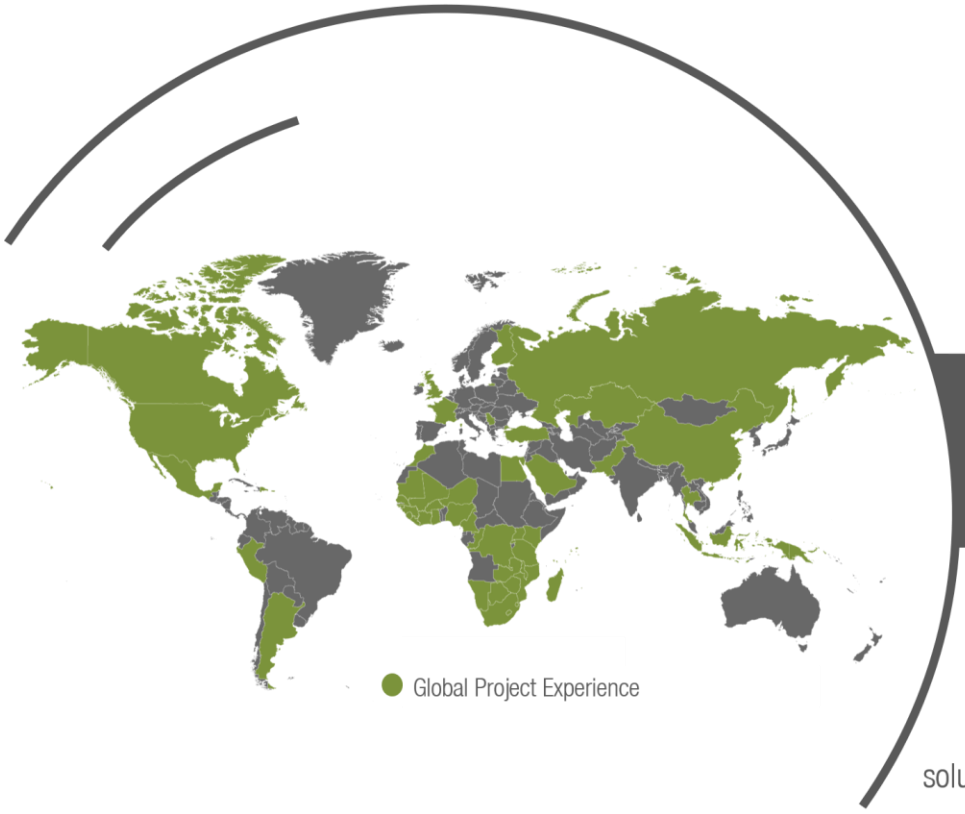

DIGBY WELLS
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Heritage Resources Management Process for the Proposed Upgrades of the Klerefontein Engineering Operations Centre at the Karoo Support Base near Carnarvon, Northern Cape

Heritage Impact Assessment

Prepared for:
South African Radio Astronomy Observatory

Project Number:
SAR8149

May 2023

Digby Wells and Associates (South Africa) (Pty) Ltd
Company Registration: 2010/008577/07

Turnberry Office Park,
Digby Wells House.
48 Grosvenor Road,
Bryanston,2191

Phone: +27 (0) 11 789 9495
Fax: +27 (0) 11 789 9495
E-mail: info@digbywells.com
Website: www.digbywells.com

Directors:
DJ Otto, J Mkhabela,
L Ratsoenyane

This document has been prepared by Digby Wells Environmental.

Report Type:	Heritage Impact Assessment
Project Name:	Heritage Resources Management Process for the Proposed Upgrades of the Klerefontein Engineering Operations Centre at the Karoo Support Base near Carnarvon, Northern Cape
Project Code:	SAR8149

Name	Responsibility	Signature	Date
Shannon Hardwick Team Lead: Heritage ASAPA Member: 451	Report Compilation Pre-disturbance Survey		May 2023
Jaco van der Walt	Technical Review		May 2023
Nomcebo Buthelezi	Approval		June 2023

DETAILS AND DECLARATION OF THE SPECIALIST

Digby Wells and Associates (South Africa) (Pty) Ltd

Contact person: Shannon Hardwick

Digby Wells House
Turnberry Office Park
48 Grosvenor Road
Bryanston
2191

Tel: 011 789 9495
Fax: 011 789 9498
E-mail: shannon.hardwick@digbywells.com

Full name:	Shannon Hardwick
Title/ Position:	Heritage Resources Management Consultant
Qualification(s):	Master of Science (MSc) Archaeology
Experience (years):	6 years
Registration(s):	ASAPA, ICOMOS, IAIAsa

I, Shannon Hardwick, declare that: –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
    - I declare that there are no circumstances that may compromise my objectivity in performing such work;
    - I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist *Date*

Findings, recommendations, and conclusions provided in this report are based on the best available scientific methods and the author's professional knowledge and information at the time of compilation. Digby Wells employees involved in the compilation of this report, however, accepts no liability for any actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.

No form of this report may be amended or extended without the prior written consent of the author and/or a relevant reference to the report by the inclusion of an appropriately detailed citation.

Any recommendations, statements or conclusions drawn from or based on this report must clearly cite or make reference to this report. Whenever such recommendations, statements or conclusions form part of a main report relating to the current investigation, this report must be included in its entirety.

EXECUTIVE SUMMARY

The South African Radio Astronomy Observatory (SARAO), together with the International Square Kilometre Array Organisation (SKAO), are establishing and operating the different radio astronomy instruments making up the larger Square Kilometre Array (SKA) Project located in the Karoo in the Northern Cape.

SARAO is currently using the existing structures on the farm Klerefontein, approximately 10 km outside the town of Carnarvon, as the support base for the current activities ongoing in the SKA Core area. SARAO now intend to upgrade the existing Engineering Operations Centre (EOC) within the Klerefontein Support Base (the Project).

The current Klerefontein Support Base comprises of the original farmhouse and outbuildings which have been maintained and which are currently in use. The farmhouse is currently used by the SARAO Operations and Health and Safety teams. The kraal is being used as a storage and laydown area and the other outbuildings are used as workshops or for storage. The current Klerefontein Support Base also includes the Engineering Operations Centre (EOC), which comprises additional offices, an electronic and a mechanical workshop and a laminar flow room. The Project will include:

- A new main building;
- A new workshop building;
- A new vehicle service workshop building;
- A new generator and diesel storage building;
- The old shed / workshop building (MeerKAT workshops and offices); and
- The old farmhouse (main building).

To this end, SARAO appointed Delta Built Environment Consultants (Delta BEC) as the independent Environmental Assessment Practitioner (EAP) to undertake the Basic Assessment (BA) Process required to obtain the authorisations needed for the Project to go ahead. SARAO additionally appointed Digby Wells Environmental (Digby Wells) to undertake a specialist Heritage Resources Management (HRM) process in compliance with the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).

This document comprises the specialist Heritage Impact Assessment (HIA) report in support of the BA process for submission to the Heritage Resources Authorities (HRAs). In this case, the applicable HRAs include the South African Heritage Resources Agency (SAHRA) and the Northern Cape Provincial Heritage Resources Authority (NCPHRA).

Mayat Hart Architects and Heritage Consultants (“Mayat Hart”) and Digby Wells completed an inspection and a pre-disturbance survey of the proposed Project area in January and February of 2023. During this time, Mayat Hart recorded and photographed the existing structures on the Klerefontein farm. During the Digby Wells pre-disturbance survey, two categories of heritage resources were identified: isolated findspots associated with the archaeological and

the historical or recent past and the Klerefontein Farmhouse and associated werf. The identified heritage resources and their significance is summarized in the table below. A more detailed description of the resources and their significance is presented in Sections 6.2.2 and 7.1 respectively.

Summary of the Cultural Significance of Identified Heritage Resources

Resource ID	Integrity	Cultural Significance
Klerefontein Farmhouse	4	Medium
Klerefontein Kraal	3	Low
Isolated Stone Age Artefacts	2	Negligible
Isolated historical/recent past Artefacts	2	
Klerefontein Workshop	2	
Klerefontein Barn	2	
Klerefontein Outhouse	2	

Potential impacts to the heritage resources include:

- Direct negative impacts to isolated surface artefacts and the Klerefontein kraal and outhouse; and
- Indirectly negative impacts to all structures of the Klerefontein Werf and the significance of the Werf as a whole.

The assessment of these impacts is presented in the table below.

Summary of the Impact Assessment

Impact	Duration	Extent	Intensity	Consequence	Probability	Significance
	Pre-mitigation:					
Indirect impact to Klerefontein Kraal	Permanent	Very Limited	Moderately high - negative	Slightly detrimental	Highly probable	Minor - negative
Direct impact to Klerefontein Werf	Permanent	Municipal Area	Moderately high - negative	Highly detrimental	Likely	Moderate - negative
Impact	**Post-mitigation:**					
Indirect impact to Klerefontein Kraal	Beyond project life	Municipal Area	Low - positive	Moderately beneficial	Likely	Minor - positive
Direct impact to Klerefontein Werf	Beyond project life	Local	Low - positive	Moderately beneficial	Likely	Minor - positive

Additionally, the proposed Project presents a risk of direct negative impact to heritage resources that may exist within the Project area, and which have not been identified to date. The table below summarises the risk to these resources.

Summary of the potential risk to heritage resources

Unplanned event	Potential impact
Accidental exposure of fossil bearing material implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 35 of the NHRA.
Accidental exposure of *in situ* archaeological material during the implementation of the Project.	
Accidental exposure of *in situ* historical built environment sites during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 34 of the NHRA
Accidental exposure of *in situ* burial grounds or graves during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 36 of the NHRA.
Accidental exposure of human remains during the construction phase of the Project.	

Considering the nature and the scope of the Project, Digby Wells recommends the following recommendations be implemented prior to the commencement of the Project:

- SARAO must re-evaluate the location of the radio mast located north of the Klerefontein farmhouse to avoid any indirect impacts such as material building up on the walls of the farmhouse.
- If direct or in direct impact from and by the radio mast cannot be avoided, SARAO must obtain a Section 34 with the relevant Heritage Resources Authority to mitigate impacts on the farmhouse.
- An EO must monitor the installation of the radio mast and the construction team must be kept to a small manageable size to manage movement and all activities associated with the installation.
- An EO must monitor the installation of two additional diesel storage tanks between the shed and the Klerefontein kraal. To avoid direct impact to the west wall of the kraal a 5 m buffer zone must be maintained with a danger tape during the installation of the storage tanks.
- An EO must also monitor any vegetation clearance and potential ground-breaking activities for the installation of the HIRAX dish prototype.
- SARAO must avoid potential direct impacts to heritage structures during construction by:

  - Erecting hoarding around the site during construction activities to protect neighbouring heritage structures. This hoarding must be erected 5 m away from the structure to create a construction buffer zone;
  - Ensuring access, parking and holding facilities for large construction vehicles is designed to avoid potential direct impacts to the heritage structures; and
  - Where intrusive methods such as deep-level compacting or piling are necessary for construction, a responsible person must monitor the heritage structures to ensure they are not damaged;
- Where items of significance are retained from the original buildings, these must be protected during construction;
- A responsible person must monitor and photograph the heritage structures regularly during the construction phase of the Project to ensure that these structures are not damaged;
- The landscaping, historical layering and the development of the site must remain legible following the establishment of the Project infrastructure. To achieve this, SARAO must implement the following:
  - The historic structures and landscaping must retain their historic architectural language, materiality and identity;
  - The new infrastructure must be contemporary in their architectural language to allow for easy identification as a new historic layer in the development of the Klerefontein property;
  - New infrastructure must highlight the identified heritage buildings and be sympathetic to the existing context and cultural significance; and
  - All existing significant historical trees and landscaping must be protected during construction activities to ensure they are not damaged. Where trees are missing, Digby Wells recommends planting new ones;
- The existing Chance Finds Procedure (CFP) for the SKA Project must be applied to the Project and implemented during the Project lifecycle; and
- SARAO must implement the Project-specific Conservation Management Plan (CMP) included in Digby Wells' current Scope of Work and the recommendations included therein.

Where SARAO implements these recommendations, Digby Wells does not object to the implementation of this Project.

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ACRONYMS, ABBREVIATIONS AND DEFINITION

Abbreviation	Meaning
ASAPA	Association of Southern African Professional Archaeologists
BA	Bachelor of Arts, or Basic Assessment (*the applicable term will be defined in the report*)
BCE	Before Common Era (also: Before Christ or BC)
BID	Background Information Document
BSc	Bachelor of Science
c.	Circa, meaning approximately
CE	Common Era (also: *Anno Domini* or AD)
CFP	Chance Find Protocol
CRR	Comments and Response Report
CS	Cultural Significance
Digby Wells	Digby Wells Environmental
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EFC	Early Farming Community (*also known as Early Iron Age, see below*)
EIA	Environmental Impact Assessment. *Please note that EIA can also refer to the 'Early Iron Age'; however, in this document, this time period is referred to as 'Early Farming Community'.*
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
ESA	Early Stone Age
GIS	Geographical Information System
GN R	Government Notice Regulation
GPS	Global Positioning System
HIA	Heritage Impact Assessment
Hons	Honours degree
HRAs	Heritage Resources Authorities
HRM	Heritage Resources Management
HSMP	Heritage Site Management Plan
ICOMOS	International Council on Monuments and Sites

Abbreviation	Meaning
Kya	Thousand years ago
LFC	Late Farming Community also known as Late Iron Age
LSA	Late Stone Age
MIA	Middle Iron Age
MSA	Middle Stone Age
MSc	Master of Science
Mya	Million years ago
NCPHRA	Northern Cape Provincial Heritage Resources Authority
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NID	Notification of Intent to Develop
PHRA	Provincial Heritage Resources Authority
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SCF	Statutory Comment Feedback
SEP	Stakeholder Engagement Process
SoW	Scope of Work
ToR	Terms of Reference
Wits	University of the Witwatersrand
Werf	A farmstead or multiple outbuildings associated with a farmhouse or agricultural activities. Plural: *werwe* (Afrikaans).

Refer to Appendix A for a Glossary of Terms.

NHRA and GN R 326 Appendix 6 Legislated Requirements

Description	App. 6	NHRA	Section
Declaration that the report author(s) is (are) independent.	1(b)	-	Page iii-iv
An indication of the scope of, and the purpose for which, the report was prepared.	1(c)	-	1.1 1.2
Details of the person who prepared the report and their expertise to carry out the specialist study.	1(a)	-	1.3
Outlines the legislative framework relevant to the specialist heritage study.	-	-	3
Identifies the specific constraints and limitations of the HIA, including any assumptions made and any uncertainties or gaps in knowledge.	1(i)	-	4
Describes the methodology employed in the compilation of this HIA.	1(e)	-	5
An indication of the quality and age of base data used for the specialist report.	1(cA)	-	5.4 15
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment.	1(d)	-	5.5
Provides the baseline cultural landscape.	-	38(3)(a)	6
Motivates for the defined Cultural Significance of the identified heritage resources and landscape.	-	38(3)(b)	7.1
A description of the potential impacts to heritage resources by project related activities, including: - Existing impacts on the site; - Possible risks to heritage resources; - Cumulative impacts of the proposed development; - Acceptable levels of change; and - Heritage-related risks to the project.	1(cB)	38(3)(c)-	7
A description of the findings and potential implications of such findings on the impact of the proposed activity or activities.	1(j)	38(3)(c)	
Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives.	1(f)	-	7 Plan 3

Description	App. 6	NHRA	Section
Considers the development context to assess the socio-economic benefits of the project in relation to the presented impacts and risks.	-	38(3)(d)	12
A description of any consultation process that was undertaken during the course of preparing the specialist report and the results of such consultation.	1(o)	38(3)(e)	10
A summary and copies of any comments received during any consultation process and where applicable all responses thereto.	1(p)	38(3)(e)	
Details the specific recommendations based on the contents of the HIA.	-	38(3)(g)	11
An identification of any areas to be avoided, including buffers.	1(g)		
Any mitigation measures for inclusion in the Environmental Management Programme (EMPr)	1(k)		8
Any conditions for inclusion in the environmental authorisation.	1(l)		11
Any monitoring requirements for inclusion in the EMPr or environmental authorisation.	1(m)		9
A reasoned opinion— (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	1(n)	38(3)(g)	13
Collates the most salient points of the HIA and concludes with the specific outcomes and recommendations of the study.	-	38(3)(f) 38(3)(g)	14
Lists the source material used in the development of the report.	1(cA)	-	15
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	1(h)	-	Plan 3
Any other information requested by the competent authority.	1(q)	-	N/A

1. Introduction

The South African Radio Astronomy Observatory (SARAO), together with the International Square Kilometre Array Organisation (SKAO), are establishing and operating the different radio astronomy instruments making up the larger Square Kilometre Array (SKA) Project located in the Karoo in the Northern Cape. The 64-dish MeerKAT instrument and the KAT-7 telescopes are currently operational and SARAO is in the process of establishing an additional 133 antennas and the supporting infrastructure comprising the SKA1_MID radio telescope.

SARAO is currently using the existing structures on the farm Klerefontein, approximately 10 km outside the town of Carnarvon, as the support base for the current activities ongoing in the SKA Core area. Given the influx of staff associated with the construction of the SKA1_MID antennae and associated infrastructure and the anticipated operation of this equipment, SARO intend to upgrade the existing Engineering Operations Centre (EOC) within the Klerefontein Support Base (the Project).

To this end, SARAO appointed Delta Built Environment Consultants (Delta BEC) as the independent Environmental Assessment Practitioner (EAP) to undertake the Basic Assessment (BA) Process required to obtain the authorisations needed for the Project to go ahead.

SARAO appointed Digby Wells Environmental (Digby Wells) to undertake a specialist Heritage Resources Management (HRM) process in compliance with the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).

This document comprises the specialist Heritage Impact Assessment (HIA) report in support of the BA process for submission to the Heritage Resources Authorities (HRAs). In this case, the applicable HRAs include the South African Heritage Resources Agency (SAHRA) and the Northern Cape Provincial Heritage Resources Authority (NCPHRA).

1.1. Terms of Reference

SARAO appointed Digby Wells as an independent specialist to undertake a Heritage Resources Management (HRM) process in support of the proposed upgrades to the Klerefontein EOC at the Karoo Support Base. This HRM process included specialist archaeological, built heritage and palaeontological assessments and will include the development of a Project-specific Conservation Management Plan (CMP) in the next phase.

1.2. Scope of Work

The Scope of Work (SoW) for the specialist HRM process included the compilation of an HIA report to comply with the requirements encapsulated in Section 38(3) of the NHRA. Digby Wells completed the following activities as part of the SoW:

- Description of the predominant cultural landscape supported through primary and secondary data collection;
- Assessment of the Cultural Significance of the identified heritage resources;

- Identification of potential impacts to heritage resources based on the Project description and Project activities;
- An evaluation of the potential impacts to heritage resources relative to the sustainable socio-economic benefits that may result from the Project;
- Recommending feasible management measures and/or mitigation strategies to avoid and/or minimise negative impacts and enhance potential benefits resulting from the Project; and
- Submission of the HIA (as well as the Draft Basic Assessment Report [DBAR] and supporting reports) to the HRAs for Statutory Comment as required under Section 38(8) of the NHRA.

1.3. Expertise of the Specialist

Table 1-1 presents a summary of the expertise of the specialists involved in the compilation of this report. Appendix D includes the full curriculum vitae (CVs) of these specialists.

Table 1-1: Expertise of the Specialists

Team Member	Bio Sketch
Shannon Hardwick ASAPA Member: 451 ICOMOS Member 38048 Years' Experience: 5	Shannon joined the Digby Wells team in May 2017 as a Heritage Management Intern and has most recently been appointed as a Heritage Resources Management Consultant. Shannon is an archaeologist who obtained a Master of Science (MSc) degree from the University of the Witwatersrand in 2013, specialising in historical archaeobotany in the Limpopo Province. She is a published co-author of one paper in *Journal of Ethnobiology*. Since joining Digby Wells, Shannon has gained generalist experience through the compilation of various heritage assessments, including Heritage Scoping Reports (HSRs), HIAs, Heritage Basic Assessment Reports (HBARs) and Section 34 permit applications. Her other experience includes compiling a Community Health, Safety and Security Management Plan (CHSSMP) and various social baselines. Shannon's experience in the field includes pre-disturbance surveys in South Africa, Malawi and the Democratic Republic of the Congo and other fieldwork in Malawi.

Team Member	Bio Sketch
Jaco van der Walt ASAPA Member: 159 APHP Member: 114 Years' Experience: 23	Jaco has been actively involved as a professional archaeologist within the heritage management field in Southern Africa for the past 23 years. He obtained his Master's degree in Archaeology from the University of the Witwatersrand in 2012 and is an accredited member of the Association of Southern African Professional Archaeologist (ASAPA Member #159) and acted as council member for SADC countries in the Cultural Resource Management (CRM) portfolio from 2011 – 2012 and for the current term (2023 – 2024). He is also an accredited member of the Association of Professional Heritage Practitioners (#114). Having worked at various universities and in the private sector and this provided him with an excellent balance between academia and the challenges that development poses on our non-renewable heritage resources. He has experience conducting heritage assessments, grave relocation projects, heritage mitigation and management projects. Jaco has worked on various international projects in Zimbabwe, Botswana, Mozambique, Lesotho, Democratic Republic of the Congo (DRC) Zambia, Guinea, Afghanistan, Nigeria and Tanzania. Through this, he has a sound understanding of the International Finance Corporations (IFC) Performance Standard requirements, with specific reference to Performance Standard 8 – Cultural Heritage

2. Project Description

SARAO have established the Klerefontein Support Base approximately 10 km outside Carnarvon and approximately 80 km from the SKA Core Area and spiral arms within which the SKA1_MID infrastructure will be established. The current Klerefontein Support Base comprises of the original farmhouse and outbuildings which have been maintained and which are currently in use. The farmhouse is currently used by the SARAO Operations and Health and Safety teams. The kraal is being used as a storage and laydown area and the other outbuildings are used as workshops or for storage. Also at the current Klerefontein Support Base is the EOC, which comprises additional offices, an electronic and a mechanical workshop and a laminar flow room.

In anticipation of the larger staffing and resourcing requirements as the SKA1_MID Project goes ahead, SARAO intend to upgrade the current EOC. The Project will include:

- A new main building;
- A new workshop building;
- A new vehicle service workshop building;
- A new generator and diesel storage building;
- The old shed / workshop building (MeerKAT workshops and offices); and
- The old farmhouse (main building).

The Project will also include the establishment of a new Radio Frequency Interference (RFI) Chamber near the historic barn.

2.1. Proposed Infrastructure and Activities

Table 2-1 provides an overview of the Project-related activities expected within the different phases of the Project.

Table 2-1: Project Phases and Associated Activities

Project Phase	Project Activity
Construction Phase	Clearing of vegetation.
	Construction of proposed Infrastructure.
Operational Phase	Operation of proposed Infrastructure.
	Routine Maintenance Activities.
Decommissioning Phase	Demolition and removal of all infrastructure.
	Rehabilitation (spreading of soil, re-vegetation and profiling/contouring).

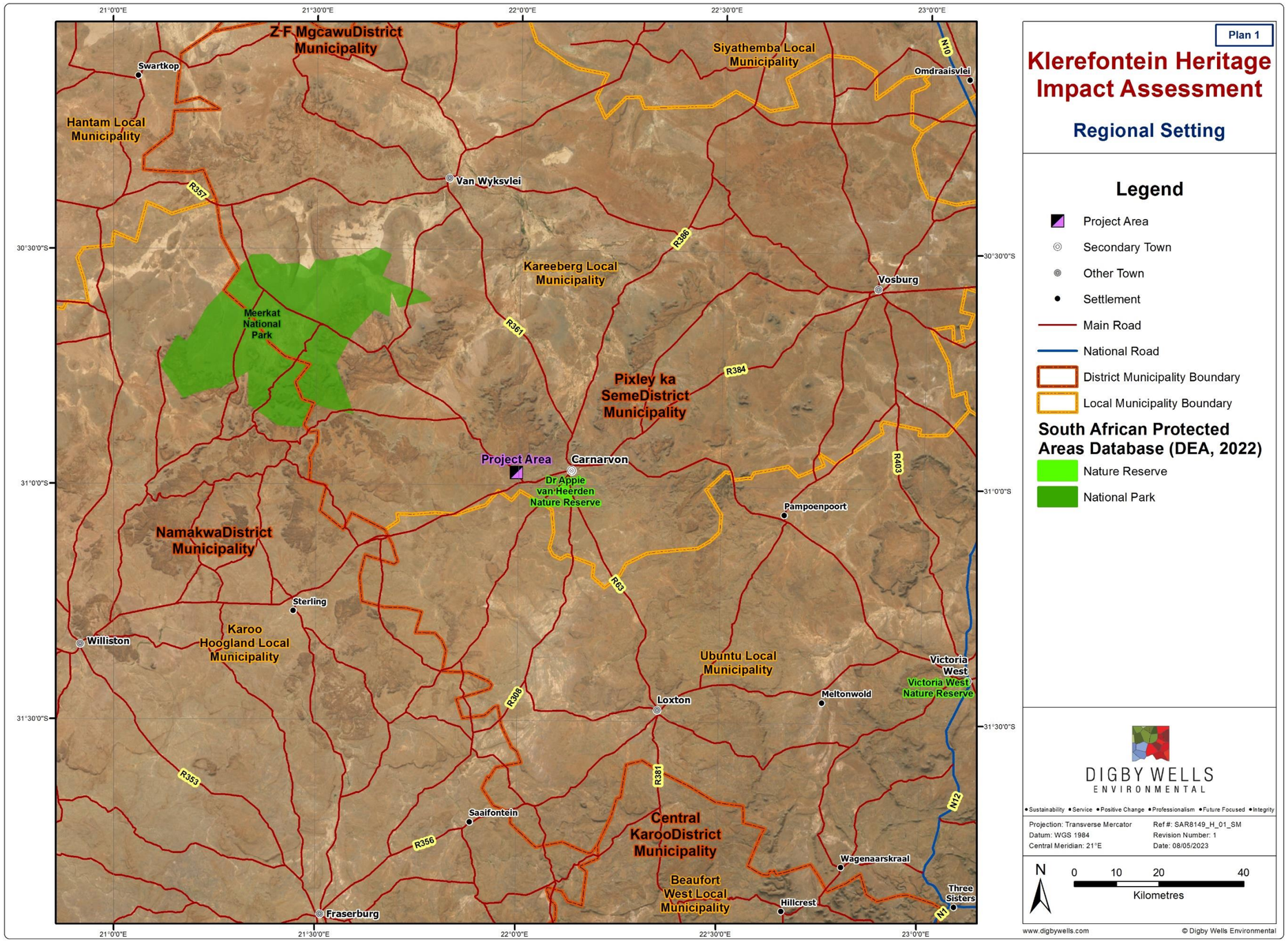
2.2. Alternatives Considered

Table 2-2 presents a summary of the alternatives considered for the proposed Project and describes the consequences of the various alternatives on the assessment of impacts posed to cultural heritage resources within the Project Area. The DBAR includes a more detailed discussion on the Project alternatives.

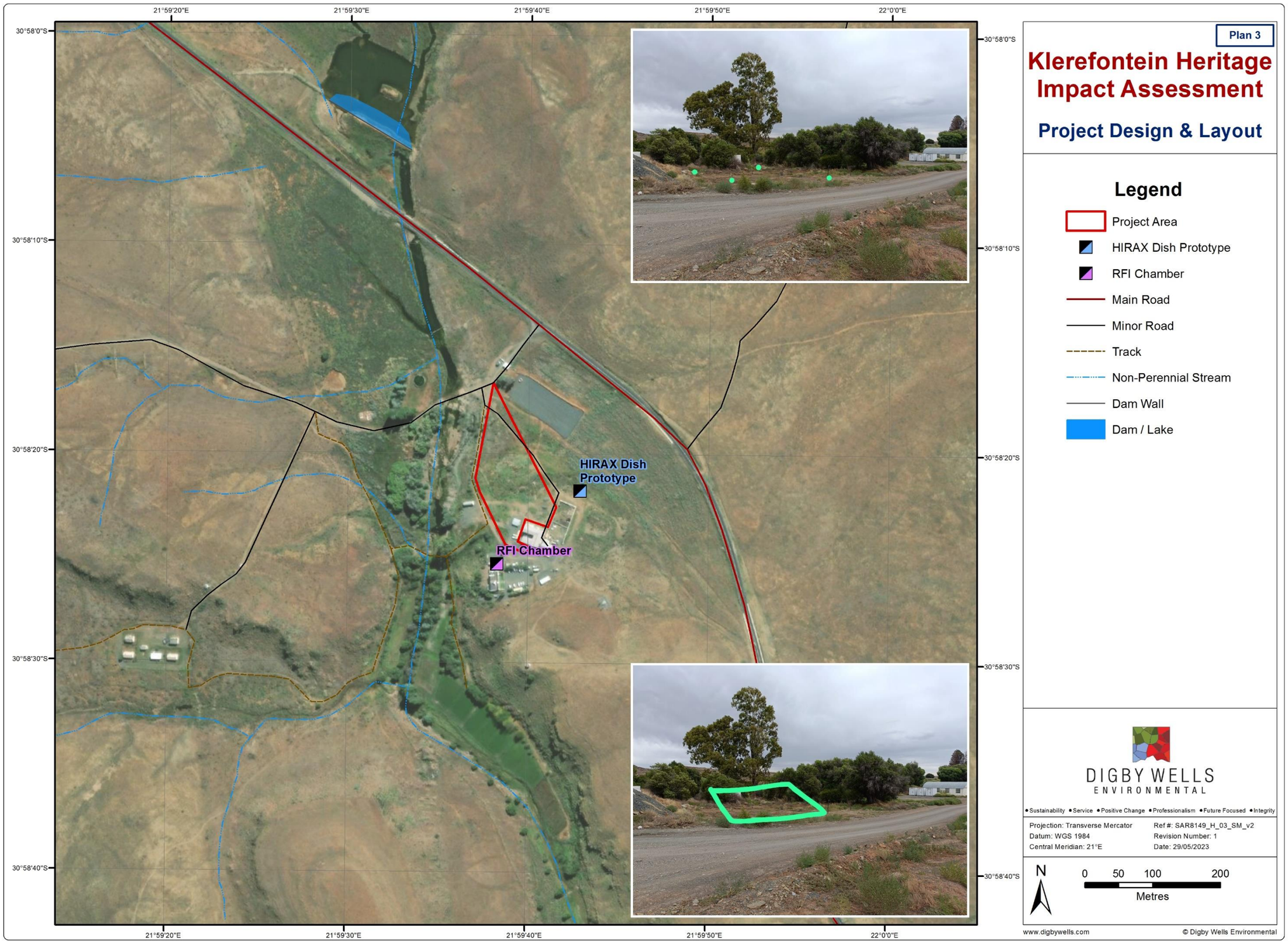
Table 2-2: Project Alternatives considered in this Assessment

Alternative	Description	Consequence for HRM Process
'No-go' Alternative	Should the Project not obtain approval, or not go ahead for any reason, the potential negative environmental and social (including heritage) impacts associated with the development of the proposed Project would not occur. However, the potential socioeconomic benefits associated with the Project (described in Section 12) would also not occur.	The no-go alternative has been considered in this assessment.

Plan 1: Regional and Local Setting



Plan 2: Project Layout and Infrastructure



3. Relevant Legislation, Standards and Guidelines

This section describes the international, national and regional legislative documents and policy documents that inform the legislative and policy framework of the HRM process. The objective is to ensure that the assessments meet all stipulated requirements to ensure legal compliance and successful integration into the regional planning context.

3.1. National Legislation and Policy

Table 3-1 presents a summary of the national legislation applicable to this HRM process and illustrates how it will be considered in the HIA. Table 3-2 below presents the applicable policies considered in the HRM process.

Table 3-1: Applicable Legislation considered in the HRM Process

Applicable legislation used to compile the report	Reference where applied
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa, with specific reference to the following Sections: • 5. General principles for HRM • 6. Principles for management of heritage resources • 7. Heritage assessment criteria and grading • 38. Heritage resources management The Act requires that Heritage Resources Authorities (HRAs), be notified as early as possible of any developments that may exceed certain minimum thresholds in terms of Section 38(1), or when assessments of impacts on heritage resources are required by other legislation in terms of Section 38(8) of the Act.	This report was compiled to comply with Section 5, 38(3), (4) and (8) of the NHRA. This report was submitted to the responsible HRAs, which in this instance is SAHRA and NCPHRA.
NHRA Regulations, 2000 (GN R 548) The NHRA Regulations regulate the general provisions and permit application process in respect of heritage resources included in the national estate. Applications must be made in accordance with these regulations. The following Chapters are applicable to this assessment:	The HRM process was undertaken with cognisance of the applicable regulations. The proposed mitigation strategies and management measures must comply with these requirements.

Applicable legislation used to compile the report	Reference where applied
• II. Permit Applications and General Provisions for Permits; • III: Application for Permit: National Heritage Site, Provincial Heritage Site, Provisionally Protected Place or Structure older than 60 years; • IV: Application for Permit: Archaeological or Palaeontological or Meteorite; • IX: Application for Permit: Burial Grounds and Graves; • X: Procedure for Consultation regarding Protected Area; • XI: Procedure for Consultation regarding Burial Grounds and Graves; and XII: Discovery of Previously Unknown Graves.	
<u>Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)</u> Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that – i. Prevent pollution and ecological degradation; ii. Promote conservation; and iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development	The HRM process was undertaken to identify heritage resources and determine heritage impacts associated with the Project. As part of the HRM process, applicable mitigation measures, monitoring plans and/or remediation were recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.
<u>National Environmental Management Act, 1998 (Act No. 107 of 1998)</u> The NEMA, as amended, was set in place in accordance with Section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making on issues affecting the environment. Section 24 (1)(a), (b) and (c) of NEMA state that: *The potential impact on the environment, socio-economic conditions and cultural heritage of activities that require authorisation or permission by law and*	The HRM process was undertaken in accordance with the principles of Section 2 of the NEMA as well as with the EIA Regulations 2014 (as amended), promulgated in terms of NEMA.

Applicable legislation used to compile the report	Reference where applied
which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity. The Environmental Impact Assessment (EIA) Regulations, Government Notice Regulation (GN) R.982 were published on 04 December 2014 and promulgated on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R.983 (Listing Notice No. 1), GN R.984 (Listing Notice No. 2) and GN R.985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended.	
GN R. 982: Environmental Impact Assessment Regulations, 2014 (as amended by GN R 326 of 7 April 2017) These three listing notices set out a list of identified activities which may not commence without an Environmental Authorisation from the relevant Competent Authority through one of the following processes: • Regulation GN R. 983 (as amended by GN R 327) - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation, and which must follow a basic assessment process. • Regulation GN R. 984 (as amended by GN R 325) – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation, and which must follow an environmental impact assessment process. • Regulation GN R. 985 (as amended by GN R 324) – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed.	The IEMP provides the SKA Project exemption from applying for environmental authorisation of the proposed specified activities that exceed thresholds contained within the Listing Notices. To this effect, the HRM process specifically, was completed to comply with the requirements of Section 38(1) of the NHRA.
National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PAA)	The HRM process considered the requirements of declaration as stipulated

Applicable legislation used to compile the report	Reference where applied
The NEM: PPA provides for South Africa's system of protected areas. It establishes the mechanisms for the protection, conservation and management of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes. It makes further provisions for intergovernmental co-operation and public consultation in matters concerning protected areas to promote the continued existence, governance and functions of the National Parks.	under Section 20(2)(a)(i) and (c) and co-management by Section 42. The HIA and CMP reference to the Cultural Heritage Survey Guidelines and Assessment Tools for Protected Areas in South Africa promulgated on 8 December 2017 (GN R 1356)
World Heritage Convention Act, 1999 (Act No. 49 of 1999) (WHCA) The WHCA makes provision for the inclusion of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention concerning the Protection of the World Cultural and Natural Heritage (*i.e. World Heritage Convention [WHC]*) of 1972, into South African law. The Act makes provision for the principles and requirements in the development of Integrated Management Plans (IMPs) under Chapter IV. These include: • Section 21: Preparation and implementation of IMPs; • Section 22: Harmonisation of IMPs; • Section 23: Objects of IMPs; • Section 24: Contents of IMPs; • Section 26: Duration of IMPs; and • Section 28: Model IMP.	The HRM process acknowledges that the Project area is situated within the /Xam Heartland, previously on the tentative UNESCO World Heritage Site list with the ≠Khomani Cultural Landscape, inscribed in 2017.
Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007) (AGA) and Karoo Central Astronomy Advantage Areas Spectrum Regulations, 2015 (GN R 1166) The AGA Act provides for the preservation and protection of areas uniquely suited for optical and radio astronomy and to provide for matters connected with astronomy advantage areas (AAAs). The Karoo Core AAA and Karoo Central AAAs have been declared as per Sections 7 and 9 of the Act. The Regulations outline restrictions that must be observed within the relevant Karoo Central AAAs. These regulations refer to the prohibition and/or restriction of certain radio frequencies (RFI) and	Given the distance of the Klerefontein Support Base from the SKA Project itself, the RFI and EMI requirements did not influence the in-field assessments. This notwithstanding, the HRM process considered the restrictions encapsulated in the AGA Act and GN R 1166.

Applicable legislation used to compile the report	Reference where applied
electromagnetic interference (EMI), administrative matters and financial compensation.	

Table 3-2: Applicable policies considered in the HRM process

Applicable policies used to compile the report	Reference where applied
SAHRA Archaeology, Palaeontology and Meteorites (APM) Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports (2007) The guidelines provide the minimum standards that must be adhered to for the compilation of a HIA (2007). Chapter II Section 7 outlines the minimum requirements for inclusion in the heritage assessment as follows: • Background information on the Project; • Background information on the cultural baseline; • Description of the properties or affected environs; • Description of identified sites or resources; • Recommended field rating of the identified sites to comply with Section 38 of the NHRA; • A statement of Cultural Significance in terms of Section 3(3) of the NHRA; and • Recommendations for mitigation or management of identified heritage resources.	This report and the PIA report (Appendix C) were compiled to adhere to the minimum standards as defined by Chapter II of the SAHRA Minimum Standards (2007 and 2012 respectively).
GN 1356: NEM: PAA Cultural Heritage Survey Guidelines and Assessment Tools for Protected Areas in South Africa promulgated on 8 December 2017: The guidelines enable managers of Protected Areas to work within the ambit of the national HRM system in a quest of continuous improvement and sustainable management of heritage resources. It establishes best practice standards to effectively: • Support the implementation of the NHRA in the identification and protection of places of Cultural Significance in Protected Areas; • Provide the basic means of ensuring those who manage Protected areas:	The physical data collection adhered to the minimum required standards to record and inventorise identified heritage resources. Principles of consultation and dissemination of information was incorporated into the HRM approach in the HIA and will be continued in the development of the CMP.

Applicable policies used to compile the report	Reference where applied
i. Are aware of the heritage resources within their Protected Area; ii. Have knowledge of the Cultural Significance of these identified heritage resources within the Protected Area; **iii.** Have the knowledge to conduct basic recording of heritage resources in the Protected Area; and • Fulfil the basic requirements of the NHRA and other applicable legislation.	
United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention concerning the Protection of the World Cultural and Natural Heritage of 1972 (World Heritage Convention [WHC]) While fully respecting the sovereignty of the States, the Convention formalises requirements for the national and international protection of cultural and natural heritage in respect of the collective interest of the international community. Article 5 requires each State Party to this Convention to: a. Adopt a general policy which aims to give cultural and natural heritage a function in the life of the community and integrate the protection of that heritage into comprehensive planning programmes; b. Set up services for the protection, conservation and presentation of the cultural and natural heritage with appropriate staff; c. Develop scientific and technical studies and research and to work out such operating methods as will make the State capable of counteracting the dangers that threaten its cultural and natural heritage; d. Take the appropriate measures necessary for the identification, protection, conservation, presentation and rehabilitation of this heritage; and Establish or development for training in the protection, conservation and presentation of the cultural and natural heritage and to encourage scientific research in the field.	The HRM process was completed to achieve the requirements of Article 5 of the WHC
Operational Guidelines for the Implementation of the World Heritage Convention, 12 July 2017 The guidelines aim to facilitate the implementation of the WHC. It further provides for:	The HRM process did consider the principles encapsulated in Chapter II of the guidelines in the designation of Cultural Significance, and

Applicable policies used to compile the report	Reference where applied
• Chapter II D: Criteria for the assessment of Outstanding Universal Value • Chapter II E: Integrity and/or Authenticity; and • Chapter II F: Protection and Management.	recommendations for protection and management of identified heritage resources and greater cultural landscape.
United Nations Educational, Scientific and Cultural Organisation (UNESCO) Convention for the Safeguarding of the Intangible Cultural Heritage, 2003 The purpose of the Convention is to safeguard and respect the intangible cultural heritage of the communities, groups and individuals concerned that concurrently raises awareness at local, national and international level of its importance. Chapter III advises to the safeguarding of the intangible cultural heritage at a national level through, amongst other, the following: • Article 12 – Inventories; • Article 14 – Education, awareness-raising and capacity building; and • Article 15 – Participation of communities, groups and individuals.	The physical data collection did adhere to the minimum required standards to record and inventorise identified heritage resources. The HRM process was furthermore, designed to consider the Articles 14 and 15.
International Council on Monuments and Sites (ICOMOS): International Charter for the Conservation and Restoration of Monuments and Sites, 1964 (*Venice Charter*) The Charter establishes the importance of architectural work, as well as the urban and rural setting in which it is found to which Cultural Significance is attributed. It acknowledges the importance in maintaining the integrity and meaning of heritage resources through conservation and restoration interventions. Articles 4 through 8 provide a set of guidelines for the conservation of such heritage resources, which underlay many of the principles of subsequent ICOMOS doctrinal texts.	The HRM process did consider the principles of conservation and restoration detailed in the Charter to ensure the integrity, meaning and Cultural Significance of identified heritage resources are, at a minimum, maintained.
International Council on Monuments and Sites (ICOMOS): Charter for the Protection and Management of the Archaeological Heritage, 1990 The Charter provides for the protection and proper management of archaeological heritage to enable archaeologists and other scholars an opportunity to study and interpret these resources on behalf of and for the benefit of present and future generations, through effective collaboration between professionals from several disciplines and local cultural groups.	The HRM process was designed on the principles and guidelines within the Charter to adhere to international best practice standards.

Applicable policies used to compile the report	Reference where applied
The Charter reflects the basic principles and guidelines for global validity as follows: • Article 2: Integrated Protection Policies; • Article 3: Legislation and Economy; • Article 4: Survey; • Article 5: Investigation; • Article 6: Maintenance and Conservation; • Article 7: Presentation, Information and Reconstruction; and • Article 8: Professional Qualifications.	
International Council on Monuments and Sites (ICOMOS): The NARA Document on Authenticity, 1994 The NARA Document provides a framework to test authenticity in ways which accord full respect to the social and cultural values of all societies. All cultures and societies are rooted in the particular forms and means of tangible and intangible expression which constitute their heritage, and these must be respected. The document postulates that conservation of cultural heritage is rooted in the value ascribed and our ability to understand this value depends, in part, on the credibility of information sources. This is a requisite for assessing all aspects of authenticity. This may differ between and within cultures, therefore, it is crucial that recognition be accorded to the specific nature of its heritage values and the credibility of the related information sources.	The HRM process did consider a great variety of information sources and assess these for credibility to permit the elaboration of the artistic, historic, social and scientific dimensions.
International Council of Monuments and Sites (ICOMOS): Principles for the Recording of Monuments, Groups of Buildings and Sites, 1996 These Principles expand upon Article 16 of the Venice Charter to outline the standards to inform the recording and documentation of heritage resources. Recording of sites should be undertaken as a record against potential damage or destruction of the monument(s) or site(s) as well as to inform future decisions that may be made regarding the heritage resources. Prior to new records being made, older records must be examined and analysed in terms of their adequacy, Records must be suitable for archival storage and should be appropriate to the monument(s) or site(s) being recorded and should consider the reason for recording.	The HRM process does include records and documentation that considers the tangible as well as the intangible aspects of the heritage resources.

Applicable policies used to compile the report	Reference where applied
International Council on Monuments and Sites (ICOMOS): Charter on the Built Vernacular Heritage, 1999 The Charter recognises that built vernacular heritage, i.e. the traditional and natural way by which communities house themselves, is an important, fundamental expression of the culture of a community and its relationship with its environment. It aims, supplementary to the Venice Charter, to establish principles for the care and protection of built vernacular heritage. Principles for conservation include: • Conservation must be carried out by multidisciplinary expertise while recognising the inevitability of change and development, and the need to respect the community's established cultural identity; • Contemporary work should respect the cultural values and traditional character of vernacular buildings, groups and settlements; • The vernacular is best conserved by maintaining and preserving groups and settlements of a representative character, region by region; • The built vernacular heritage is an integral part of the cultural landscape and this relationship must be taken into consideration in the development of conservation approaches; The vernacular embraces not only the physical form and fabric of buildings, structures and spaces, but the ways in which they are used and understood, and the traditions and the intangible associations which attach to them.	The assessment of the vernacular built heritage within the Project area considered the principles detailed in the Charter, focussed not only on the tangible aspects of the structures, but the intangible associations through use and space.
International Council on Monuments and Sites (ICOMOS): International Cultural Tourism Charter, 1999 The Charter formalises the ethos that natural and cultural heritage belongs to all people with the right and responsibility to understand, appreciate and conserve its Cultural Significance. The Charter details various principles that strive to facilitate and encourage: • Accessibility of heritage resources and their Cultural Significance to host communities and visitors; • Promotion and management of tourism in ways that respect and enhance heritage resources Cultural Significance and living cultures of host communities; • Dialogue between conservation interests and tourism; and	The CMP considers the principles of the Charter in as far as feasible, viable tourism opportunities are identified considering the special constraints of the Project.

Applicable policies used to compile the report	Reference where applied
The formulation of plans and policies to develop detailed, measurable goals and strategies relating to the presentation and interpretation of heritage places and cultural activities, in the context of their preservation and conservation.	
International Council on Monuments and Sites (ICOMOS): Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage, 2003 The document presents the basic concepts of conservation required to promote rational methods of analysis and repair methods appropriate to cultural context. These comprise the following sections: • Section 1: General criteria; • Section 2: Research and diagnosis; and • Section 3: Remedial measures and controls.	The approach of the specialist Built Environment assessment was designed based on the principles of Section 2. Any recommended mitigation and/or management measures were cognisant of the principles as outlined in Section 3.
International Council on Monuments and Sites (ICOMOS): Declaration of the Kimberley Workshop on the Intangible Heritage of Monuments and Sites, 2003 The Declaration commits ICOMOS to taking account of the intangible values and local communities that are the custodians of these values in the management and preservation of monuments and sites. Chief amongst which is the collaboration with communities to identify: • Concepts of intangible heritage; • Impacts of change and the diverse perceptions; • Mechanisms of preservation; and • Interpretations and dissemination methods.	The HRM process was designed to facilitate an inclusive and consultative approach to the development of mitigation and management measures in accordance with the principles of the Declaration.
International Council on Monuments and Sites (ICOMOS): Xi'an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas, 2005 The Declaration acknowledges the contribution of setting to the designated Cultural Significance. The Cultural Significance is derived from the perceived social, aesthetic, scientific and historic value of heritage resources and its interactions with setting. It requires that, to understand and interpret the setting in diverse contexts, a multi-disciplinary approach and use of diverse information sources must be used within a regulatory framework. Relevant principles to be considered include:	The HRM process was undertaken to adhere to the principles of the Declaration.

Applicable policies used to compile the report	Reference where applied
• Principle 7 – Impacts of incremental or rapid change on setting should be effectively controlled; • Principle 8 – HIA's should be required for all new developments; • Principle 9 – Rate of change and impacts of change an transformation on setting is an on-going process which must be monitored and managed; • Principle 10 – Management must aim to retain Cultural Significance and distinctive character; • Principle 12 – Co-operation and engagement with associated and local communities is essential for the sustainable conservation and management of setting; and • Principle 13 – Dissemination of information through various mechanisms must be encourages to support co-operation and sharing of knowledge.	
International Council on Monuments and Sites (ICOMOS): Québec Declaration on the Preservation of the Spirit of Place, 2008 Building on the Kimberley Declaration, the document identifies principles and recommendations to preserve the spirit of place through the safeguarding of tangible (*sites, buildings, landscapes, routes, objects*) and intangible heritage (*memories, narratives, written documents, traditional knowledge, values, etc.*). The Declaration acknowledges that the spirit of a place can vary in time and from one culture to another, that it continually reconstructed by various social actors, managers and users who all actively and concurrently contribute to giving it meaning. Relevant principles and recommendations are encapsulated in Articles 4 through 10.	The HRM process was undertaken in accordance with the recommendations encapsulated in the Declaration to, as far as possible, identify and preserve the spirit of place through active engagement with heritage resource producers and users.

3.2. Regional Regulatory Context

The HRM process was completed to comply with the requirements of the South African national legislative framework as described above. Provincial legislation and municipal by-laws are applicable to graves and cemeteries and are considered in our recommendations where a Grave Relocation Process (GRP) may be required.

4. Assumptions, Limitations and Exclusions

Digby Wells encountered constraints and limitations during the compilation of this report. Table 4-1 presents an overview of these limitations and the consequences.

Table 4-1: Constraints and Limitations

Description	Consequence
The reviewed literature does not represent an exhaustive list of information sources for the various study areas.	The cultural heritage baseline presented in Section 6 below is considered accurate but may not include new data or information which may not have been made available to the public.
The final EOC update design was not available at the time of the survey or compilation of this report.	Some heritage resources in the Project may therefore not have been identified. Every effort was made to cover the extent of the study area[1]. The survey was focused on the proposed infrastructure layout current at the time of the survey. Subsequent to the completion of this survey, the Radio Frequency Interference (RFI) Reverberation Chamber infrastructure was included in the Project. As such, this area was not specifically surveyed. This notwithstanding, the infrastructure footprint is small and located in a disturbed area and is not expected to affect the outcomes of this assessment. The infrastructure design will be informed in part by the results of the heritage assessment.
This report does not present an exhaustive list of identified heritage resources. Clusters of dense vegetation limited visibility and the area was largely disturbed at the time of the pre-disturbance survey.	Previously unidentified heritage resources may be encountered. Should this occur, SARAO must alert the HRAs of the find and may need to enlist the services of a suitably qualified archaeologist or palaeontologist to advise them on the way forward.
Historical, archaeological and palaeontological resources, as well as graves, commonly occur at subsurface levels. These types of resources cannot be adequately recorded or documented by assessors without destructive and intrusive methodologies and without the correct permits issued in terms of Section 35 of the NHRA.	The reviewed literature, previously-completed heritage assessments and the results of the field survey are in themselves limited to surface observations. Subsurface tangible heritage may be exposed during Project activities. Should this occur, SARAO must alert the HRAs of the find and may need to enlist the services of a suitably qualified archaeologist or palaeontologist to advise them on the way forward.

[1] Refer to Section 5.1 for a description of the study area.

5. Methodology

The following section presents a summary of the methodologies employed in the HRM process. Appendix E includes a more detailed description of the methodologies employed during the HRM process.

5.1. Defining the Study Areas

Heritage resources do not exist in isolation to the greater natural and social environment (which includes the socio-economic, socio-political, and socio-cultural aspects). To develop an applicable cultural heritage baseline for the Project, Digby Wells defined three nested study areas to be considered. These include:

- The *site-specific study area*: the farm portions extent associated with the proposed Project and proposed infrastructure, including a 500 m buffer area. The site-specific study area may extend linearly, in which case the site-specific study area will include the linear development and a 200 m buffer on either side of the footprint;
- The *local study area:* the area most likely to be influenced by any changes to heritage resources in the Project area, or where project development could cause heritage impacts. The local study area is defined as the area bounded by the local municipality and includes particular reference to the immediate surrounding properties or farms. The local study area is specifically examined to offer a backdrop to the socio-economic conditions within which the proposed development will occur. The local study area furthermore provides the local development and planning context that may contribute to cumulative impacts. The Project area is situated within the Kareeberg Local Municipality (KLM); and
- The *regional study area:* the area bounded by the district municipality demarcation. In this case, the Project is located in the Pixley ka Seme District Municipality (PSDM). Where necessary, the regional study area may be extended outside the boundaries of the district municipality to include areas closest to the Project area. The aim of this is to include much wider expressions of specific types of heritage resources and historical events. The regional study area also provides the regional development and planning context that may contribute to cumulative impacts.

5.2. Statement of Significance

Digby Wells designed the significance rating process to provide a numerical rating of the Cultural Significance of identified heritage resources. This process considers heritage resources assessment criteria set out in subsection 3(3) of the NHRA, which determines the intrinsic, comparative, and contextual significance of identified heritage resources. A resource's importance rating is based on information obtained through review of available credible sources and representativity or uniqueness (i.e., known examples of similar resources to exist).

The rationale behind the heritage value matrix takes into account that a heritage resource's value is a direct indication of its sensitivity to change (i.e., impacts). Value, therefore, was determined prior to completing any assessment of impacts.

The matrix rated the potential, or importance, of an identified resource relative to its contribution to certain values – aesthetic, historical, scientific and social. Resource significance is directly related to the impact on it that could result from Project activities, as it provided minimum accepted levels of change to the resource.

5.3. Definition of Heritage Impacts

Potential impacts to heritage resources may manifest differently across geographical areas or diverse communities when one considers the simultaneous effect to the tangible resource and social repercussions associated with the intangible aspects. Furthermore, potential impacts may concurrently influence the Cultural Significance of heritage resources. This assessment therefore considers three broad categories adapted from Winter & Baumann (2005, p. 36). Table 5-1 presents a summary of these impact categories.

Table 5-1: Impact Definition

Category	Description
Direct Impact	Affect the fabric or physical integrity of the heritage resource, for example destruction of an archaeological site or historical building. Direct impacts may be the most immediate and noticeable. Such impacts are usually ranked as the most intense but can often be erroneously assessed as high-ranking.
Indirect Impact	Occur later in time or at a different place from the causal activity, or as a result of a complex pathway. For example, restricted access to a heritage resource resulting in the gradual erosion of its Cultural Significance that may be dependent on ritual patterns of access. Although the physical fabric of the resource is not affected through any direct impact, its significance is affected to the extent that it can ultimately result in the loss of the resource itself.
Cumulative Impact	Result from in-combination effects on heritage resources acting within a host of processes that are insignificant when seen in isolation, but which collectively have a significant effect. Cumulative effects can be: • Additive: the simple sum of all the effects, e.g., the reclamation of a historical Tailings Storage Facilities (TSFs) will minimise the sense of the historic mining landscape. • Synergistic: effects interact to produce a total effect greater than the sum of the individual effects, e.g., the removal of all historical TSFs will sterilise the historic mining landscape. • Time crowding: frequent, repetitive impacts on a particular resource at the same time, e.g., the effect of regular blasting activities on a nearby rock art site or protected historical building could be high.

Category	Description
	• Neutralizing: where the effects may counteract each other to reduce the overall effect, e.g., the effect of changes from a historic to modern mining landscape could reduce the overall impact on the sense-of-place of the study area. • Space crowding: high spatial density of impacts on a heritage resource, e.g., density of new buildings resulting in suburbanisation of a historical rural landscape.

5.4. Secondary Data Collection

Data collection assists in the development of a cultural heritage baseline profile of the study area under consideration. Qualitative data was collected to inform this HIA report and was primarily obtained through secondary information sources, i.e., desktop literature review and historical layering.

A survey of diverse information repositories was made to identify appropriate relevant information sources. These sources were analysed for credibility and relevance. These credible, relevant sources were then critically reviewed. The objectives of the literature review include:

- Gaining an understanding of the cultural landscape within which the proposed Project is located; and
- Identify any potential fatal flaws, sensitive areas, current social complexities and issues and known or possible tangible heritage.

Repositories that were surveyed included the South African Heritage Resources Information System (SAHRIS), online/electronic journals and platforms and select internet sources. This report includes a summary and discussion of the most relevant findings.

5.5. Primary Data Collection

Jaco van der Walt and Shannon Hardwick undertook a pre-disturbance survey of the Project area on 14 February 2023. The survey was pedestrian survey and focused on the areas affected by the proposed Project. The survey was non-intrusive (i.e., no sampling was undertaken). The aim of the survey was to:

- Visually record the current state of the cultural landscape; and
- Record a representative sample of the visible, tangible heritage resources present within the development footprint area, site-specific study area and greater study area.

Identified heritage resources were recorded as waypoints using a handheld GPS device. These heritage resources were also recorded through written notes and photographs. Plan 3 presents the results of the pre-disturbance survey, including the waypoints and GPS tracks.

5.6. Site Naming Convention

Following the convention used in the previous HRM processes undertaken for the SKA Project, heritage resources identified by Digby Wells during the pre-disturbance survey were prefixed by the SAHRIS case identification generated for this Project. Information on the relevant period / feature code and site number followed (e.g. BGG-001). Table 5-2 presents a list of the relevant period and feature codes.

Table 5-2: Relevant Feature and Period Codes

Feature or Period Code	Reference
BGG	Burial Grounds and Graves
MXD	Mixed (i.e. multiple periods represented)
PAL	Palaeontological resource
RA	Rock Art
SA	Stone Age

6. Findings and Discussion

This section presents a description of the cultural heritage baseline informed through primary and secondary data collection. The section also includes a summary of the developmental context within which the Project is located and presents the potential socio-economic benefits anticipated to arise from the Project. As required by Section 38(3)(d) of the NHRA, the socio-economic benefits are compared to the heritage impacts is considered in Section 12.

6.1. Cultural Heritage Baseline Description

The following section presents a summary of the cultural heritage landscape, from the palaeontological setting through the archaeological and historical periods and up to the more recent past. Heritage resources associated with these different times do not occur in isolation from one another, but are rather as temporal palimpsests[2] and including much overlap.

6.1.1. Geological Landscape and Palaeontological Sensitivities

The geological context of the regional study area is associated with sediments of the Karoo Supergroup of Early to Middle Permian age (Le Roux & Keyser, 1988; Viljoen, 1989; Prinsloo, 1989; Johnson, et al., 2006; Almond, 2016; Bamford, 2018). The Karoo Basin is divided into the Dwyka, Ecca and Beaufort Groups.

The Ecca Group formations were laid down within or on the margins of a very extensive inland sea or lake on southwestern Gondwana (Almond, 2016). The Karoo Supergroup

[2] An assemblage of material and objects that form part of the same deposit but are of different ages and ‘life” span (Bailey, 2007)

lithostratigraphic unit is inherently associated with fossil remains, both fauna and flora. The Ecca Group includes the following fossils:

- Aquatic Fauna: Temnospondyl amphibians, Palaeoniscoid fish, non-marine bivalves, and Phyllopod crustaceans;
- Flora: Petrified wood, rarer leaves of Glossopteris, Horsetail stems, plant rootlet horizons; and
- Trace Fossils: Tetrapod trackways, burrows and coprolites. Arthropod trackways and burrows, “worm” burrows, fish fin trails.

6.1.2. Archaeology and Cultural Heritage

The South African Stone Age sequence is complex, spanning more than two million years (Mya). The sequence comprises three broad periods, each containing sub-phases and techno-complexes that manifest regional variations in characteristics and time ranges (Lombard, et al., 2012). These include the following:

- The Earlier Stone Age (ESA), from more than 2 million years ago (mya) to approximately 200 000 years ago (kya);
- The Middle Stone Age (MSA), between 300 and 20 kya; and
- The Later Stone Age (LSA) between approximately 40 kya and1840 AD.

Table 6-1 presents an overview of the Stone Age and the various periods within and are described in more detail below.

Table 6-1: South African Stone Age sequence

Period	Techno-complex	Dates	Also known as (including regional variants)
Earlier Stone Age >200 kya	Oldowan	>2 – 1.5 Mya	-
	Acheulean	1.5 Mya – 300 kya	
Middle Stone Age >20 - <300 kya	ESA-MSA transition	600 - >200 kya	Fauresmith, Sangoan
	Early MSA	300 – 130 kya	-
	Klasies River	130 – 105 kya	MSA I at Klasies River, MSA 2a generally (Pietersburg)

Period	Techno-complex	Dates	Also known as (including regional variants)
	Mossel Bay	105 – 77 kya	MSA II at Klasies River, MSA 2b generally (Pietersburg, Orangian)
	Pre-Still Bay	96 – 72 kya	-
	Still Bay	77 – 70 kya	
	Howieson's Poort	66 – 58 kya	
	Sibudu	58 – 45 kya	Late MSA / post-Howieson's Poort or MSA III at Klasies and MSA 3 generally
	Final MSA	40 – 20 kya	MSA IV at Klasies River, MSA 4 generally
Later Stone Age <40 kya	Early LSA	40 – 18 kya	Late Pleistocene microlithic
	Robberg	18 – 12 kya	
	Oakhurst	7 – 1 kya	Terminal Pleistocene / early Holocene non-microlithic (Albany, Lockshoek, Kuruman)
	Wilton	8 – 4 kya	Holocene microlithic
	Final LSA	4 – 0.1 kya	Post-classic Wilton, Holocene microlithic (Smithfield, Kabeljous, Wilton)
	Ceramic Final LSA	<2 kya	Ceramic post-classic Wilton, Late Holocene with pottery (Doornfontein, Swartkop)

Adapted from Lombard et al, 2012

The ESA marks the period during which our hominid ancestors learnt to select suitable raw material and manipulate stone to create tools. These included Oldowan Industry flakes struck from cobbles, and later Achuelean core tools characterised by straighter and sharper edges (Esterhuysen & Smith, 2007).

Within the Northern Cape, ESA lithics may include long blades, cores and low incidence of formal tools such as handaxes and cleavers. Considering the raw material and morphology of lithics from this period in the Northern Cape, they will be moderate to heavily weathered where identified. According to Beaumont et al (1995), clusters with distinct Acheulean characteristics have been recorded in the regional study area.

High proportions of blades that have been minimally modified, represented by the Levallois technique characterise the early MSA (Clark, 1982). More generally, however, the MSA is broadly defined by blades and points produced from good quality raw material. The use bone tools, ochre, beads and pendants also occurs in this period (Deacon & Deacon, 1999).

In the Karoo, associated lithics occur widely over the landscape and can be considered as "background" scatter in that geological, rather than human action condition the fine-scale distribution (Orton, 2016). Well-researched MSA sites in this region of South Africa are therefore uncommon. Within the Northern Cape, however, lithics are often associated with the pans dispersed throughout the landscape (Beaumont, et al., 1995).

The LSA dates from approximately 40 kya to the historical period. Ethnographically, this period correlates to habitation of the landscape by:

- *Bona fide* hunter-gatherer groups, i.e. the San; and
- Southerly migration of pastoralists, i.e. Khoekhoe into the region from ~2 kya (Brenton, et al., 2014; Sadr, 2015).

Lithics associated with the LSA are specialised (specific tools were created for specific purposes) and bone tools are found within the assemblages (Mitchell, 2002). LSA sites commonly contain diagnostic artefacts, such as microlithic scrapers and segments. In this region of the Northern Cape, the LSA is commonly represented by expression of the Final LSA dating to ~4 – 0.1 kya and the latest LSA techno-complex, Ceramic Final LSA dating from ~<2 kya (See Table 6-1). These techno-complexes represent tangible material culture markers of different socio-economic identities associated with the San and Khoekhoe respectively. Archaeologically, these commonly correlate with the Swartkop (i.e. hunter-gatherer) and Doornfontein (i.e. pastoralist) variants (Beaumont & Vogel, 1984; Beaumont, et al., 1995; Parsons, 2003; 2006; 2008).

Swartkop assemblages are characterised by many blades / bladelets and backed blades (Lombard & Parsons, 2008) on Crypto-Crystalline Silicates (CCS[3]) (Beaumont, et al., 1995; Parsons, 2003). Ceramic samples consist of coarse undecorated potsherds, often with grass temper, and few iron objects. Sites dating to this period usually occur close to water sources like pans or stream-bed margins, bedrock depressions containing seasonal water (referred to as *!gorras*), hollows on dunes, and on the flanks or crests of koppies (Beaumont, et al., 1995; Parsons, 2008). Interestingly stone built structures, such as ovals or circles, are known to occur at Swartkop sites. These features may represent the bases of huts, windbreaks or

[3] CCS broadly refers to sedimentary rock that has been altered through metamorphic processes resulting extremely fine-grained or microscopic crystals built with a silicon and oxygen structure.

hunter's hides (Parsons, 2004; Jacobson, 2005; Lombard & Parsons, 2008). These sites are linked to the historic /Xam communities of the area who usually followed a hunter-gatherer economy (Deacon, 1986; 1988; Beaumont, et al., 1995).

Doornfontein sites are mostly confined to permanent water sources and are characterised by large samples of thin-walled ceramics with a large portion of necks and rims decorated. Lithics are often produced on quartz, and dominated by coarse irregular flakes with a small or absent retouched component (Beaumont, et al., 1995; Parsons, 2003; 2008; Lombard & Parsons, 2008). Later manifestations contain coarser potsherds with some grass temper, a higher number of iron or copper objects, and large ostrich eggshell beads (Jacobson, 1984; 2005). These assemblages are mostly associated with the Khoekhoe who usually followed a pastoralist economy (Beaumont, et al., 1995).

LSA sites have very few, if any, associated organic items. The only organic finds are fragments of ostrich eggshell from eggs eaten or from shells used as flasks. Such flasks have been widely recorded across the Northern Cape (Morris, 1994; Morris & Von Bezing, 1996).

The LSA period is further characterised by rock art as evidence of ritual practices and complex societies enfolded in the landscape, relative to other tangible heritage markers such as LSA lithics (Deacon & Deacon, 1999; Morris, 2012). Rock art within the Northern Cape includes both engraving and painting production techniques

- Rock engravings are produced by incising, chipping or pecking of the rock surface to remove the outer surface of the rock. These are commonly situated in the open, on boulders or exposed glaciated pavements within the central plateau of the interior of South Africa (Morris, 1988; Smith & Ouzman, 2004; Morris, 2012); and
- Paintings are produced using fine brushes, quills, sticks or fingers predominantly done in red, white and black, and more rarely bichrome and polychrome (Eastwood, et al., 2002; Smith & Zubieta, 2007). Commonly identified in escarpment and mountainous areas and valleys where shelters occur and provide panels for paintings (Hollmann & Hykkerud, 2004; Morris, 2012).

The variations in production technique and distribution within the landscape notwithstanding, there are notable similarities between the rock engraving and painting "types" of rock art that suggest the distinction is not as significant as originally purported (Morris, 2012). By and large, it is accepted that rock art is affiliated with the San and Khoekhoe communities (*Refer to subsequent sections for abbreviated discussion on San and Khoekhoe communities*).

The art of the San depict imagery of realistic and proportionally correct animals (such as various antelope species), human figures and shamanistic concepts (comprising symbolic beings or entoptic shapes), related to themes of gender, landscape and politics (Eastwood, et al., 2002; Smith & Ouzman, 2004). This iconography and the site preference contrasts with the geometric imagery recorded throughout southern Africa and suggests that geometric art may either be a subtradition of San art, or is a seperately produced tradition (Smith & Ouzman, 2004).

Geometric art is commonly accepted to be affiliated with the Khoekhoe, derived from a different context to that of the San. Within the tradition, the images comrpise a limited and distinctive set of geometric forms, such as circular outlines, crosses, lines, concentric circles, oblong forms and finger-applied paint dots in rows, columns and clusters (Smith & Ouzman, 2004).

Imagery associated with early travellers, soldiers and settlers from the nineteenth century has been recorded within the cultural landscape. These include writing of names and dates, inscriptions made during the South African War of 1899 – 1902, or human figures in the corresponding attire (Ouzman, 1999; Smith & Ouzman, 2004; Morris, 2012). This tradition is distinct from the San and Khokhoe Rock Art, providing a chronicle for regional and farm histories, and sometimes the social context of the time as demonstrated through the blatant desecration of the precolonial traditions (Morris, 1988; Morris, 2012).

Researchers attribute the aforementioned LSA archaeological signatures as tangible markers of /Xam and Khoekhoe ethno-historical groups' occupation and use of the landscape (Beaumont & Vogel, 1984; Beaumont, et al., 1995; Smith & Ouzman, 2004; Parsons, 2006; Sadr, 2015).

The /Xam hunter-gatherer group occupied the landscape concentrated between present day Kenhardt and Carnarvon as the most western and eastern boundaries respectively. This "heartland" was known as /Xam-ka-!au. Significantly, Wilhelm Bleek and Lucy Lloyd recorded the folklore and beliefs of this group in their language during the 1870s' (Deacon & Foster, 2005). This is the only instance in which this occurred in South Africa, providing insights into the /Xam worldview, rock art of the region and relationship with the landscape (Deacon, 1988; Deacon, 1996; Deacon & Foster, 2005).

Through their beliefs, rituals and folklore, the /Xam personified and humanised aspects of the landscape, incorporating select physical features and environmental stimuli in a "mythical" reality. Bleek and Lloyd /Xam informants make reference to several examples of these associations. Deacon (1986; 1988) considered, amongst others, the Bitterpits pans and Strandberg Mountains respectively in her works to demonstrate how the natural world provided the inspiration for the metaphors and symbols used understanding and describing the spirit world.

The /Xam later shared the landscape with Khoekhoe pastoralist groups (*described below*). Their arrival in the regional study area is subject to debate, centred on models of either migration or diffusion of the "pastoralist package" into the Cape (Ehret, 1982; Elphick, 1985; Schrire & Deacon, 1989; Smith, 1992; Sealy & Yates, 1994; Ehret, 1998; Smith & Ouzman, 2004; Fauvelle-Aymar & Sadr, 2008). The outcome of this debate notwithstanding, it is commonly accepted that a different socio-economic group from the /Xam occupied the region from as early as 2 kya.

The Khoekhoe had a distinctive lifestyle and material culture. This consisted of a seasonally transhumant way of life, temporary camps defined by mat huts and stone structures amongst which sheep and goats were kept safe at night, and a pastoralist "package" comprising LSA

lithics and ceramics (Sadr, 2008). Pastoralists are thought to have moved quickly across the landscape in search for new pastures commonly along well watered and fertile inland river valleys (Arthur, 2008). These customs are said to have been retained well into the twentieth century (Smith & Ouzman, 2004).

Within the regional context, the Khoekhoe were represented by the Korana. The Korana have also been referred to as the Koranner, Corana, Koranna and the Kora (Coplan, 2000; Landau, 2010). Initially there were two main groups, however, quarrels over water and grazing rights, or the ownership of women or livestock usually caused divisions, resulting in many splinter groups whose names were not recorded or forgotten over time. Most Korana settled in the region of the Orange River, with smaller groups moving into the Overberg and Karoo (South African History Online, 2016).

6.1.3. Historical Period

The historical period[4] is commonly regarded as the period characterised by contact between Europeans and the various African groups and the written records associated with this interaction. However, the division between the LFC and historical period is artificial, as there is a large amount of overlap between the two.

The first records of the Xhosa in the regional study area suggest they settled in the vicinity of the Orange River around 1795. They migrated in search of independence from the Cape Colony, and to exploit the cattle and ivory trade to the north made possible through the introduction of arms and ammunition. The Xhosa settled amongst groups of San, Korana and Griquas[5], collectively described as “traders, colonial deserters and criminals” by the Cape colony settlers. By 1830, smaller, more fluid groups of Xhosa settled throughout the landscape, including along the Zak (Sak) River and Schietfontein (i.e. Carnarvon) (Anderson, 1985).

The barren landscape of the Karoo was not suitable to sustain agricultural practices and the consequent sedentary lifeways. To this effect, the Xhosa settled along the Sak River and Schietfontein were largely seasonal nomadic, comparable to the Khoekhoe. After the initial settlement in the local study area, the Xhosa welcomed large numbers of colonial deserters, as well as intermarried with indigenous San women, Korana and Griqua pastoralist, increasing the population significantly over the following years. This increase in population, within an already harsh environment, led to competition for resources (Anderson, 1985). In this instance, the significant numbers of sheep and cattle associated with the Xhosa, Korana and Griquas’ resulted in overgrazing of grass seeds, which was a common food staple for the /Xam. This,

[4] In southern Africa, especially in Mpumalanga, the last 500 years represents a formative period that is marked by enormous internal economic invention and political experimentation that shaped the cultural contours and categories of modern identities outside of European contact. This period is currently not well documented but is being explored through the 500 Year Initiative (Swanepoel, et al., 2008).
[5] Griqua / Grikwa an ethnic distinction of heterogeneous and multiracial, predominantly Khoekhoe and European descent; “coloured” people previously grouped together with San; Khoe and slaves under various names including Newlanders (Dreyer, 2001; Klatzow, 2010)

in and of itself, exacerbated the raiding of livestock by the /Xam (Deacon & Foster, 2005), and consequent skirmishes between the Xhosa and /Xam (Anderson, 1985).

The influx of Europeans from the colony exacerbated conditions. Missionaries first moved through the regional study area during the late 18th century (Cadman, 2007). As these missionaries moved northward, they established mission stations at various locales, two relevant examples being Amandelboom from which Williston was founded, and Schietfontein (i.e. Carnarvon). In this instance, the Rhenish Missionary society initially established the Amandelboom mission station amongst the Zak River Griqua, after which the "Schietfontein" Xhosa petitioned for a mission station of their own. The Reverend C. W. Alheit was dispatched, however, existing fractures amongst the diverse group were amplified, and many who did not agree with the mission stations authority or religion migrated elsewhere. Despite this, the Rev. Alheit played a dominant role in Carnarvon. His presence influenced the perceptions of Colonial officials and the increasing number of white stock farmers. At Schietfontein specifically, the group was seen as being under the confines of the missionary reserve, and internally as having freedom of movement (Anderson, 1985).

At the time of the movement of missionaries into the Karoo, the wine and grain market within the colony was becoming saturated. Many white farmers considered stock farming as a viable alternative to counter the oversaturation of the wine and grain market, but overgrazing in the region of the Western Cape forced stock farmers to investigate further afield. Migrants moved into the Karoo area with wagons, tents and *matjiehuise*[6] initially, adopting a transhumance farming economy (Walton, 1989; Kramer, 2011).

The 1813 Cradock Proclamation allowed for legal permanency and settlement of the land, although official survey of farm boundary demarcations only commenced in the 1820s. This gave the frontier farmers a greater sense of ownership, and facilitated a greater influx from the colony. It is surmised that during this period, the first permanent structures were constructed using the material available to them. The result was a vernacular architecture[7] known as corbelled buildings (Kramer, 2011).

The encroachment on Schietfontein applied additional pressures on land capacity on the remotest areas of the colony and beyond. Frontier farmers, Xhosa, Korana and Griqua competed for large amounts of land to sustain their flocks, a high commodity during the "wool-boom" of the 1840s (Anderson, 1985). Furthermore, the indigenous /Xam groups were competing with all groups over access to land and its natural resources. As mentioned above, this resulted in increased livestock raiding and consequently tensions between the various groups. During this period, it is commonly accepted that the /Xam, and San groups in general, were considered vermin by the frontier farmers, and often clashed with other groups residing in the region. De Prada-Samper (2012, p. 173) states "thousands of San perished at the hands of commandos organised by frontier farmers, not always white, and that an untold number of women and children were forced to become serfs of the murderers or their families." Even in

[6] Plural; singular: *matjiehuis*. This translates to a "mat house".
[7] Vernacular architecture is an architectural style that is designed based on local needs, availability of construction materials and reflecting local traditions.

the instances where the /Xam were “assimilated” into the farm-economy, testimonies from the time are abound in references to people killed or maimed while working for the farmers.

From approximately 1860, Schietfontein divided into 200 erven, with the surveyed erven not being sufficient to support livestock of the Xhosa, or the pastoralist way of life of the Griqua. This encouraged the Xhosa and Griqua to abandon the area, with many of the former opting to become migrant labour within the diamond mines surrounding Kimberley. During this period, Schietfontein became a predominantly white community, and the preceding tensions between the various groups had exterminated the /Xam in the region (Anderson, 1985).

Corbelled[8] buildings vary in style, size and function where no two are alike. This makes them true forms of vernacular architecture. In general the buildings are constructed from stone and are circular, with few square or rectangular exceptions. The floors comprised a mixture of clay and cow dung, and in some instances rubbed smooth and often polished with a mixture of ox blood and fat. “*Keeping – holes*” were found in the walls and beams often stretched across the arcs for drying meat or hanging clothes. Animal horns were also used as pegs. The walls curve inwards to an apex, reaching heights between 2 – 5 m, giving it a beehive shape. The interior was often plastered and painted over with lime wash. The windows were restricted in size, believed to be constructed in this manner to guard against /Xam bowmen attack. The gradually domed roof is then closed off by a flat stone. The roofs often have projecting stones which most likely served as steps and anchors for scaffolding during construction, as well as repair work. The absence of wood from the landscape did not allow for the construction of a house with a pitched roof or “*brakdak*”[9] (Walton, 1961; Walton, 1989; Kramer, 2011)

These buildings are commonly associated with the permanent settlement of white stock farmers and later Trekboers in the Carnarvon (*Schietfontein*), Loxton and Fraserburg area, serving as a collection of invaluable information source of mid-19th century life in the Karoo which is largely undocumented (Kramer, 2011, p. 5). It has been suggested that these structures may have been influenced by the Xhosa residing in the region and the Sotho-Tswana from further north, groups that came from a “stone building” culture (Frescura, 1981; Kramer, 2011).

Walton (1989, p. 129) suggests that stock farmers opted to construct structures in conventional rectangular forms with flat *brakdak*, and later in time, corrugated iron roofs. This form of construction provided for larger living areas and required less maintenance. Within the site-specific study area, the evolution from corbelled buildings, to rectangular flat-roofed dwellings, and finally corrugated pitch roof structures can be observed.

6.2. Results from the Pre-disturbance Survey

Brendan Hart and Yasmin Mayat (architects and Heritage Practitioners) of Mayat Hart Architects and Heritage Consultants (“Mayat Hart”) completed an inspection of the site on 30 and 31 January 2023. This site visit focused predominantly on the existing heritage structures

[8] A method of construction using brick or stone where each course steps or projects slightly from the course below
[9] A flat, clay topped roof

and included photographing and recording the structures to complete the architectural drawings of these structures.

Shannon Hardwick and Jaco van der Walt, (archaeologists and Heritage Practitioners) undertook a pre-disturbance survey of the site-specific study area on 14 February 2023. This survey focused on areas covered by proposed infrastructure and was completely pedestrian. The survey was recorded as GPS tracks and identified heritage resources were marked as waypoints. Identified heritage resources were also recorded through written notes and photographs. The GPS data are provided in Plan 3.

The following sections describe the observations made during the survey and the outcomes of the survey.

6.2.1. Existing Environment

The natural vegetation of the site-specific study area has been disturbed in varying degrees by human activities. The environment at the time of the verification survey was disturbed through anthropogenic and animal activities. These were related to the establishment and operation of the various farming-related structures including, but not limited to, the farmhouse, animal pens and windmills. As described in the Built Heritage Impact Assessment Report (Appendix B), these activities have been ongoing potentially since 1880. Figure 6-1 below presents an overview of the environment at the time of the pre-disturbance survey.

More recently, the site is being used as the Klerefontein Support Base and includes a mix of permanent, semi-permanent and temporary structures. Most of the existing historical structures are being reused as office space, workshops for mechanical and electrical work and as storage or lay down areas. Gravel and tar roads and parking areas, security / access control structure, stormwater management infrastructure and other ancillary infrastructure have been established within this werf. Figure 6-1 below includes some of these structures.

Figure 6-1: State of the Environment during the Pre-disturbance Survey

6.2.2. Newly-identified Heritage Resources

Two categories of heritage resources were identified during the pre-disturbance survey. Table 6-2 includes a summary of these heritage resources and Figure 6-2 includes photographs. Plan 3 includes the results of the pre-disturbance survey.

Table 6-2: Heritage Resources identified during the Survey

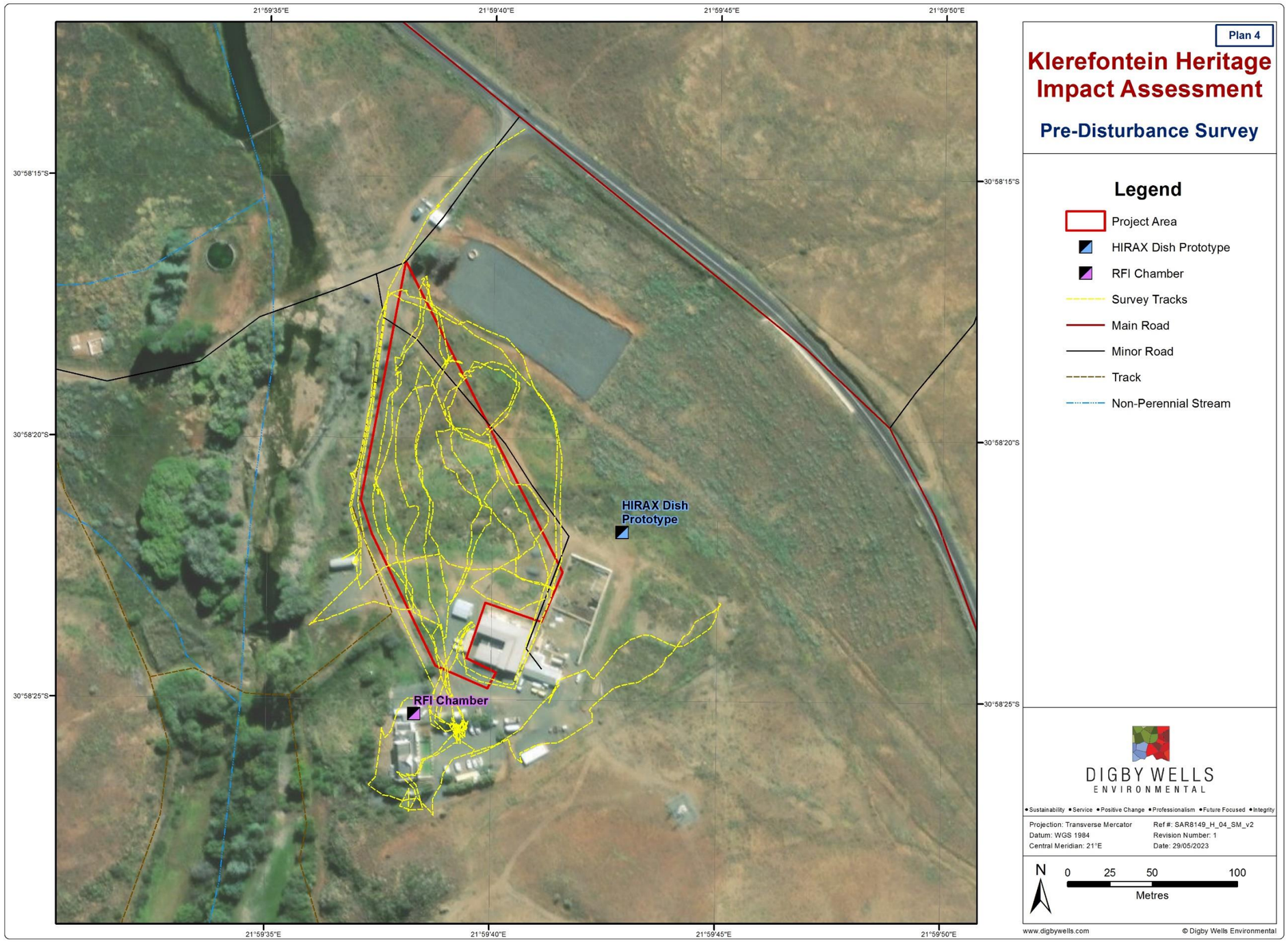
Heritage Resource	Description
Isolated archeological and historical / recent past findspots	During the pre-disturbance survey, individual surface artefacts were observed amongst heavily disturbed areas – these appeared to include dumped stone and sand material. These find spots included: • Fragments of European ceramic, fragments of blue glass and a clear glass bottle. These items may be associated with the structures still in use, or may be more modern; and • Stone Age materials including a broken, irregular blade and a flake. Both look fresh, although the flake has a patina and was made of hornfels. These artefacts are likely not in a primary depositional context, given the disturbances observed in this area.
Klerefontein Farmhouse and Werf	As described in the Built Heritage Impact Assessment Report (Appendix B), the Klerefontein Farmhouse was likely established around 1880 to 1900. The farmhouse would have been established as part of a sheep farm. The werf includes several additional structures, established at different points in time. The werf includes two large animal kraals, a workshop building (dated 1952), a barn and an outhouse. These are described in more detail in the Built Heritage Impact Assessment Report.

Photographs of Isolated Surface Artefacts

Photographs of Structures on the Klerefontein Werf

Figure 6-2: Results of the Pre-disturbance Survey showing Newly Identified Heritage Resources

Plan 3: Results of the Pre-disturbance Survey



7. Impact Assessment

This section presents a description of the Cultural Significance of identified heritage resources informed through primary and secondary data collection. The Cultural Significance of the heritage resources informs the minimum required mitigation encapsulated in the NHRA and the SAHRA Minimum Standards.

7.1. Cultural Significance of Identified Heritage Resources

Heritage resources are intrinsic to the history and beliefs of communities. They characterise community identity and cultures and are finite, non-renewable and irreplaceable. Considering the innate value of heritage resources, HRM acknowledges that these have lasting worth as evidence of the origins of life, humanity and society. Notwithstanding the inherent value ascribed to heritage, it is incumbent on the assessor to determine the significance of these resources to allow for the implementation of appropriate management. This is achieved through assessing the value of heritage resources relative to the prescribed criteria encapsulated in policies and legal frameworks.

This section presents a statement of Cultural Significance as is relevant to newly identified heritage resources and the greater cultural landscape of the site-specific study area. The statement of significance considers the importance or the contribution of the identified heritage resources and the landscape to four broad value categories: aesthetic, historical, scientific and social, to summarise the Cultural Significance and other values described in Section 3(3) of the NHRA.

During the pre-disturbance survey, two categories of heritage resources was recorded – isolated archaeological or historical surface artefacts and the historical structures forming the Klerefontein werf.

The assessment of the Cultural Significance and Field Ratings demonstrated that the identified resources have significance ratings ranging from negligible to medium. Table 7-1 presents a summary of this assessment. The Cultural Significance of the built heritage resources were assessed separately by MayatHart (Appendix B).

Sites of the same type that share the same Cultural Significance have been grouped together in terms of the impact assessment (refer to Sections 7.2 to 7.4 below).

Table 7-1: Cultural Significance of the Identified Heritage Resources

Resource ID	Resource Period	Type	Description	Aesthetic	Historic	Scientific	Social	INTEGRITY	VALUE	Designation
Isolated Stone Age Artefacts	ESA (3 mya to 300 kya) To LSA (c. 30 kya to 2 000 years ago)	Occurrence	A broken, irregular blade and a flake. Both look fresh, although the flake has a patina and was made of hornfels. This is likely *ex situ*.	3	-	1	-	2	4	Negligible
Isolated historical/recent past Artefacts	British Colony and First Boer Republics (1814 CE to 1880 CE) To Apartheid Republic of South Africa (1961 to 1994)	Occurrence	• Fragments of European Ceramics • Fragments of glass • Whole glass jar These are likely *ex situ*.	3	-	1	-	2	4	Negligible
Klerefontein Farmhouse	Established in 1880-1900	Site	Structure is in good condition and retains several original features. There has been significant alteration inside the building and on the werf itself.	4	2	2	3	4	11	Medium

Resource ID	Resource Period	Type	Description	Aesthetic	Historic	Scientific	Social	INTEGRITY	VALUE	Designation
Klerefontein Kraal	Likely established with the main farmhouse.	Site	The kraal is in a fair state of repair, but shows damage and collapse in some areas.	3	2	2	3	3	8	Low
Klerefontein Workshop	Established 1952	Site	A typical example of a med-20th century utilitarian farm building, it has been substantially altered inside.	2	2	2	2	2	4	Negligible
Klerefontein Barn	Established in approximately 1930-1940.	Site	The barn is a typical example of a med-20th century utilitarian farm building and has not been altered significantly. It is in a good state of repair.	2	2	2	2	2	4	Negligible
Klerefontein Outhouse	Likely established with the main farmhouse.	Site	The barn is a typical example of a med-20th century utilitarian farm building and has not been altered significantly. It is in a poor state of repair.	2	2	2	2	2	4	Negligible

7.2. Construction Phase Impacts

Table 7-2 presents the activities expected to occur during the Construction Phase and the expected impacts to the cultural heritage landscape that may arise from these activities.

Table 7-2: Interactions and Impacts of Construction Phase Activities

Interaction	Impact
Clearing of vegetation.	Direct negative impacts to isolated surface artefacts and the Klerefontein kraal and outhouse are possible.
Construction of proposed Infrastructure.	Additionally, the Project may indirectly impact all structures of the Klerefontein Werf and the significance of the Werf as a whole.

The isolated surface artefacts and Klerefontein kraal are of negligible Cultural Significance as shown in Table 7-1 above. The SAHRA Minimum Standards recommend that heritage resources with negligible Cultural Significance require no additional mitigation and their inclusion into a heritage assessment report (such as an HIA report) is considered sufficient in terms of recording these resources. The inclusion of this resource in Table 6-2 and Figure 6-2 is adequate to meet these requirements. To this effect, potential impacts posed to these resources are not considered in this section.

This notwithstanding, the Klerefontein outhouse is older than 60 years of age and is therefore afforded General Protection under Section 34 of the NHRA. Impacts to this heritage resource must therefore be avoided, or where these impacts cannot be avoided, SARAO must obtain a destruction permit in terms of Section 34 of the NHRA before the structure is impacted.

Given the layout and proximity between the proposed Project infrastructure and the Klerefontein Kraal, there is potential for a direct impact to occur. Table 7-3 resents a summary of the potential direct impact to this heritage resource.

Table 7-3: Summary of the Potential Direct Impact to the Klerefontein Kraal

IMPACT DESCRIPTION: Indirect impact to Heritage Resource of Medium Significance				
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	Damage to or destruction of this heritage resource will be permanent and cannot be reversed.	Consequence: Slightly detrimental (-9)	Significance: Minor – negative (-54)
Extent	Very limited (1)	This potential impact will affect this specific heritage resource.		
Intensity x type of impact	Moderately high - negative (-4)	Damage to or destruction of this heritage resource would be considered a major change to a heritage resource of low significance.		
Probability	Highly probable (6)	Given the proposed Project layout and infrastructure, this impact is very likely to occur.		
MITIGATION:				
Digby Wells recommends that SARAO install the proposed additional diesel storage tanks directly behind the shed and south of the existing tank to avoid blocking access to the kraal. Additionally, earthworks near the kraal must be avoided to prevent direct impact or the build-up of material against the stone walls. Digby Wells recommends SARAO implements a 5 m no-go buffer zone around this resource using a danger tape. The *in situ* conservation of this this heritage resource is considered in the post-mitigation scenario.				
POST-MITIGATION				
Duration	Beyond project life (6)	Should the CMP be implemented, the benefits will last beyond the Project lifetime.	Consequence: Moderately beneficial (11)	Significance: Minor - positive (55)
Extent	Local (3)	The implementation of the CMP will affect most of the identified heritage resources.		

IMPACT DESCRIPTION: Indirect impact to Heritage Resource of Medium Significance				
Dimension	**Rating**	**Motivation**		
Intensity x type of impact	Low - positive (2)	The implementation of the CMP will be considered a minor change to a heritage resource of medium significance.		
Probability	Likely (5)	Should the CMP be implemented, it is likely that the benefits will be realised.		

Potential indirect impacts may affect the structures of the Klerefontein Werf. As per MayatHart, the Klerefontein Werf as a unit be considered to be a Grade III B resource and having medium cultural significance. Table 7-4 presents a summary of the potential indirect impact to this heritage resource.

Table 7-4: Summary of the Potential Indirect Impact to the Klerefontein Werf

IMPACT DESCRIPTION: Indirect impact to Heritage Resource of Medium Significance				
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Permanent (7)	The loss of the sense of place, historical setting and cultural significance will be permanent and cannot be reversed.	Consequence: Highly detrimental (-15)	Significance: Moderate – negative (-75)
Extent	Municipal Area (4)	Given the significance of this structure, this impact will affect the broader cultural landscape.		
Intensity x type of impact	Moderately high - negative (-4)	The loss of the sense of place, historical setting and cultural significance would be considered a major change to a heritage resource of medium significance.		
Probability	Likely (5)	Given the proposed Project layout and infrastructure, this impact may occur.		

IMPACT DESCRIPTION: Indirect impact to Heritage Resource of Medium Significance				
Dimension	**Rating**	**Motivation**		
MITIGATION:				
The landscaping, historical layering and the development of the site must remain legible following the establishment of the Project infrastructure. To achieve this, the historic structures and landscaping must retain their historic architectural language, materiality and identify. The new infrastructure must be contemporary in their architectural language to allow for easy identification as a new historic layer in the development of the Klerefontein property. New infrastructure must highlight the identified heritage buildings and be sympathetic to the existing context and cultural significance. All existing significant historical trees and landscaping must be protected during construction activities to ensure they are not damaged. Where trees are missing, Digby Wells recommends planting new ones. Digby Wells recommends that SARAO investigate alternative locations for the proposed radio mast so that this infrastructure does not form part of the backdrop of the Klerefontein farmhouse. MayatHart has developed a Project-specific Conservation Management Plan (CMP) which must be implemented by SARAO. This is considered in the post-mitigation scenario.				
POST-MITIGATION				
Duration	Beyond project life (6)	Should the CMP be implemented, the benefits will last beyond the Project lifetime.	Consequence: Moderately beneficial (11)	Significance: Minor - positive (55)
Extent	Local (3)	The implementation of the CMP will affect most of the identified heritage resources.		
Intensity x type of impact	Low - positive (2)	The implementation of the CMP will be considered a minor change to a heritage resource of medium significance.		
Probability	Likely (5)	Should the CMP be implemented, it is likely that the benefits will be realised.		

7.3. Operational Phase Impacts

Table 7-5 presents the activities expected to occur during the Operational Phase and the expected impacts to the cultural heritage landscape that may arise from these activities.

Table 7-5: Interactions and Impacts of Operational Phase Activities

Interaction	Impact
Operation of proposed Infrastructure.	Digby Wells envisages no impact to the cultural heritage landscape, given the nature of the proposed activities and the location of identified heritage resources in relation to the proposed Project infrastructure.
Routine Maintenance Activities.	

Digby Wells does not envisage any additional impact to the identified heritage resources from the above-mentioned activities and has therefore not assessed these impacts further in this report.

7.4. Decommissioning Phase Impacts

Table 7-6 presents the activities expected to occur during the Decommissioning Phase and the expected impacts to the cultural heritage landscape that may arise from these activities.

Table 7-6: Interactions and Impacts of Decommissioning Phase Activities

Interaction	Impact
Demolition and removal of all infrastructure (incl. transportation off site)	Digby Wells envisages no impact to the cultural heritage landscape, given the nature of the proposed activities and the location of identified heritage resources in relation to the proposed Project infrastructure. Should any infrastructure intended for demolition increase in age to older than 60 years during the Project lifecycle, the structure must be considered a heritage structure. Any alterations to these structures will be subject to a NHRA Section 34 permit application process
Rehabilitation (spreading of soil, re-vegetation and profiling/contouring)	

Digby Wells does not envisage any impact to the identified heritage resources from the above-mentioned activities and has therefore not assessed these impacts further in this report.

7.5. Cumulative Impacts

Cumulative impacts occur from in-combination effects of various impacts on heritage resources acting within a host of processes that result in an incremental effect. The importance of identifying and assessing cumulative impacts is that the whole is often greater than the sum of its parts. This implies that the total effect of multiple stressors or change processes acting simultaneously on a system may be greater than the sum of their effects when acting in isolation.

This Project in conjunction with other planned developments in line with the strategic development plans for the Northern Cape Province requires consideration to identify the possible in-combination effects of various impacts to known heritage resources. Table 7-7 presents a summary of the possible cumulative impacts of the Project.

Table 7-7: Summary of Potential Cumulative Impacts

Type	Cumulative Impact	Direction of Impact	Extent of Impact
Space-crowding	The proposed infrastructure will add to the existing infrastructure associated with activities characterising the area immediately surrounding the proposed Project area and further afield. This installation of this infrastructure will result in a loss of the area within which heritage resources can exist. The proposed Project encroaches onto a werf with historical and cultural significance.	Neutral	Site-specific study area

7.6. Unplanned and Low Risk Events

This section considers the potential risks to protected heritage resources, as well as the potential heritage risks that could arise for SARAO in terms of implementation of the Project. These two aspects are discussed separately in this section.

Section 6.2.2 describes the heritage resources identified during the pre-disturbance survey. This list is, however, not an exhaustive list of all heritage resources within the Project area. If heritage resources are subsequently identified, and where SARAO knowingly does not take proactive management measures, potential risks to SARAO may include litigation in terms of Section 51 of the NHRA and social or reputational repercussions. Table 7-8 presents a summary of the primary risks that may arise for SARAO.

Table 7-8: Identified Heritage Risks that may arise for SARAO

Description	Primary Risk
Heritage resources with a high CS rating are inherently sensitive to any development in so far that the continued survival of the resource could be threatened. In addition to this, certain heritage resources are formally protected thereby restricting various development activities.	Negative Record of Decision (RoD) and/or development restrictions issued by NCPHRA and/or SAHRA in terms of Section 38(8) of the NHRA.

Description	Primary Risk
Impacting on heritage resources formally and generally protected by the NHRA without following due process. Due process may include social consultations and/or permit application processes to SAHRA and/or NCPHRA.	• Fines; • Penalties; • Seizure of Equipment; • Compulsory Repair / Cease Work Orders; and • Imprisonment.

If additional heritage resources are identified during decommissioning and dismantling of the proposed infrastructure and/or activities undertaken during the rehabilitation processes, potential risks to those heritage resources will need to be assessed. Table 7-9 provides an overview of these potential unplanned events, the subsequent impact that may occur and mitigation measures and management strategies to remove or reduce these risks.

Table 7-9: Identified Unplanned Events and Associated Impacts

Unplanned event	Potential impact	Mitigation / Management / Monitoring
Encountering unidentified in situ remnants of historical built environment resources during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 34 of the NHRA	Establish Project-specific Chance Find Procedures (CFPs) as a condition of authorisation. Refer to Section 11 for more detailed recommendations.
Accidental exposure of fossil bearing material implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 35 of the NHRA	
Accidental exposure of *in situ* archaeological material during the implementation of the Project.		
Accidental exposure of *in situ* burial grounds or graves during the implementation of the Project.	Damage or destruction of heritage resources generally protected under Section 36 of the NHRA.	
Accidental exposure of human remains during the decommissioning and rehabilitation and closure phases of the Project.		

8. Environmental Management Plan

Table 8-1 below summarises the outcomes of the HRM process that must be included in the Environmental Management Plan (EMP).

Table 8-1: Heritage Specialist Input into the Environmental Management Program

Activity/Activities	Potential Impacts	Aspects Affected	Phase	Mitigation Measure	Mitigation Type	Time period for implementation
• Activities outlined in Section 2.1 above	Damage to or destruction of Klerefontein Kraal and Outhouse	Cultural Heritage	Construction	• Monitoring and implementing a 30 m no-go buffer zone around the resource.	***Avoid***	Before the commencement of the Project
• Activities outlined in Section 2.1 above	Indirect impacts to Klerefontein Werf	Cultural Heritage	Construction and operation	• Maintain sense of place, historical layering, landscaping and history of development as described in Table 7-4	***Avoid***	During the Project lifecycle
• Activities outlined in Section 2.1 above	Damage to structures associated with the Klerefontein Werf	Cultural Heritage	Construction	• Regular photographing and inspecting of the heritage structures to ensure damage is avoided	***Control***	During the construction phase
• Activities outlined in Section 2.1 above	Damage to or destruction of previously unidentified heritage resources.	Cultural Heritage	Construction	• Update existing CFP to apply to the Project.	***Control***	Before the commencement of the Project
• Activities outlined in Section 2.1 above	Damage to or destruction of previously unidentified heritage resources.	Cultural Heritage	Construction and operation	• Implement updated CFP.	***Control***	During the Project lifecycle

9. Monitoring Programme

Digby Wells recommends that the historical structures associated with the Klerefontein Werf are monitored and photographed regularly during the construction phase of the Project to ensure these structures are not damaged during these activities.

10. Consultation and Results from Stakeholder Engagement

The Public Participation Process (PPP) required in terms of the NEMA as a component of the BA process has not been completed in part to date but will be completed as a process separate to the heritage specialist assessment. This consultation process affords Interested and Affected Parties (I&APs) opportunities to engage in the BA process. The objectives of the PPP or Stakeholder Engagement Process (SEP) include the following:

- To ensure that I&APs are informed about the project;
- To provide I&APs with an opportunity to engage and provide comment on the project;
- To draw on local knowledge by identifying environmental and social concerns associated with the project;
- To involve I&APs in identifying methods in which concerns can be addressed;
- To verify that stakeholder comments have been accurately recorded; and
- To comply with the legal requirements.

No formal consultation was undertaken as part of the heritage assessment as this forms part of the PPP or SEP. Should any I&AP comments be submitted in relevance to heritage resources during the PPP, these will be considered in the final HIA report or BAR.

Site surveys can often present an opportunity for informal consultation with specific stakeholders (usually farm owners, managers and employees). This consultation can result in the identification of burial grounds and graves – importantly, these could include formal burial grounds or graves, sometimes with no visible surface markers – or in the identification of sacred sites or other places of importance, which may not otherwise be identified. No such informal consultation was undertaken as part of this assessment.

11. Recommendations

Considering the nature and the scope of the Project, Digby Wells recommends the following recommendations be implemented prior to the commencement of the Project:

- SARAO must re-evaluate the location of the radio mast located north of the Klerefontein farmhouse to avoid any indirect impacts such as material building up on the walls of the farmhouse;

- If direct or in direct impact from and by the radio mast cannot be avoided, SARAO must obtain a Section 34 with the relevant Heritage Resources Authority to mitigate impacts on the farmhouse.
- An EO must monitor the installation of the radio mast and the construction team must be kept to a small manageable size to manage movement and all activities associated with the installation.
- SARAO must avoid potential direct impacts to the heritage structures during construction by:
    - Erecting hoarding around the site during construction activities to protect neighbouring heritage structures. This hoarding must be erected 5 m away from the structure to create a construction buffer zone;
    - Ensuring access, parking and holding facilities for large construction vehicles is designed to avoid potential direct impacts to the heritage structures; and
    - Where intrusive methods such as deep-level compacting or piling are necessary for construction, a responsible person must monitor the heritage structures to ensure they are not damaged;
- Where items of significance are retained from the original buildings, these must be protected during construction;
- A responsible person must monitor and photograph the heritage structures regularly during the construction phase of the Project to ensure that these structures are not damaged;
- The landscaping, historical layering and the development of the site must remain legible following the establishment of the Project infrastructure. To achieve this, SARAO must implement the following:
    - The historic structures and landscaping must retain their historic architectural language, materiality and identify;
    - The new infrastructure must be contemporary in their architectural language to allow for easy identification as a new historic layer in the development of the Klerefontein property;
    - New infrastructure must highlight the identified heritage buildings and be sympathetic to the existing context and cultural significance; and
    - All existing significant historical trees and landscaping must be protected during construction activities to ensure they are not damaged. Where trees are missing, Digby Wells recommends planting new ones;
- The existing CFP for the SKA Project must be applied to the Project and implemented during the Project lifecycle; and

- SARAO must implement the Project-specific CMP and the recommendations included therein.

12. Socio-economic Benefit versus Heritage Impacts

This Project contributes directly to the larger SKA Project. The greatest potential socio-economic benefit arising from the SKA Project is the scientific and technological benefit arising from the SKA Project. The SKAO anticipate the SKA Project will generate the largest data volumes ever created, thereby stimulating and contributing to major advancements in scientific data methods and computational power.

The potential socio-economic benefits that may be derived from the SKA Project are greater than the heritage impacts identified in Section 7. This statement is support by the following:

- The majority of known heritage resources can be maintained *in situ* and managed through the proposed recommendations and Project-specific CMP;
- Heritage resources that may be impacted upon by the Project can be mitigated through the proposed recommendations;
- The SKA Project will contribute at a macro and local economic level to the benefit of South Africa and community members in the local study area.

The greatest potential socio-economic benefit arising from the SKA Project

13. Reasoned Opinion on Whether Project should Proceed

Based on the understanding of the Project while considering the results of this assessment, Digby Wells does not object to the Project provided the recommendations detailed in Section 11 above are adopted.

14. Conclusion

The aim of the HRM process was to comply with regulatory requirements contained within Section 38 of the NHRA through the following:

- Defining the cultural landscape within which the Project is situated;
- Identifying, as far as is feasible, heritage resources that may be impacted upon by the project as well as define the Cultural Significance;
- Assessing the possible impacts to the identified heritage resources;
- Considering the socio-economic benefits of the Project; and
- Providing feasible mitigation and management measures to avoid, remove or reduce perceived impacts and risks.

These objectives were met as presented in Sections 6 through 13 above. Based on the understanding of the Project while considering the results of this assessment, Digby Wells does not object to the Project provided the recommendations detailed above are adopted.

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Appendix A: Glossary of Terms

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Appendix B: Built Heritage Impact Assessment Report

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Appendix C: Palaeontological Impact Assessment Report

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Appendix D: Specialist CV

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Appendix E: Digby Wells HRM Process Methodology