



**mineral resources**

Department:  
Mineral Resources  
**REPUBLIC OF SOUTH AFRICA**

**BASIC ASSESSMENT REPORT**  
**And**  
**ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT**

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

**NAME OF APPLICANT:** ORION EXPLORATION NO. 5 (PTY) LTD.

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**FILE REFERENCE NUMBER SAMRAD:** NC30/5/1/1/2/12405PR

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## 1. IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining “will not result in unacceptable pollution, ecological degradation or damage to the environment”.

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

**It is therefore an instruction that** the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

**It is furthermore an instruction that** the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with uninterpreted information and that it unambiguously represents the interpretation of the applicant.

## **2. Objective of the basic assessment process**

The objective of the basic assessment process is to, through a consultative process—

- (a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context;
- (b) identify the alternatives considered, including the activity, location, and technology alternatives;
- (c) describe the need and desirability of the proposed alternatives,
- (d) through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage , and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on the these aspects to determine:
  - (i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and
  - (ii) the degree to which these impacts—
    - (aa) can be reversed;
    - (bb) may cause irreplaceable loss of resources; and
    - (cc) can be managed, avoided or mitigated;
- (e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to—
  - (i) identify and motivate a preferred site, activity and technology alternative;
  - (ii) identify suitable measures to manage, avoid or mitigate identified impacts; and
  - (iii) identify residual risks that need to be managed and monitored.



**Orion Exploration No. 5 (Pty) Ltd**  
**Final Basic Assessment Report**

**Application for Environmental Authorisation  
in support of a Prospecting Right Application**  
October 2019

## TABLE OF CONTENTS

<b>1</b>	<b>CONTACT PERSON AND CORRESPONDENCE ADDRESS .....</b>	<b>12</b>
1.1	DETAILS OF THE EAP WHO PREPARED THE REPORT .....	12
1.2	EXPERTISE OF THE EAP .....	12
1.2.1	The Qualifications of the EAP.....	12
1.2.2	Summary of the EAPs Past Experience .....	12
<b>2</b>	<b>Location of Overall Activity.....</b>	<b>12</b>
2.1	OVERVIEW.....	12
2.2	LOCALITY MAP.....	13
<b>3</b>	<b>DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY.....</b>	<b>13</b>
3.1.1	Non-Invasive Prospecting Methods.....	13
3.1.2	Invasive Prospecting Methods.....	14
3.2	LISTED AND SPECIFIED ACTIVITIES.....	17
<b>4</b>	<b>POLICY AND LEGISLATIVE CONTEXT .....</b>	<b>18</b>
4.1	LISTED ACTIVITIES IDENTIFIED IN TERMS OF NEMA, NEM:WA AND NWA .....	21
<b>5</b>	<b>NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES.....</b>	<b>21</b>
<b>6</b>	<b>MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE INCLUDING A FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE... 23</b>	
6.1	DETAILS OF THE DEVELOPMENT FOOTPRINT ALTERNATIVES CONSIDERED.....	23
6.1.1	The Property on which or Location Where it is Proposed to Undertake the Activity.....	23
6.1.2	The Type of Activity to be Undertaken.....	24
6.1.3	The Design or Layout of the Activity.....	24
6.1.4	The Technology to be used in the activity.....	25
6.1.5	The Option of not Implementing the Activity .....	26
<b>7</b>	<b>Details of Public Participation Process Followed.....</b>	<b>26</b>
7.1	PRIOR CONSULTATION.....	26
7.2	NOTIFICATION PHASE .....	26
7.3	DRAFT BAR.....	27
7.4	I&AP IDENTIFICATION, CONSULTATION AND DATABASE MANAGEMENT .....	27
7.5	MUNICIPAL COUNCILLORS.....	27
7.6	FINAL BAR.....	27
7.7	NOTIFICATION OF DECISION.....	27

7.8	SUMMARY OF ISSUES RAISED BY I&APS .....	27
<b>8</b>	<b>THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT ALTERNATIVES .....</b>	<b>28</b>
8.1	BASELINE ENVIRONMENT - TYPE OF ENVIRONMENT AFFECTED BY THE PROPOSED ACTIVITY.....	28
8.1.1	Climate .....	28
8.1.2	Mean Annual Rainfall .....	28
8.1.3	Mean Annual Evaporation.....	28
8.1.4	Temperature.....	29
8.1.5	Wind Speed and Direction .....	29
8.1.6	Topography.....	30
8.1.7	Geology.....	30
8.1.8	Soils .....	31
8.1.9	Terrestrial Ecology .....	31
8.1.10	Water Sources .....	39
8.1.11	Air Quality .....	39
8.1.12	Heritage and Archaeology .....	39
8.1.13	Socio-Economic Environment.....	44
8.1.14	Environmental and Current Land Use Map .....	51
8.1.15	Description of the Current Land Uses.....	51
8.1.16	Adjacent land use .....	51
8.2	DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE.....	52
8.2.1	Surface Water Features and Wetlands .....	52
8.2.2	Protected Areas (PA).....	52
8.2.3	Critical Biodiversity AREA (CBA) and Ecological Support Area (ESA) .....	52
8.2.4	Declared Karoo Central Astronomy Advantage Area .....	53
<b>9</b>	<b>IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY .....</b>	<b>54</b>
<b>10</b>	<b>METHODOLOGY USED IN DETERMINING AND RANKING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT, DURATION AND PROBABILITY OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS .....</b>	<b>54</b>
10.1	OVERVIEW.....	54
10.2	APPLICATION OF IMPACT RATING CRITERIA .....	55
<b>11</b>	<b>THE POSITIVE AND NEGATIVE IMPACTS THAT THE PROPOSED ACTIVITY AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY THAT MAY BE AFFECTED .....</b>	<b>57</b>
<b>12</b>	<b>THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK.....</b>	<b>57</b>

<b>13</b>	<b>MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED .....</b>	<b>61</b>
<b>14</b>	<b>STATEMENT MOTIVATING THE ALTERNATIVE DEVELOPMENT LOCATION WITHIN THE OVERALL SITE .....</b>	<b>61</b>
<b>15</b>	<b>FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY ..</b>	<b>61</b>
<b>16</b>	<b>ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK .</b>	<b>61</b>
<b>17</b>	<b>SUMMARY OF SPECIALIST REPORTS .....</b>	<b>67</b>
<b>18</b>	<b>ENVIRONMENTAL IMPACT STATEMENT .....</b>	<b>71</b>
18.1	SUMMARY OF THE KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT .....	71
18.2	FINAL SITE MAP .....	71
18.3	SUMMARY OF THE POSITIVE AND NEGATIVE IMPLICATIONS AND RISKS OF THE PROPOSED ACTIVITY AND IDENTIFIED ALTERNATIVES.....	71
18.3.1	Positive Impacts.....	71
18.3.2	Negative Impacts .....	71
<b>19</b>	<b>PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPr.....</b>	<b>72</b>
<b>20</b>	<b>FINAL PROPOSED ALTERNATIVES .....</b>	<b>73</b>
<b>21</b>	<b>Aspects for inclusion in the Environmental Authorisation. ....</b>	<b>73</b>
<b>22</b>	<b>DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES, AND GAPS IN KNOWLEDGE .....</b>	<b>74</b>
<b>23</b>	<b>REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED .....</b>	<b>74</b>
23.1	REASONS WHY THE ACTIVITY SHOULD BE AUTHORISED OR NOT .....	74
23.2	CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION .....	74
23.2.1	Specific Conditions to be Included into the Compilation and Approval of EMPr.....	74
<b>24</b>	<b>PERIOD FOR WHICH ENVIRONMENTAL AUTHORISATION IS REQUIRED .....</b>	<b>75</b>
<b>25</b>	<b>FINANCIAL PROVISION.....</b>	<b>75</b>
25.1	DETERMINATION OF THE AMOUNT OF FINANCIAL PROVISION .....	75
25.2	CONFIRM THAT THIS AMOUNT CAN BE DERIVED FROM THE OPERATING EXPENDITURE....	75
<b>26</b>	<b>OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY.....</b>	<b>75</b>
<b>27</b>	<b>ENVIRONMENTAL PROGRAMME REPORT .....</b>	<b>77</b>



27.1	DETAILS OF THE EAP .....	77
27.2	DESCRIPTION OF THE ASPECTS OF THE ACTIVITY.....	77
<b>28</b>	<b>COMPOSITE MAP.....</b>	<b>77</b>
<b>29</b>	<b>DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS.....</b>	<b>77</b>
29.1	DETERMINATION OF CLOSURE OBJECTIVES .....	77
29.2	VOLUMES AND RATES OF WATER USE REQUIRED FOR THE OPERATION.....	78
29.2.1	Has a Water Use Licence Been Applied For? .....	79
<b>30</b>	<b>FINANCIAL PROVISION.....</b>	<b>96</b>
30.1	DETERMINATION OF THE AMOUNT OF FINANCIAL PROVISION .....	96
30.1.1	Describe the Closure Objectives and the Extent to which they have been Aligned to the Baseline Environment described under the Regulation.....	96
30.2	CONFIRM SPECIFICALLY THAT THE ENVIRONMENTAL OBJECTIVES IN RELATION TO CLOSURE HAVE BEEN CONSULTED WITH LANDOWNER AND INTERESTED AND AFFECTED PARTIES.....	96
30.3	PROVIDE A REHABILITATION PLAN THAT DESCRIBES AND SHOWS THE SCALE AND AERIAL EXTENT OF THE MAIN MINING ACTIVITIES, INCLUDING THE ANTICIPATED MINING AREA AT THE TIME OF CLOSURE.....	96
30.3.1	Rehabilitation of Boreholes.....	96
30.3.2	Final Rehabilitation of Access Tracks and / Roads.....	96
30.3.3	Site Rehabilitation.....	97
30.3.4	Explain why it can be Confirmed that the Rehabilitation Plan is Compatible with the Closure Objectives .....	97
30.3.5	Calculate and State the Quantum of the Financial Provisions Required to Manage and Rehabilitate the Environment in accordance with the Applicable Guideline .....	97
30.3.6	Confirm that the Financial Provision will be Approved as Determined .....	98
30.3.7	Indicate the Frequency of the Submissions of the Performance Report.....	100
30.3.8	Manner in which the Applicant Intends to Inform his or her Employees of any Environmental Risk which may Result from their Work.....	100
30.3.9	Manner in which Risk will be Dealt with in order to Avoid Pollution or the Degradation of the Environment.....	101
30.3.10	Specific Information Required by the Competent Authority.....	102
30.4	UNDERTAKING.....	104

## LIST OF FIGURES

Figure 3-1: Typical Diamond-Core Drilling Rig.....	15
Figure 5-1: Geological Map of Proposed Prospecting Right Area.....	22
Figure 8-1: Average Annual Wind Direction and Speed For Copperton.....	30
Figure 8-2: Archaeological Sites Recorded In Relation To The Study Area. ....	40
Figure 8-3: Heritage Sensitivity Map .....	41
Figure 8-4: SAHRIS Palaeosensitivity Maps for the Proposed Prospecting Right.....	43
Figure 8-5: Geographical Boundary of the SLM.....	44
Figure 8-6: Northern Cape Compostive Spatial Plan .....	46
Figure 8-7: Summary of Employment and Income in SLM.....	50
Figure 29-1: Settling Ponds Used for the Recycling of Water at a Drilling Rig .....	79

## LIST OF TABLES

Table 2-1: Description of the Properties .....	13
Table 2-2: 21 digit Surveyor-General Code for Each Farm Portion .....	13
Table 3-1: Detailed Prospecting Works Program .....	16
Table 4-1: Policy and Legislative Context .....	18
Table 4-2: NEMA Listed Activities Applicable to the Proposed Prospecting Activities .....	21
Table 6-1: Environmental Buffer Zones .....	24
Table 8-1: Mean Monthly and Annual Rainfall and Evaporation.....	28
Table 8-2: Mean Monthly and Annual Temperatures.....	29
Table 8-3: Floristic composition and important taxa in Bushmanland Basin Shrubland .....	31
Table 8-4: Mammal SCC occurring in the general vicinity of the project area .....	35
Table 8-5: Biome-restricted endemic species recorded from the vicinity of the project area * .....	36
Table 8-6: Avifauna SCC occurring in the general vicinity of the project area .....	37
Table 8-7: Key Statistics of Siyathemba Local Municipality .....	47
Table 8-8: Labour Ratios for SLM.....	50
Table 8-9: A framework for linking spatial planning categories (CBA"s) to land-use planning and decision-making guidelines based on a set of high-level land biodiversity management objectives.....	53
Table 10-1: Criteria for Assessing the Significance of Impacts .....	56
Table 10-2: Significance Rating Matrix .....	57
Table 10-3: Positive/Negative Mitigation Ratings.....	57
Table 12-1: Proposed mitigation measures.....	58
Table 16-1: Assessment of Each Identified Potentially Significant Impact and Risk.....	62
Table 19-1: Impact Management Objectives and Outcomes .....	72
Table 29-1: Impacts to be Mitigated in their Respective Phases.....	80
Table 29-2: Impact Management Outcomes.....	89
Table 29-3: Impact Management Actions .....	92
Table 30-1: Calculated liability for rehabilitation .....	97
Table 30-2: Mechanism for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon.....	99

**LIST OF APPENDICES**

Appendix A: EAP Experience ..... i  
Appendix B: Maps ..... ii  
Appendix C: Public Participation Materials ..... vii  
Appendix D: Heritage And Palaeontological Assessment..... i  
Appendix E: Summary List of Legislation..... i

## LIST OF MAPS IN APPENDIX B

Map 1: Regional Locality Map.....	iii
Map 2: Sensitivity.....	i
Map 3: Critical Biodiversity and Ecological Support Areas .....	ii
Map 4: Current Landuses.....	iii
Map 5: Soils.....	iv
Map 6: Vegetation.....	v
Map 7: PRA in Relation to the Karoo Central AAA.....	vi

## LIST OF ACRONYMS AND ABBREVIATIONS

AAA	Astronomy Advantage Areas
AEL	Atmospheric Emission License
AEM	Airborne Electromagnetic Survey
AQSR	Air Quality Sensitive Receptor
BA	Basic Assessment
BAR	Basic Assessment Report
CBA	Critical Biodiversity Area
CRM	Cultural Resources Management
CRR	Comment and Response Register
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EM	Electromagnetic
EMPr	Environmental Management Programme
ESA	Ecological Support Area
GDP	Gross Domestic Product
HCAC	Heritage Contracts and Archaeological Consulting
HDPE	High-Density Polyethylene
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
Kl	Kilolitre
Ktpa	Kilotons per annum
Ktpm	Kilotons per month
L	Litre
LED	Local Economic Development
LSA	Later Stone Age
M	Metre
MAE	Mean Annual Evaporation
mamsl	Metres above mean sea level
Mm	Millimetre
MHSA	Mine Health and Safety Act
MPRDA	Minerals and Petroleum Resources Development Act
MR	Mining Right

MRA	Mining Right Application
MSA	Middle Stone Age
Mt	Million tonnes
Mtpa	Million tons per annum
NCDENC	Northern Cape Department: Environment and Nature Conservation
NEMA	National Environmental Management Act
NEM:AQA	National Environmental Management: Air Quality Act
NEM:BA	National Environmental Management: Biodiversity Act
NEM:WA	National Environmental Management: Waste Act
NHRA	National Heritage Resources Act
NWA	National Water Act
OHS	Occupation Health & Safety
p.a.	Per annum
PA	Protected Areas
PCM	Prieska Copper mine
PPP	Public Participation Process
PR	Prospecting Right
PRA	Prospecting Right Application
PKSD	Pixley Ka Seme District Municipality
RF	Radio Frequency
SAHRA	South African Heritage Resource Agency
SAHRIS	South African Heritage Resources Information System
SANS	South African National Standards
SARAO	South African Radio Astronomy Observatory
SDF	Spatial Development Framework
SEZ	Special Economic Zone
SHE	Safety Health and Environment
SKA	Square Kilometre Array
SLM	Siyathemba Local Municipality
TDEM	Time-Domain Electromagnetic
TEM	Transient Electromagnetic Survey
VHMS	Volcanic Hosted Massive Sulphide
WSA	Water Services Authority
WSP	Water Services Provider
WUL	Water Use Licence

# PART A

## BASIC ASSESSMENT REPORT

### 1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

#### 1.1 DETAILS OF THE EAP WHO PREPARED THE REPORT

Name of the Practitioner:	Chané Pretorius ABS Africa (Pty) Ltd.
Tel No.:	+27 11 805 0061
E-mail address:	<a href="mailto:chane@abs-africa.com">chane@abs-africa.com</a>

#### 1.2 EXPERTISE OF THE EAP

##### 1.2.1 THE QUALIFICATIONS OF THE EAP

**Name:** Ms. Chané Pretorius

**Academic Qualifications:**

- Bachelor of Science in Tourism: North West University, 2010
- Bachelor of Science (Honours) in Geography: University of Johannesburg, 2011

##### 1.2.2 SUMMARY OF THE EAPs PAST EXPERIENCE

ABS Africa (Pty) Ltd is a professional environmental advisory company with a focus on the mining industry. The ABS Africa personnel included in the project team structure for the independent environmental assessment have collectively completed more than 100 EIAs across the African continent.

Much of this experience has been gained in undertaking complex and challenging EIAs involving the management of specialist teams, conducting public participation processes, aligning international standards with in-country legislation and interfacing with project engineering teams.

Please refer to Appendix A for a record of the experience of the EAP.

### 2 LOCATION OF OVERALL ACTIVITY

#### 2.1 OVERVIEW

In November 2018, Orion lodged an application for a prospecting right over three farm portions. A basic assessment environmental authorisation (EA) process was conducted in support of the application and a decision on the EA is pending.

On submission of the Prospecting Right Application (PRA), Orion was informed by the DMR that the mineral rights for 10 of the minerals they had applied for were held by a third party over two of the three farm portions relevant to the PRA. Accordingly, these minerals were excluded from the PRA lodged by Orion.

These rights have since lapsed and Orion is thus lodging a second PRA for the 10 minerals excluded from their first PRA.. The minerals under application include: Cobalt; Copper; Lead; Silver; Sulphur; Iron; Nickel; Zinc; Gold; Rare Earth Elements. The location and extent of the proposed prospecting right areas are shown in Table 2-1.



**TABLE 2-1: DESCRIPTION OF THE PROPERTIES**

<b>FARM NAMES:</b>	The following farms relate to the prospecting right application:			
		<b>Farm Number</b>	<b>Subdivision Number</b>	<b>Extent (Ha)</b>
	Gras Pan	112	5	2739
	Gras Pan	112	RE	3666
	Uitspan	115	1	2533
	Please see Map 1 - Locality Map in Appendix B.			
<b>APPLICATION AREA (HA):</b>	The extent of the proposed prospecting right area is approximately 8938 Hectares. Please see Map 1 - Locality Map in Appendix B. The area of disturbance envisaged by the prospecting activities is an extent of 0.15 ha.			
<b>MAGISTERIAL DISTRICT:</b>	Siyathemba Local Municipality Pixley ka Seme District Municipality			
<b>DISTANCE AND DIRECTION TO NEAREST TOWNS</b>	The proposed prospecting activities are located 15 km South-West of Copperton and 60 km South-West of Prieska in the Northern Cape Province.			

**TABLE 2-2: 21 DIGIT SURVEYOR-GENERAL CODE FOR EACH FARM PORTION**

FARM NAME	FARM NUMBER	SUBDIVISION NUMBER	SG CODE
Gras Pan	112	5	C06000000000011200005
Gras Pan	112	RE	C06000000000011200000
Uitspan	115	1	C06000000000011500001

## 2.2 LOCALITY MAP

Please refer to Appendix B Map 1.

## 3 DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

The region of interest, the Copperton Subvolcanic area, is situated in the Northern Cape Province and is part of the geological Areachap Group. The nearest town to the proposed prospecting area is Copperton (15 km north-east). Prieska is situated approximately 60 m north-east of the proposed prospecting area.

Orion Exploration No. 5 intends to undertake prospecting activities for a variety of minerals by means of the following non-invasive and invasive prospecting methods:

### 3.1.1 NON-INVASIVE PROSPECTING METHODS

- Compile a working plan on a scale of 1: 10 000, which would integrate all geological, geophysical and geochemical data, as well as farm tracks, fences and drainages, to cover the relevant portion of the prospect area.
- Geological mapping of a zone covering the approximate position of the old "sea floor".
- Geophysical Surveys.
- Reconnaissance soil sampling traverses followed by more detailed and systematic soil sampling and trenches.

- Geochemical Surveys- It is expected that more than 1 000 soil samples may be collected on traverse lines and analysed using a hand-held XRF.

### 3.1.2 INVASIVE PROSPECTING METHODS

- Diamond-core drilling to test the conductors and soil geochemical anomalies at depth (20 m to 550 m).
- If economic grades of base metals are intersected, follow-up diamond-core boreholes will be drilled to delineate the economic zones.
- An initial 5 holes are planned to a depth of 550 m for the exploration phase
- If the drilling determines an economic deposit, it will be modelled, and a pre-feasibility study will be done resulting in a resource statement and feasibility study.
- Minor trenching may be conducted in areas of limited outcrop to determine geological contacts and continuity.
- No bulk sampling will be carried out for the duration of the prospecting right applied for.

Diamond core drilling (diamond drilling) is used to retrieve a large piece of relatively intact cylindrical rock. This technique is so named for industrial strength diamonds that are placed into the hollow end of the drill bit and they are used to cut away at almost any strength of rock or other material. Diamond drilling is a hydraulic assisted method that produces no dust. The cutting edge is constantly water flushed and all rock chips and fine particles are transported up the hole as a sludge.

Diamond drilling is appropriate where more detailed geological information needs to be obtained and for accurate ore sampling. The process involves the use of light and easy to transport equipment and it can be used in just about all locations, including underwater. Another advantage is that diamond drilling produces less noise pollution and little or no dust.

The drilling program will be confirmed through the surface work plan.

If, at the end of this prospecting period, an orebody of economic tonnage and grade is proven, an extension of the prospecting right will be applied for, for the purpose of bulk sampling and testing. In the event of an economic orebody being proven or indicated well before the end of the prospecting period, an amended work program will be submitted to the DMR for approval.



**FIGURE 3-1: TYPICAL DIAMOND-CORE DRILLING RIG**

**TABLE 3-1: DETAILED PROSPECTING WORKS PROGRAM**

PHASE	ACTIVITY (WHAT ARE THE ACTIVITIES THAT ARE PLANNED TO ACHIEVE OPTIMAL PROSPECTING)	SKILL(S) REQUIRED (REFERS TO THE COMPETENT PERSONNEL THAT WILL BE EMPLOYED TO ACHIEVE THE REQUIRED RESULTS)	TIMEFRAME (IN MONTHS) FOR THE ACTIVITY)	OUTCOME (WHAT IS THE EXPECTED DELIVERABLE, E.G. GEOLOGICAL REPORT, ANALYTICAL RESULTS, FEASIBILITY STUDY, ETC.)	TIMEFRAME FOR OUTCOME (DEADLINE FOR THE EXPECTED OUTCOME TO BE DELIVERED)	WHAT TECHNICAL EXPERT WILL SIGN OFF ON THE OUTCOME? (E.G. GEOLOGIST, MINING ENGINEER, SURVEYOR, ECONOMIST , ETC)
1	Non-Invasive Prospecting Literature Survey Geological Mapping	Geologist Geologist	3 Months 6 Months	Maps and detail reports. Maps and geological repos	3 Months 6 Months	Geologist Geologist
1	Non-Invasive Prospecting Airborne Geophysical Survey Ground Geophysical Survey	Geophysicist Geophysicist	3 Months 6 Months	Regional targets Drilling targets	3 Months 6 Months	Geophysicist Geophysicist
2	Non-Invasive Prospecting Soil sampling Invasive Prospecting Trenches	Geologist Geologist	3 Months 3 Months	Maps and detail reports. Geological contacts	3 Months 3 Months	Geologist Geologist
3	Invasive Prospecting Drilling	Geologist	24 Months	Borehole core data		Geologist
4	Invasive Prospecting Resource drilling	Geologist	24 Months	Borehole core data	24 Months	Geologist
5	Non-Invasive Prospecting Analytical desktop studies	Geologist / Mine Economist	12 Months 12 Months	Pre-feasibility reports. Resource Statement	12 Months 12 Months	Geologist Geologist

### 3.2 LISTED AND SPECIFIED ACTIVITIES

(The layout for activities described below will only be established once non-invasive prospecting has been completed).

<b>NAME OF ACTIVITY (ALL ACTIVITIES INCLUDING ACTIVITIES NOT LISTED)  (E.G. EXCAVATIONS, BLASTING, STOCKPILES, DISCARD DUMPS OR DAMS, LOADING, HAULING AND TRANSPORT, WATER SUPPLY DAMS AND BOREHOLES, ACCOMMODATION, OFFICES, ABLUTION, STORES, WORKSHOPS, PROCESSING PLANT, STORM WATER CONTROL, BERMS, ROADS, PIPELINES, POWER LINES, CONVEYORS, ETC...ETC...ETC.)</b>	<b>AERIAL EXTENT OF THE ACTIVITY HA OR M<sup>2</sup></b>	<b>LISTED ACTIVITY MARK WITH AN X WHERE APPLICABLE OR AFFECTED</b>	<b>APPLICABLE LISTING NOTICE (GNR 544, GNR 545 OR GNR 546)/ NOT LISTED</b>	<b>WASTE MANAGEMENT AUTHORISATION  (INDICATE WHETHER AN AUTHORISATION IS REQUIRED IN TERMS OF THE WASTE MANAGEMENT ACT).  (MARK WITH AN X)</b>
Drilling of diamond core boreholes	1125 m <sup>2</sup>	X	GNR 983 (20) GNR 985 (12)	n/a
Establishment of access tracks for drilling equipment	2500 m <sup>2</sup>	n/a	n/a	n/a
Removal of vegetation for access tracks and drilling sites	3625 m <sup>2</sup>	X	GNR 983 (20) GNR 985 (12)	n/a
Establishment of temporary topsoil stockpiles at drilling locations	0 – accommodated within the 15 m x 15 m footprint for each drilling site	n/a	n/a	n/a

All applicable listed activities from the Listing Notices in the EIA Regulations, 2014 (as amended) requiring Environmental Authorisation are specified in Table 4-2.

## 4 POLICY AND LEGISLATIVE CONTEXT

Table 4-1 provides a description of the legislation which has particular importance to the BAR process being undertaken for the development. A detailed list of other legislation which may be applicable is provided in Appendix E.

**TABLE 4-1: POLICY AND LEGISLATIVE CONTEXT**

<b>APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT</b> <b>(A DESCRIPTION OF THE POLICY AND LEGISLATIVE CONTEXT WITHIN WHICH THE DEVELOPMENT IS PROPOSED INCLUDING AN IDENTIFICATION OF ALL LEGISLATION, POLICIES, PLANS, GUIDELINES, SPATIAL TOOLS, MUNICIPAL DEVELOPMENT PLANNING FRAMEWORKS AND INSTRUMENTS THAT ARE APPLICABLE TO THIS ACTIVITY AND ARE TO BE CONSIDERED IN THE ASSESSMENT PROCESS)</b>	<b>REFERENCE WHERE APPLIED</b>
<b>ACTS</b>	
National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)	<p>NEMA provides 18 specific principles relating to Environmental Management. Of key importance are the precautionary principle and the polluter pays principle. The 18 principles of NEMA are to be recognised during the undertaking of the Impact Assessment Process and play a key role during the decision-making process.</p> <p>Section 24 of NEMA requires environmental authorisation to be obtained for certain activities identified in three listing notices, published on 4 December 2014. The procedure for obtaining an environmental authorisation requires either a basic assessment (activities in Listing Notice 1 and 3) or scoping and Environmental Impact Assessment (activities in Listing Notice 2) process to be undertaken to inform the application for authorisation.</p> <p><b>The proposed prospecting activities fall within the ambit of various listed activities in Listing Notice 1. Since activities in Listing Notice 1 apply to the proposed prospecting activities, a Basic Assessment process is being followed. The BAR process is being undertaken in compliance with the requirements of NEMA and the EIA Regulations, 2014.</b></p>
Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)	<p>The MPRDA regulates the acquisition, use and disposal of mineral and petroleum rights.</p> <p><b>A Prospecting Right Application is applicable.</b></p>
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA)	<p>The NEM: WA provides for the reform of waste management legislation and repeals or amends the legislation under which waste was previously regulated.</p> <p>Part 4 of the NEM: WA pertains to listed waste management activities. In accordance with section 19(2) of the NEM: WA, the Minister published a schedule of listed waste management activities in Government Notice (GN) 921 of 29 November 2013. These are considered activities that have or are likely to have a detrimental effect on the environment.</p>

	<p>According to regulation 2 of GN 921, no person may commence, undertake, or conduct a listed waste management activity unless a licence is issued in respect of that activity.</p> <p><b>No application in terms of NEM:WA is required for the intended prospecting activities.</b></p>
Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (MHSA)	<p>The objective of the Act is to cover all aspects relating to health and safety of employees and other persons on the mine property. The Act places the responsibility on the mine owner for ensuring that the mine is designed, constructed and equipped in a manner which allows for a safe and healthy working environment.</p> <p><b>The safety precautions in Section 7 of the MHSA have been considered in the environmental sensitivity map.</b></p>
The National Water Act, 1998 (Act No. 36 of 1998) (NWA)	<p>The National Water Act, 1998 (Act No. 36 of 1998), identifies 11 consumptive and non-consumptive water uses, which must be authorised under a tiered authorisation system, which include Scheduled uses, General Authorisations, or Licenses. In terms of the National Water Act, the following water uses are identified:</p> <ul style="list-style-type: none"> <li>(a) Taking water from a water resource;</li> <li>(b) Storing water;</li> <li>(c) Impeding or diverting the flow of water in a watercourse;</li> <li>(d) Engaging in a stream flow reduction activity contemplated in section 36;</li> <li>(e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);</li> <li>(f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;</li> <li>(g) Disposing of waste in a manner which may detrimentally impact on a water resource;</li> <li>(h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;</li> <li>(i) Altering the bed, banks, course or characteristics of a watercourse;</li> <li>(j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and</li> <li>(k) Using water for recreational purposes.</li> </ul> <p><b>No WUL application has been identified as being necessary for the prospecting activities.</b></p>
National Environmental Management: Air Quality Act 2004 (Act No. 39 of 2004) (NEM:AQA)	<p>The main objectives of the National Environmental Management: Air Quality Act 2004 (Act no. 39 of 2004) (NEM: AQA) are to protect the environment by providing reasonable legislative and other measures to:</p> <ul style="list-style-type: none"> <li>➤ Prevent air pollution; and</li> <li>➤ Promote conservation and secure ecologically sustainable development.</li> </ul> <p><b>No AEL application has been identified as being necessary for the prospecting activities.</b></p>
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)	<p>The NHRA describes the importance of heritage in the South African context, and designates the South African Heritage Resource Agency (SAHRA) as guardian of the national estate which may include heritage resources of cultural significance that link to biodiversity, such as places to which oral traditions are attached or which are associated with living heritage, historical settlements, landscapes and natural features of cultural significance, archaeological and paleontological sites, graves and burial grounds, or movable objects associated with living heritage.</p>

	<p>Section 38 of the Act requires a Heritage Impact Assessment (HIA) to be undertaken for various types of development. If the HIA demonstrates that the development will have an impact on a heritage resource, approval from the South African Heritage Resource Agency, or the relevant provincial heritage authority is needed prior to proceeding with the development.</p> <p><b>Based on the desktop heritage specialist study compiled for the prospecting right area. ESA, MSA and LSA scatters as well as sites can be expected in the larger study area. Heritage artefacts are common in the study area. A site survey prior to drilling commencing and a chance find procedure are incorporated in the EMPr to ensure that no significant archaeological sites or finds are disturbed or impacted upon.</b></p>
<p>Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007)</p>	<p>Provides for the protection, preservation and maintenance, in respect of radio frequency interference or interference in any other way, of declared astronomy advantage areas. Three Central Astronomy Advantage Areas have been established to date, namely:</p> <ul style="list-style-type: none"> <li>➤ The Northern Cape Province, excluding Sol Plaatje Municipality</li> <li>➤ The Karoo Core AAA</li> <li>➤ The Karoo Central AAA</li> </ul> <p><b>The prospecting right area is located within the Northern Cape Province and the Karoo Central AAA. Restrictions may apply with respect to prospecting-related radio and electrical activities, if these are deemed to interfere with radio astronomy work.</b></p>
<p><b>GUIDELINES</b></p>	
<p>Department of Environmental Affairs (DEA) Guideline Series 7: Public Participation (2012)</p> <p>DEA Public Participation Guideline (2017) – Not Gazetted</p>	<p>The public participation guideline outlines the importance of public participation as well as the minimum legal requirements for the public participation process, the steps to be taken and the guideline for planning a public participation process.</p> <p><b>The public participation process for this application has incorporated relevant requirements of the guidelines.</b></p>
<p>Department of Environmental Affairs (DEA) Guideline Series 9: Need and Desirability (2012)</p> <p>DEA Guideline on Need and Desirability (2017) – Not Gazetted</p>	<p>The need and desirability guidelines highlight the importance of establishing and assessing the need and desirability for a project. The consideration of need and desirability in the EIA decision making process requires the consideration of the strategic importance of the development alongside the broader societal need and public interests.</p> <p><b>The need and desirability description for the proposed development has taken cognisance of these guidelines.</b></p>



#### 4.1 LISTED ACTIVITIES IDENTIFIED IN TERMS OF NEMA, NEM:WA AND NWA

**TABLE 4-2: NEMA LISTED ACTIVITIES APPLICABLE TO THE PROPOSED PROSPECTING ACTIVITIES**

NEMA LISTED ACTIVITIES		
REGULATION	ACTIVITY NUMBER	SUMMARY DESCRIPTION
<b>GN R.983, 8 December 2014 (as amended on 7 April 2017)</b>  <b>Listing Notice 1: Basic Assessment</b>	1(20)	Any activity including the operation of that activity which requires a prospecting right in terms of section 16 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including - (a) associated infrastructure, structures and earthworks, directly related to prospecting of a mineral resource; or (b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in Listing Notice 2 applies.  <b>The applicant is applying for a prospecting right.</b>

#### 5 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

Orion Minerals has several prospecting rights in the Northern Cape Province which it is investigating. The area identified for this prospecting right application forms part of the company's regional exploration strategy for the Areachap Group minerals belt. The latter represents a mid-Proterozoic fossil island arc environment consisting of amphibolite, hornblende gneiss, quartz-feldspathic gneiss, calc-silicates and pelitic schists. Chemical compositions of these highly deformed upper amphibolite/granulite grade metamorphosed rocks indicate protoliths ranging from rhyolite/rhyodacite, calc-alkaline basalt, tholeiite to ultramafic igneous rocks and sediments. This assemblage is typical of an island arc environment.

The 1: 250 000 Geological Sheets (Sheet 2922 Prieska and Sheet 3022 Britstown) demonstrate the Areachap Group in blue (Mv). It is, on average 10 km wide, striking southeast - northwest, flanked by granitic intrusions 3 km to the southeast of the prospect area and most of the area is covered by Dwyka tillite and sand (Figure 5-1).



In addition to the export market need for minerals like copper, zinc, nickel, cobalt and others, there is a significant need in the Northern Cape for developments which facilitate economic growth and provide employment opportunities at a local and regional scale. The PKSD SDF (2013-2018) identifies mining as one of the economic sectors which has historically contributed the most to regional gross domestic product and identifies the sector as having further development potential. Similarly, the SLM IDP (2017-2018) identifies the potential for new mining development within the municipality as an economic opportunity.

The intended prospecting is also in line with the following objectives of the MPRDA (Act 28 of 2002):

- Promoting economic growth and mineral and petroleum resources development in the Republic;
- Promoting employment and advance the social and economic welfare of all South Africans;
- Promotion for security of tenure in respect of prospecting, exploration, mining and production operations; and

Give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development.

There are several other land uses within the proposed prospecting rights area. These are predominantly small livestock farming, and game farming. The majority of the prospecting right area is within the boundary of the Alkantpan Test Range. Surrounding properties comprise of mainly small livestock farming and game farming. Several operating and proposed renewable energy developments (wind and solar) are located on surrounding properties to the east, with the nearest operating solar PV plant (Mulilo Prieska PV) being approximately 5 km from the eastern boundary of the proposed prospecting right area.

With an intended total surface disturbance area of less than one hectare, low impact intensity, short duration of the prospecting work programme, avoidance of sensitive areas, and no irreversible impacts identified, it is concluded that the intended prospecting activities can be managed in such a manner that they will not conflict with any other land uses in the broader study area.

The prospecting is thus necessary to confirm whether there are any mineral deposits of economic value within the prospecting right area. The activity is desirable in that it will not have a significant impact on the environment and it will advance the objectives of the MPRDA and the recommendations of the National Development Plan 2030, with respect to the extraction of mineral resources in a sustainable manner.

## **6 MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE INCLUDING A FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE**

### **6.1 DETAILS OF THE DEVELOPMENT FOOTPRINT ALTERNATIVES CONSIDERED**

#### **6.1.1 THE PROPERTY ON WHICH OR LOCATION WHERE IT IS PROPOSED TO UNDERTAKE THE ACTIVITY**

The properties included in the prospecting right application represent the cadastral units relating to the geological formation of interest, namely a portion of the Areachap Group. The proposed location of the prospecting activities on each property is similarly determined by the location of the resource on that property.

In addition to the geological formation, the proposed prospecting right area has been defined based on several other factors such as access to available mineral rights, infrastructure, and the proximity to the existing PCM mine.

The location of the invasive prospecting activities (drilling and trenching) will be informed by the information obtained through the non-invasive prospecting activities, particularly the TDEM survey data. Drilling site locations will avoid the sensitive areas mapped in Appendix B.

### 6.1.2 THE TYPE OF ACTIVITY TO BE UNDERTAKEN

Prospecting activities (invasive and non-invasive) will be undertaken for several minerals on the properties under application. A full description of the planned prospecting activities is provided in Section 3 of this report. Invasive prospecting activities will be limited to diamond core drilling.

Current land uses include livestock and game farming. Due to the low impact intensity and short duration of the proposed prospecting activities, current and future land use alternatives will not be compromised.

### 6.1.3 THE DESIGN OR LAYOUT OF THE ACTIVITY

The site layout of the prospecting activities is largely determined by the orebody of interest. The proposed drilling programme will be refined based on the information derived from the non-invasive prospecting activities, including geological mapping and EM surveys. An environmental sensitivity map has been compiled and the location of drilling and access tracks to the drilling locations will be planned in a manner that avoids the identified sensitive environmental areas.

The latter includes:

- Natural features, for example watercourses;
- Existing physical structures, such as roads and railways; and
- Spatially designated Critical Biodiversity Areas and Ecological Support Areas, as identified in the provincial biodiversity plan.

Buffer distances (minimum safe distances), determined primarily from legislation, including GN704 and the MHSA, were then applied (Table 6-1).

The identified sensitive areas and the applied buffers is shown in Appendix B Map 2.

**TABLE 6-1: ENVIRONMENTAL BUFFER ZONES**

INFRASTRUCTURE	BUFFER (M)	LEGISLATION / COMMENT
Buildings	100	MHSA and Regulations
Roads		
Railways		
Structures		
Restricted areas	50	MHSA GN93
Watercourses	100	NWA GN704
Wetlands	500	NWA GN704 GN1199
Powerlines	25	A proposed buffer (either side of centre-line) for protection of powerline infrastructure
Critical Biodiversity Areas and Ecological Support Areas	0	The CBA and ESA areas have been shown on the map as published by the provincial authority

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## 6.1.4 THE TECHNOLOGY TO BE USED IN THE ACTIVITY

### 6.1.4.1 *Technical Data Detailing Prospecting Methods*

Geological mapping of the area will be undertaken. This will include surveying of all reference points, geological features, linear distances, etc., with a GPS Receiver.

Reconnaissance soil sampling, with follow-up stages and reconnaissance soil sampling traverses, followed by more detailed and systematic soil sampling will then proceed. Soil and stream sediment samples collected along traverses will be sieved to minus 80# or minus 200# (depending on the results of orientation studies) for analysis.

SkyTEM, a leading airborne electromagnetic (AEM) survey company headquartered in Denmark which offers state-of-the-art helicopter borne transient electromagnetic (TEM) and magnetic acquisition system, will be used to fly a TEM survey. This technique was used with great success on the other tenements which Orion operates on. The targets that are generated with the SkyTEM will be followed up with ground EM. These targets combined with the soil geochemistry will lead to the drilling targets.

Diamond-core drilling to test the more promising geophysical and soil geochemical anomalies will follow. If economic grades of base metals are intersected, follow-up diamond-core boreholes will be drilled for the purpose of delineating the economic zone. During the diamond-core drilling phase geological supervision and core processing can take place simultaneously. The drilling program may be interrupted occasionally to allow time for assaying, data processing and revision of the structural interpretation. Only zones with visible sulphides will be sampled for assay purposes. Mineralized core will be split with a core splitter. One half of the split core will be sent for assay, while the other half is kept for record purposes. All cores will be stored after processing is completed. Borehole collars will be surveyed by GPS Receiver on different days to enable average coordinates to be calculated. Down-hole surveys to detect deviation will only be carried out on holes deeper than 300 m. Collars will be covered with numbered cement slabs until the end of the prospecting period.

Borehole sites are GPS located and pegged with a steel dropper. The site is inspected and photographed prior to any disturbance. A drill pad is then cleared, keeping disturbance to the native vegetation to an absolute minimum. Any topsoil removed is stored separately for later reuse. These holes would be drilled in phases, with the first phase of holes being drilled on a wide 200 m grid on the target areas identified during Phase 1 and the balance being drilled on a tighter grid as the target becomes more resolved. Each hole would be started as an 8-inch diameter hole to allow for casing to be inserted for the first 9 m of drilling stabilizing overburden and thereafter progress to 600 m as a 6-inch diameter hole. Plastic lining to prevent oil spillage is used under the rig. After the drilling operation is complete, each borehole collar is surveyed, and the site is rehabilitated and photographed. The retained topsoil is used to fill any sumps and is reseeded if necessary. Any spoils or drilling material is transported off site and disposed often an approved area.

Phase 1 of the drilling would involve the completion of 200 m spaced diamond-core holes and would thereafter be further resolved with a second phase of diamond-core drilling on a 100 m by 100 m grid. This is contingent on the size and distribution of identified targets and may be adapted depending on results from previous phases. This should allow for a broad resource target area to be defined which 'would then be followed up with a third drilling phase on 20 m spacing.

Approval for additional drilling will be obtained from the DMR prior to commencing therewith.

Metallurgical work will be undertaken using the drill cores obtained during the first phase of drilling. At this stage only, bench scale test work is considered to define the likely upgrading and hydro-metallurgical process that would be applied to any ore grade material encountered.

Diamond-core drilling has been selected as the preferred drilling technology based on its proven success and because it produces no dust emissions. Percussion drilling is a drilling technology which could also be employed but is not considered in this instance because of the dust which this type of drilling technology generates.

### 6.1.5 **THE OPTION OF NOT IMPLEMENTING THE ACTIVITY**

Without prospecting, the presence of mineral resources which could be economically mined cannot be determined. Should the prospecting not proceed, the presence of mineral resources with the potential to be extracted would thus remain uncertain.

Although limited at this stage, the employment and procurement of local goods and services which would arise from the prospecting activities would not be realised.

No diamond-core drilling and/or trenching would be undertaken and the rehabilitation of these areas and any associated activities, including access roads, will not be necessary. The impacts associated with the prospecting activities would not occur.

Should the feasibility study undertaken as part of the prospecting activities show economically beneficial outcomes in terms of extraction of the resources, a mine right application is likely to be undertaken. In turn mining will contribute positively to the local and regional socio-economic environment. This includes procurement of local goods and services, employment opportunities for local communities as well as other South African citizens, income generation, skills development and education opportunities, local economic development, GDP improvement and the distribution of revenue and wealth. These benefits cannot however be realised if the prospecting is not implemented.

## **7 DETAILS OF PUBLIC PARTICIPATION PROCESS FOLLOWED**

The public participation process has been undertaken in accordance with Chapter 6 of the EIA Regulations, 2014 (as amended) and the DEA Public Participation Guidelines.

### **7.1 PRIOR CONSULTATION**

The proposed PRA surface area comprises of properties for which a PRA was submitted in 2018. Consultation was undertaken with Interested and Affected Parties (I&APs) as part of the basic assessment process completed in support of the PRA. Comments and Responses pertaining to prior consultations is attached as Appendix C.

I&APs, including landowners, land users and surrounding landowners/land users, have therefore previously been consulted with in terms of the prospecting activities.

### **7.2 NOTIFICATION PHASE**

All I&APs will be notified of the new application for a prospecting right and EA as follows:

- Landowners directly affected by the proposed prospecting activities have been identified and will be encouraged to participate in the BAR process through personal letters (post and email);
- Written notification of the project and associated application for Environmental Authorisation will be provided to the municipality, municipal councillor and relevant organs of state;
- Distribution of a Draft Basic Assessment Report which also served as a Background Information Document and Comment Sheet to all registered and identified I&APs;
- Placement of statutory advertisements in the Oewernuus; and
- Placement of On-Site Notice Boards at various locations within the study area

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### **7.3 DRAFT BAR**

I&APs was informed in writing of the availability of the Draft BAR and was given 30 days to provide ABS Africa with feedback, comments or concerns regarding the proposed prospecting activities.

The draft report was made available electronically and hard copies placed at a public venue.

### **7.4 I&AP IDENTIFICATION, CONSULTATION AND DATABASE MANAGEMENT**

Throughout the BA Process, the PPP Team will compile and maintain an electronic database of I&APs that will contain a full and complete record of all public participation activities.

All landowners and land occupiers required to be notified in terms of the EIA Regulations, 2014 (as amended) will be identified and requested to participate in the BA Process.

### **7.5 MUNICIPAL COUNCILLORS**

In terms of representative democracy and in line with the provisions of the Municipal Systems Act, 2000, Councillors are recognised as the elected representatives of the people. Councillors have a mandate as elected representatives to participate on behalf of and also to provide feedback to their constituencies. The PPP team will ensure that Councillors from the potentially affected areas are registered on the I&AP database and are encouraged to participate in the BA Process.

### **7.6 FINAL BAR**

All I&APs will be notified of the submission of the Final BAR and provided with access thereto on request.

All issues raised by I&APs was captured in a Comments and Response Report (CRR). The CRR contains comments forwarded to project team members, raised at various meetings, received through comment sheets, letters, faxes and e-mail.

### **7.7 NOTIFICATION OF DECISION**

Upon receipt of the decision on the EA the EIA Project Team will assist the applicant in making the application decisions available to all registered I&APs and notifying them of the appeal procedure to be followed in terms of the National Appeal Regulations [Government Notice No. R.993 promulgated in terms of section 44(1a) and 43(4) of NEMA].

### **7.8 SUMMARY OF ISSUES RAISED BY I&APS**

All comments from I&APs are capture in a Comments and Response Report (Appendix C).

## 8 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT ALTERNATIVES

### 8.1 BASELINE ENVIRONMENT - TYPE OF ENVIRONMENT AFFECTED BY THE PROPOSED ACTIVITY

A desktop review of available information on the baseline environment has been undertaken in accordance with the requirements of the EIA Regulations, 2014 (as amended).

The proposed prospecting right area is large and the drilling site locations can only be established once the non-invasive prospecting has been concluded. If no anomaly is identified through the non-invasive prospecting phase, it is possible that there will be no invasive prospecting.

To undertake specialist studies across the entire proposed prospecting right area when the actual area of disturbance from the proposed 5 drill sites is estimated to be less than one hectare in extent, is impractical. Thus, once the preliminary drilling locations have been established (following the non-invasive prospecting phase), a heritage and ecological site assessment will be undertaken to establish any sensitive fauna, flora or heritage attributes of significance which may be associated with intended drilling locations. The recommendations from these studies will be used to optimise the drilling locations and an updated site layout map showing the drilling site locations will be submitted to the DMR. The desktop review, informed primarily by the several studies undertaken for Orion’s mining right applications at nearby properties with similar biogeographical characteristics, is presented below.

#### 8.1.1 CLIMATE

The proposed activity is situated in the BWh (mild desert climate) of the Köppen Climate Classification System. Climatic conditions are characterised by warm to hot summers, high evaporation and dry warm winters, a mean annual rainfall of 198 mm and a large degree of variability in the monthly rainfall. Potential evaporation is extremely high. The temperatures are highest in January and the coldest month is in July.

#### 8.1.2 MEAN ANNUAL RAINFALL

Mean Annual Rainfall for the area is 198 mm (Peens & Associates, 2017). Rainfall is strongly seasonal with approximately 60% of the yearly rainfall falling in the summer months (October to January) (Table 8-1).

#### 8.1.3 MEAN ANNUAL EVAPORATION

Regional evaporation data obtained from gauging stations operated by the Department of Water and Sanitation (DWS) indicate a Mean Annual Evaporation (MAE) of 2714 mm for the area (Table 8-1).

**TABLE 8-1: MEAN MONTHLY AND ANNUAL RAINFALL AND EVAPORATION**

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
<b>RAINFALL</b>													
<b>MM</b>	26.6	31.2	41.0	23.3	9.3	4.8	5.2	5.5	5.2	12.2	15.3	18.8	<b>198</b>
<b>%</b>	13.4	15.7	20.7	11.8	4.7	2.4	2.6	2.8	2.6	6.1	7.7	9.5	100
<b>EVAPORATION</b>													
<b>MM</b>	283	336	380	373	295	241	158	109	82	100	146	211	<b>2 714</b>
<b>%</b>	10.4	12.4	14.0	13.7	10.9	8.9	5.8	4.0	3.0	3.7	5.4	7.8	100

Source: Peens & Associates (2017)



### 8.1.4 TEMPERATURE

High maximum and very low minimum temperatures characterises the environment. The temperatures are highest in January with an average around 26.9°C. July is the coldest month with 9.8°C on average.

**TABLE 8-2: MEAN MONTHLY AND ANNUAL TEMPERATURES**

MONTH	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
<b>RAINFALL</b>													
<b>MIN</b>	12.1	15	17.8	19.2	18.5	16	11.3	5.9	1.5	1	3.7	7.5	<b>10.8</b>
<b>MAX</b>	29.2	31.3	34.1	34.6	33.8	31	26.8	22.3	18.8	18.6	21.7	25.2	<b>27.3</b>
<b>AVE</b>	<b>20.6</b>	<b>23.1</b>	<b>25.9</b>	<b>26.9</b>	<b>26.1</b>	<b>23.5</b>	<b>19</b>	<b>14.1</b>	<b>10.1</b>	<b>9.8</b>	<b>12.7</b>	<b>16.3</b>	

Source: South African Weather Service (Prieska Weather Station)

### 8.1.5 WIND SPEED AND DIRECTION

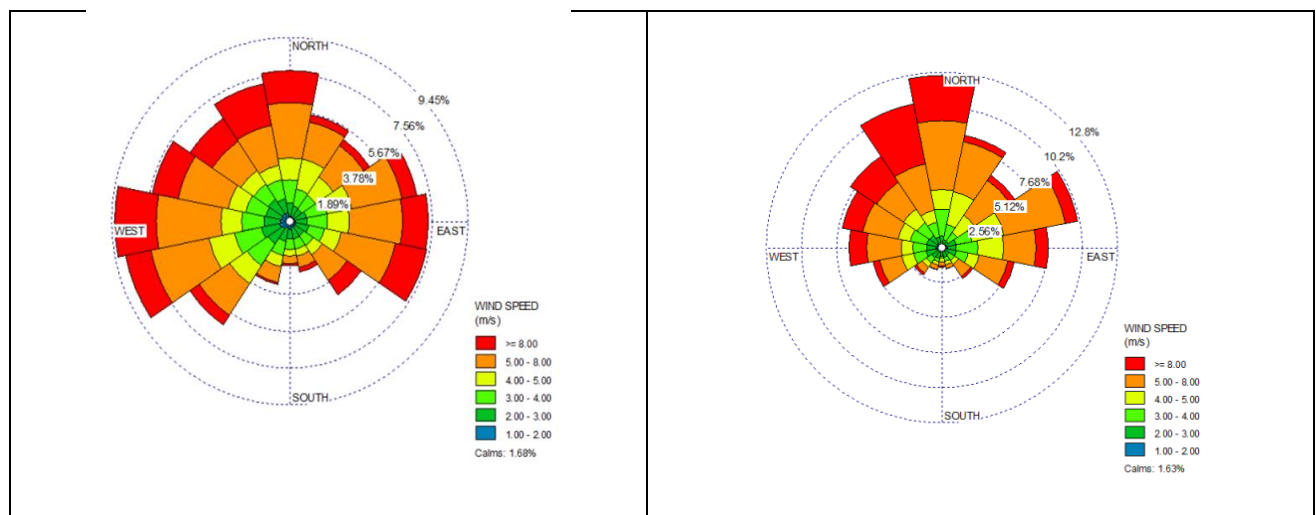
Dominant wind directions and wind speed across the site are presented in Figure 8-1. Seasonal and daytime/night-time variation in wind speeds and direction are also shown.

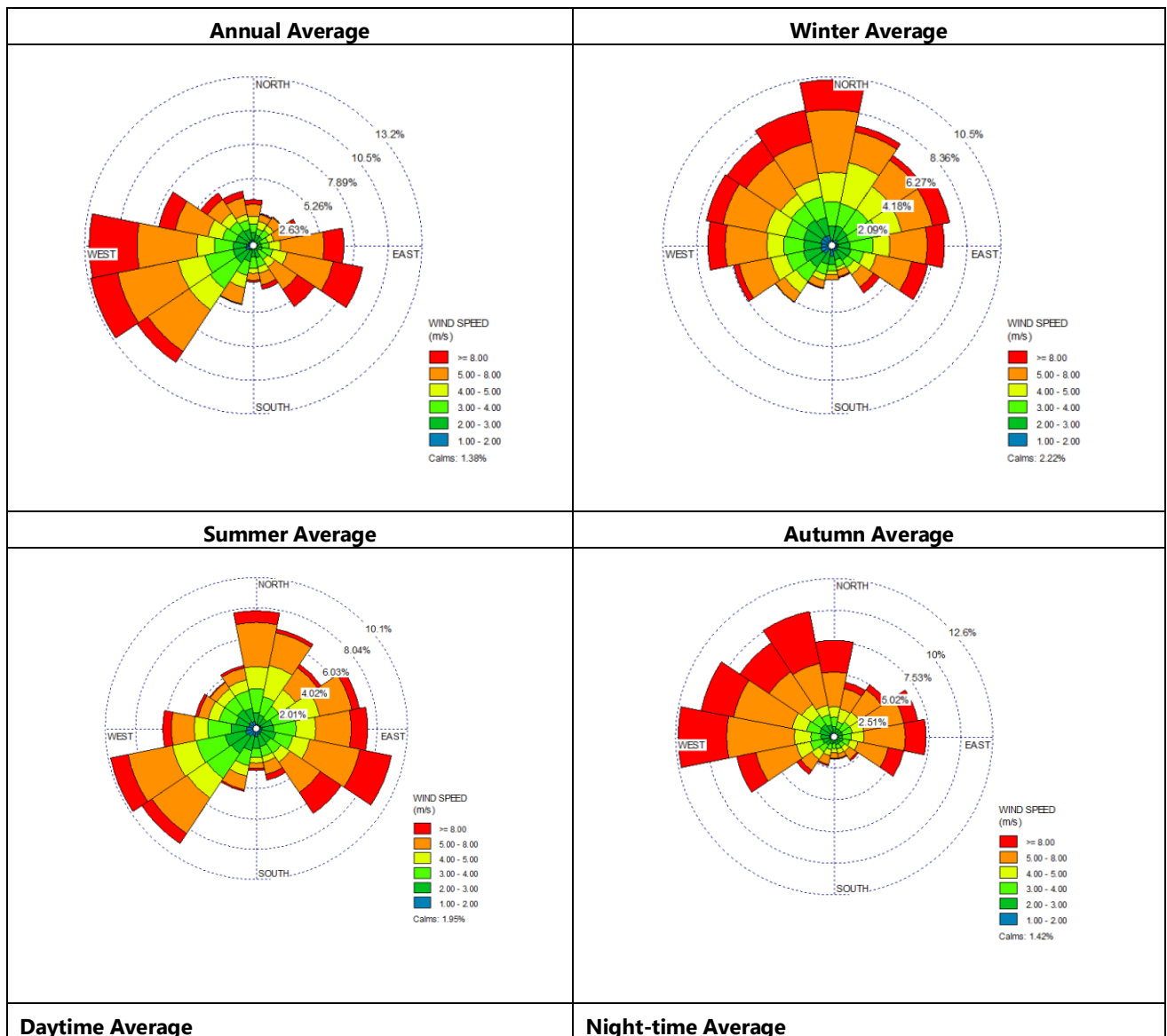
Wind roses comprise 16 spokes, which represent the directions from which the wind blew during a specific period. The colours used in the wind roses reflect the distinct categories of wind speeds; for example, yellow representing winds in between 1.5 and 2 m/s. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. The frequency with which calms occurred, i.e. periods during which the wind speed was below 1 m/s are also indicated.

Annual average wind direction is dominant from the west and west-west-south. Winds from the north, east and east-east-south are also frequent. Wind is a characteristic of the region, with calm conditions (wind speed less than 1m/s) only being present for 1.58% of the time.

There is a distinct seasonal variation between summer and winter wind direction with predominant winds in winter being from the north and north-north-west. In summer, the predominant wind direction is from the west and west-west-south with south-easterly winds also important. Autumn and spring wind direction is similar to that of winter and summer respectively.

Daytime average wind direction is from the south-west and south-east whereas night-time wind direction is predominantly from a westerly direction. Wind speeds are stronger during night-time compared with daytime conditions.





Source: MM5 Data (2014-2016)

**FIGURE 8-1: AVERAGE ANNUAL WIND DIRECTION AND SPEED FOR COPPERTON**

### 8.1.6 TOPOGRAPHY

The application area can be described as flat with no significant natural physiographic features present in the area. Elevation is highest in the north of the proposed prospecting right area and lowest in the south-west. The elevation change from north to south is approximately 150 m, over an extent of approximately 7 km.

### 8.1.7 GEOLOGY

The Prieska Orebody is hosted by highly deformed metamorphic rocks of the Copperton Formation of the Areachap Group, which forms part of the Namaqualand Metamorphic Province.

The Areachap Group represents a mid-Proterozoic fossil island arc environment consisting of amphibolite, hornblende gneiss, quartz-feldspathic gneiss, calc-silicates and pelitic schists. Chemical compositions of these highly deformed upper amphibolite/granulite grade metamorphosed rocks indicate protoliths ranging from rhyolite/rhyodacite, calc-alkaline basalt, tholeiite to ultramafic igneous rocks and sediments. The above-mentioned assemblage is typical of an island arc environment.

Island arc environments are ideal hosts for volcanic hosted massive sulphide (VHMS) type deposits and may successfully be explored by using the VHMS lithogeochemical alteration model. VHMS deposits not only yield strategic base metals such as zinc (Zn), copper (Cu) and lead (Pb), but significant grades of gold (Au) and silver (Ag) are associated with these deposits.

### 8.1.8 SOILS

The soils associated with the proposed project site are mostly red-yellow apedal soils, freely drained, with a high base status and 741 mm deep, typical of Ah45 land types. A soil map of the proposed prospecting right area is attached in Appendix B (Map 5).

### 8.1.9 TERRESTRIAL ECOLOGY

A terrestrial Screening study was undertaken by Ecorex (2019). The findings of the study is presented below and attached as Appendix D.

#### 8.1.9.1 National Vegetation Types

The project area is situated within the Nama-Karoo Biome, a large area on the central plateau of western South Africa that is characterised by high variability in temperature and annual rainfall, although most rainfall occurs in summer (Mucina & Rutherford, 2006). The flora of the Nama-Karoo is not as diverse and rich in endemics as the adjacent Succulent Karoo and does not contain any centres of plant endemism. Three geographically distinct bioregions are present within this biome, namely Bushmanland, Upper Karoo and Lower Karoo. The project area is situated within the Bushmanland Bioregion in the Bushmanland Basin Shrubland (NKb6) vegetation type, near the boundary with Bushmanland Arid Grassland (NKb3). One azonal vegetation type, Bushmanland Vloere (AZi5), and a small patch of Northern Upper Karoo (NKu3) (Upper Karoo Bioregion) are present on adjacent properties but are not represented within the project area. Bushmanland Basin Shrubland is described in more detail below (following Mucina & Rutherford, 2006).

#### **Bushmanland Basin Shrubland**

Bushmanland Basin Shrubland is also confined to Northern Cape province, occurring in the Bushmanland Basin that is located between Grootboskolk in the west, Copperton in the east, Kenhard in the north and Williston in the south, and covering an area of about 34 100km<sup>2</sup>. Terrain comprises extensive plains covered in dwarf shrubland that is dominated by spiny, woody shrubs. Soils are shallow Glenrosa and Mispah forms and, to a lesser extent, red-yellow apedal, freely drained soils with a high base status; soil salt content is high. As with Bushmanland Arid Grassland, rain falls primarily in late summer to autumn. Mean annual precipitation varies from 100 – 200 mm. Floristic composition and important taxa are indicated in Table 1 below. Bushmanland Basin Shrubland is not represented in any official conservation areas, but shows no sign of serious habitat transformation and has a conservation status of Least Threatened.

**TABLE 8-3: FLORISTIC COMPOSITION AND IMPORTANT TAXA IN BUSHMANLAND BASIN SHRUBLAND**

IMPORTANT TAXA	
Dominant Grasses	<i>Aristida adscensionis</i> , <i>Enneapogon desvauxii</i> , <i>Stipagrostis ciliata</i> , <i>S. obtusa</i> .

Selected Woody Shrubs	<i>Lycium cinereum, Rhigozum trichotomum, Aptosimum spinescens, Hermannia spinosa, Pentzia spinescens, Zygophyllum microphyllum, Aptosimum elongatum, Eriocephalus microphyllus var. pubescens, E. pauperrimus, Osteospermum armatum, O. spinescens, Pegolettia retrofracta, Phaeoptilum spinosum, Plinthus karoocicus, Pteronia glauca, P. inflexa, P. leucoclada, P. sordida, Selago albida, Tetragonia arbuscula, Zygophyllum lichtensteinianum.</i>
Succulent Shrubs	<i>Salsola tuberculata, Aridaria noctiflora subsp. straminea, Brownanthus ciliatus subsp. ciliatus, Galenia sarcophylla, Lycium bosciifolium, Ruschia intricata, Salsola namibica, Sarcocaulon patersonii, S. salmoniflorum, Tripteris sinuata var. linearis, Zygophyllum flexuosum</i>
Herbaceous Plants	<i>Gazania lichtensteinii, Leysera tenella, Amaranthus praetermissus, Chamaesyce inaequilatera, Dicoma cape-nsis, Indigastrium argyraeum, Lepidium desertorum, Monsonia umbellata, Radyera urens, Sesamum capense, Tribulus terrestris, T. zeyheri</i>
Biogeographically Important Taxon (Bushmanland endemic)	
Succulent Herb	<i>Tridentea dwequensis</i>
Species endemic to the vegetation type	
Geophytes	<i>Ornithogalum bicornutum, O. ovatum subsp. oliverorum</i>
Herbaceous Plants	<i>Cromidon minutum</i>

### **Centres of Plant Endemism**

The prospecting right area is situated at the southern boundary of the Griqualand West Centre of Plant Endemism (GWCE) as defined by Frisby (2016). This centre of endemism is confined to the Northern Cape from Pomfret in the north to Prieska in the south, and with Upington and Vryburg forming the western and eastern boundaries respectively. Van Wyk & Smith (2001) predicted at least 40 endemic plant species for the GWCE, while Frisby (2016) refined this list to 26 endemic and near-endemic species.

### **Threatened Ecosystems**

The prospecting right area is not located within or close to any listed Threatened Ecosystems as described under Notice 1002 of Government Gazette 34809, 9 December 2011.

#### **8.1.9.2 Local Context – Plant Species Richness and Vegetation Assemblages**

The Botanical Database of Southern Africa (BODATSA), which is curated by SANBI, lists 731 plant species from 83 families for the QDSs 2922CC and 3022AA, as well as all adjacent grids (Appendix 1 of the specialist report). The dominant plant families in the flora are the Asteraceae (108 spp), Poaceae (100 spp), Fabaceae (49 spp), Aizoaceae (40 spp) and Scrophulariaceae (38 spp). This is obviously a significantly higher plant species diversity than that which is in the project area as these grids represent a far greater variety of habitats.

The description of broad-scale vegetation assemblages below is based primarily on MacDonald (2013), who conducted fieldwork in 2011 on the farms Hoekplaas (Remainder of Farm 146), Klipgats Pan (Portion 4 of Farm

117) and Struisbult (Farm No. 104 Portion 1), which are adjacent to the project area. Even though MacDonald (2013) was conducted on adjacent properties, satellite imagery indicates similar vegetation on Graspan and this is considered to be the most relevant floristic data for the area.

MacDonald (2013) classified eight different vegetation communities on the farms Hoekplaas and Klipgats Pan, which are summarized as follows:

- Rhigozum trichotomum Shrubland: scattered throughout Klipgats Pan but concentrated in areas of fairly deep red sand; dominated by *R. trichotomum* and grasses such as *Stipagrostis* species; low botanical sensitivity. Highly likely to be present in the Graspan project area.
- Asteraceous Shrubland: the most widespread vegetation type at Klipgats Pan and highly likely to be present in the Graspan project area as well; has the greatest diversity of species, mainly low shrubs in the family Asteraceae, with lower diversity of grasses and other herbaceous species; occurs on shallow sandy-loam soils often with calcrete hardpan just below the surface; low botanical sensitivity.
- *Salsola* spp. – *Pentzia incana* Shrubland: low shrubland on red sands that forms an ecotone between Asteraceous Shrubland and *Rhigozum trichotomum* Shrubland; low species richness and dominated by one or two *Salsola* species and *Pentzia incana*; low botanical sensitivity. Very likely to be present in the Graspan project area as well.
- Leegte' Shrubland: found in shallow seasonal drainage lines at Klipgats Pan and Hoekplaas; vegetation dominated by grasses (e.g. *Setaria verticillata*) and low shrubs such as *Lycium* species (especially *L. bosciifolium*) and *Psilocaulon junceum*; merges with *Rhigozum trichotomum* Shrubland along some drainage lines; high botanical sensitivity. A large seasonal drainage line is present in the Graspan project area and this vegetation community is likely to be well-represented.
- *Psilocaulon junceum* – *Lycium* spp. Shrubland: characteristic of disturbed sites and often dominated by *Psilocaulon junceum* and *Lycium* species; also found around 'heuweltjies' where fossorial mammals disturb the soil; low botanical sensitivity. Possibly present in the Graspan project area.
- Shale Koppie Shrubland: typical vegetation community on elevated shale hills in the southern part of Klipgats Pan; open to mid-dense shrubland dominated by *Lycium* species, with a moderate to good cover of grasses, and other low shrubs and forbs including *Aptosimum* species, *Pentzia incana*, *Stipagrostis ciliata*, *Tribulus cristatus* and *Zygophyllum retrofractum*; scattered *Boscia albitrunca* trees and *Aloe claviflora* are diagnostic of this community; high botanical sensitivity. There don't appear to be any hills in the Graspan project area, so this vegetation community is probably not represented.
- *Psilocaulon junceum* – *Atriplex lindleyi* subsp. *inflata* Shrubland: similar to *Psilocaulon junceum* – *Lycium* spp. Shrubland but *Lycium* species shrubs are absent and the low shrub, *Atriplex lindleyi* subsp. *inflata*, is co-dominant with *P. junceum*; this community is characteristic of areas that have been intensely disturbed; very low botanical sensitivity. Possibly present in the Graspan project area.
- Endorheic Pans: these shallow pans fill briefly during periods of rainfall, but soon dry out; pans at Hoekplaas and Klipgats Pan are vegetated with grasses, forbs and patches of dwarf shrubs, a number of which are habitat specialists confined to this community; pan plant communities were not studied in detail but were recognized as a specific and important habitat; high botanical sensitivity. Several pans are present in the Graspan project area and this vegetation community is highly likely to be present.

### **Species of Conservation Concern**

The vast majority of the plant species occurring in the general vicinity of the project area are currently classified as either Least Concern (661 spp) or Not Evaluated (66 spp) (Appendix 1 of the specialist report). One species, *Listia minima*, is classified as Data Deficient (Taxonomically Problematic) and cannot be assessed until its taxonomy is resolved (Victor, 2006). Five species of conservation concern have been confirmed in the relevant QDGCs and are dealt with in more detail below.

### **Hoodia officinalis subsp. officinalis**

This species has been assessed as Near Threatened (NT B1ab(v)) by Victor & Powell (2009). It occurs sparsely in the Desert, Succulent Karoo and Nama Karoo biomes, from southern Namibia to the vicinity of Kimberley and Prieska in the Northern Cape. *Hoodia officinalis* is known from fewer than 15 locations in South Africa and is threatened by collecting when misidentified as the widely used *Hoodia gordonii*. Has a moderate likelihood of occurring in the project area.

### **Phyllobolus amabilis**

This small succulent is currently only known from one site near Prieska in the Northern Cape (Frisby, 2016), although Raimondo & Cholo (2005) state in error that the site is near Sutherland. Very little is known about this species, although it is known to occur in rocky habitat and no population declines have been documented. However, Raimondo & Cholo (2005) have assessed it as Rare as a result of a very small extent of occurrence. Has a low likelihood of occurring in the project area given that it is only known from one site and that rocky habitat is likely to be poorly represented.

### **Aloidendron dichotomum (Quiver Tree)**

This iconic tree aloe species occurs from the Brandberg in central Namibia to the Northern Cape between Nieuwoudtville and Olifantsfontein, and is confined to the Desert, Succulent Karoo and Nama Karoo biomes. It has been assessed by Foden (2005) as Vulnerable (VU A3ce) because of documented population declines and a modelled vulnerability to climate change. Has a low likelihood of occurring in the project area, especially since it seems to favour rocky hillsides in the Copperton area (pers.obs.), a habitat that doesn't appear to be present in the project area.

### **Dinteranthus pole-evansii**

This is an easily overlooked small succulent that occurs in sparsely vegetated quartz pebble fields. It is known from only two localities between Upington and Prieska and is considered to have a global population of less than 1000 plants, resulting in a classification of Vulnerable (VU D1+2) (Burgoyne & Daniels, 2005). Has a low likelihood of occurring in the project area given that it is only known from two sites in habitat that is unlikely to be well represented in the project area.

### **Tridentea virescens**

This is a fairly widespread small succulent that occurs in small, highly fragmented subpopulations in the Eastern, Western and Northern Cape provinces, mostly on stony ground, or hard loam in floodplains. It has been assessed as Rare by Victor (2009). Has a moderate likelihood of occurring in the project area.

### **Endemic Species**

The prospecting right area is situated at the southern boundary of the Griqualand West Centre of Plant Endemism as defined by Frisby (2016). Five of the 26 endemic or near-endemic GWCP species have been confirmed to occur in the general vicinity of the project area, namely *Calobota cuspidosa* (Fabaceae), *Justicia thymifolia* (Acanthaceae), *Phyllobolus amabilis* (Aizoaceae), *Putterlickia saxatilis* (Celastraceae) and *Searsia tridactyla* (Anacardiaceae). However, given the position of the project area at the edge of the GWCP, it is unlikely that a high proportion of the endemics are present.

### **Protected Species**

One hundred and forty-nine plant species occurring in the general vicinity of the project area are protected, either under Schedules 1 and 2 of the Northern Cape Nature Conservation Act (No. 9 of 2009) or under the National Environment Management: Biodiversity Act (No. 10 of 2004) - Threatened or Protected Species

regulations (updated in March 2015) (Appendix 1 of the specialist report). MacDonald (2013) confirmed the presence of two of these species on an adjacent property, namely *Boscia albitrunca* and *Aloe claviflora*.

### 8.1.9.3 Mammals

#### Regional Context

The project area is situated within the Namib-Karoo biome, which is confined to the arid western part of South Africa, the western third of Namibia and marginally into south-western Angola White (1983). Numerous small mammal species are endemic to this biome, of which the following have been confirmed to occur within the general vicinity of the project area (Friedman & Daly, 2004): Western Rock Sengi (*Elephantulus rupestris*), Round-eared Elephant Shrew (*Macroscelides proboscideus*), Spectacled Dormouse (*Graphiurus ocellatus*), Pygmy Rock Mouse (*Petromyscus collinus*), Brukkaros Pygmy Rock Mouse (*P. monticularis*), Bush Vlei Rat (*Otomys unisulcatus*), Brants's Whistling Rat (*Parotomys brantsii*) and Littledale's Whistling Rat (*P. littledalei*).

#### Species Richness

A list of 56 mammal species that have been recorded in the QDGCs surrounding the project area was compiled using Friedman & Daly (2004) and is presented in Appendix 4 of the specialist report. Twenty-two of these species were confirmed to occur on an adjacent property in 2017 (ECOREX, 2018), four of which are endemic or near-endemic to the Namib-Karoo biome, namely Cape Fox (*Vulpes chama*), Round-eared Sengi, South African Ground Squirrel (*Xerus inauris*) and Suricate (*Suricata suricatta*).

#### Species of Conservation Concern

Two Vulnerable and five Near Threatened mammal species have been recorded in QDSs in the vicinity of the project area according to distribution maps in Friedman & Daly (2004), three of which have a moderate likelihood of occurring, and one (Brown Hyaena *Parahyaena brunnea*) which was recorded on an adjacent property (ECOREX 2018) and thus has a high likelihood of occurring (Table 8-4).

**TABLE 8-4: MAMMAL SCC OCCURRING IN THE GENERAL VICINITY OF THE PROJECT AREA**

Common Name	Scientific Name	Conservation Status	Habitat Preferences	Likelihood of Occurrence	Reason
African Clawless Otter	<i>Aonyx capensis</i>	NT/VU *	Wide range of aquatic habitats, such as rivers, lakes or even man-made impoundments.	Very Low	No suitable habitat present in the project area
Southern African Hedgehog	<i>Atelerix frontalis</i>	NT	Wide range of grassland and savannah types.	Moderate	Suitable habitat is present throughout the project area.
Black-footed Cat	<i>Felis nigripes</i>	VU	Occurs in arid grassland and dwarf Karoo shrubland.	Moderate	Suitable habitat is present throughout the project area.
Spectacled Dormouse	<i>Graphiurus ocellatus</i>	NT	Associated with rock outcrops, crevices and stone kraals in the Western Cape and south-western Karoo.	Low	Limited suitable habitat present in the project area but no recent records in the general vicinity
African Leopard	<i>Panthera pardus</i>	NT	Occurs in a variety of savannah and shrubland habitats.	Low	Although suitable habitat is present throughout the project area, suitable prey sources are limited.
Brown Hyaena	<i>Parahyaena brunnea</i>	NT	Occurs in a variety of savannah and shrubland habitats.	High	A recently abandoned den was located on an adjacent property (ECOREX, 2018).

Littledale's Whistling Rat	<i>Parotomys littledalei</i>	NT	Occurs in arid shrublands, avoiding open areas.	Moderate	Suitable habitat is present throughout the project area.
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VU = Vulnerable

NT = Near Threatened

\* = IUCN status

#### 8.1.9.4 Birds

##### Regional Context

The project area is situated within the Namib-Karoo biome as defined by White (1983) and followed by Fishpool & Evans (2001). This biome is confined to the arid western part of South Africa, the western third of Namibia and extends marginally into south-western Angola. Twenty-three species are listed by Barnes (1998) as being endemic to the Namib-Karoo biome i.e. not occurring outside of the biome, of which 15 species (65%) have been recorded within the general vicinity of the project area during the current Southern African Bird Atlas Project (SABAP2) (Table 8-5). Two species that are endemic to the Kalahari-Highveld biome and one species that is endemic to the Zambezi biome have also been recorded in the same area (Table 8-5).

**TABLE 8-5: BIOME-RESTRICTED ENDEMIC SPECIES RECORDED FROM THE VICINITY OF THE PROJECT AREA \***

COMMON NAME	SCIENTIFIC NAME	NAMIB - KAROO	KALAHARI-HIGHVELD	ZAMBEZIAN
Black-eared Sparrowlark	<i>Eremopterix australis</i>	43.52		
Black-headed Canary	<i>Serinus alario</i>	3.76		
Kalahari Scrub-robin	<i>Cercotrichas paena</i>		53.36	
Karoo Chat	<i>Cercomela schlegelii</i>	12.69		
Karoo Eremomela	<i>Eremomela gregalis</i>	2.12		
Karoo Korhaan	<i>Eupodotis vigorsii</i>	71.99		
Karoo Long-billed Lark	<i>Certhilauda subcoronata</i>	21.86		
Layard's Tit-babbler	<i>Parisoma layardi</i>	3.32		
Ludwig's Bustard	<i>Neotis ludwigii</i>	57.41		
Namaqua Warbler	<i>Phragmacia substriata</i>	0.74		
Pale-winged Starling	<i>Onychognathus nabouroup</i>	16.97		
Red Lark	<i>Calendulauda burra</i>	0.79		
Sclater's Lark	<i>Spizocorys sclateri</i>	20.19		
Sickle-winged Chat	<i>Cercomela sinuata</i>	7.6		
Sociable Weaver	<i>Philetairus socius</i>		55.89	
Stark's Lark	<i>Spizocorys starki</i>	43.97		
Tractrac Chat	<i>Cercomela tractrac</i>	30.76		
White-bellied Sunbird	<i>Cinnyris talatala</i>			1.23

\* Figures represent SABAP2 mean reporting rates for relevant pentads at date of download (23/07/2019)

The project area is also situated in a designated secondary Endemic Bird Area, namely the Karoo EBA (s047) (Barnes et al., 2001).



There are no Important Bird Areas within the vicinity of the project area, the closest being the Platberg-Karoo Conservancy IBA (ZA037), approximately 130 km to the east (Barnes, 1998).

### **Species Richness**

Data from the ongoing second Southern African Bird Atlas Project (SABAP2) indicate that 99 species have been recorded from the five pentads (mapping units) relevant to the project area (Appendix 5 of the specialist report). A pentad measures approximately 77 km<sup>2</sup>, and is a reasonable scale for predicting which species are likely to occur in the project area. One of these pentads (2955\_2205) has not yet been surveyed during SABAP2, and two of the other pentads (2955\_2210, 3000\_2210) have only been surveyed once, indicating the project area has been inadequately sampled during SABAP2. True species richness is likely to be higher than 99 species.

Fieldwork on an adjacent property recorded 72 species, which occurred in three distinct avifaunal assemblages present, namely a Shrubland assemblage, Woodland / Thicket assemblage and a modified Garden assemblage (ECOREX, 2018). While the Garden assemblage is unlikely to be present in the project area, and additional assemblage is likely to be present when the ephemeral pans are filled.

### **Species of Conservation Concern**

One Endangered (EN), one Vulnerable (VU) and four Near Threatened (NT) species have been recorded from the pentads within which the project area is situated during SABAP2 (Table 8-6). However, the project area has been poorly sampled during SABAP2 and this may not be an accurate indication of potentially occurring SCC in the project area. Adjacent pentads that have been more thoroughly sampled have recorded an additional Critically Endangered (CR) species, four more EN species, four other VU species and one other NT species. These species have also been included in Table 8-6.

Six of these species have a high likelihood of occurring in the project area, based on known habitat requirements of these species and confirmed records on adjacent properties. These are Ludwig's Bustard *Neotis ludwigii* (EN), Martial Eagle *Polemaetus bellicosus* (EN), Double-banded Courser *Rhinoptilus africanus* (NT), Kori Bustard *Ardeotis kori* (NT), Karoo Korhaan *Eupodotis vigorsii* (NT) and Sclater's Lark *Spizocorys sclateri* (NT). Another three species have a moderate likelihood of occurring because of the presence of suitable habitat in the project area, namely Black Harrier *Circus maurus* (EN), Secretarybird *Sagittarius serpentarius* (VU) and Lanner Falcon *Falco biarmicus* (VU). The moderate to high likelihood of nine avifauna SCC occurring in the project area indicates the high value of natural habitat in the area for such species.

**TABLE 8-6: AVIFAUNA SCC OCCURRING IN THE GENERAL VICINITY OF THE PROJECT AREA**

<b>COMMON NAME</b>	<b>SCIENTIFIC NAME</b>	<b>CONSERVATION STATUS</b>	<b>HABITAT PREFERENCES</b>	<b>LIKELIHOOD OF OCCURRENCE</b>	<b>REASON</b>
Verreaux's Eagle	<i>Aquila verreauxii</i>	VU	Associated with mountains, cliffs and rocky ridges in grassland and shrubland habitat	Low	Limited suitable habitat present.
Kori Bustard	<i>Ardeotis kori</i>	NT	Occurs in arid grassland, open shrubland and open savannah.	High	Suitable habitat present; recorded from one of the relevant pentads
Red Lark	<i>Calendulauda burra</i>	VU	Endemic to Karoo, preferring sand dunes and alluvial plains, particularly where tussock-grasses are prominent.	Low	Limited suitable habitat present.
Black Harrier	<i>Circus maurus</i>	EN	Grassland, karroid shrubland, coastal scrub	Moderate	Suitable habitat present, although not recorded from relevant pentads

Burchell's Courser	<i>Cursorius rufus</i>	VU	Open short-grass plains, sparse shrubland, sand or gravel desert, salt pans	Low	Limited suitable habitat present and not recorded from any relevant pentads
Karoo Korhaan	<i>Eupodotis vigorsii</i>	NT	Occurs in arid grassland and shrubland.	High	Suitable habitat present; recorded from 2 relevant pentads, as well as an adjacent property
Lanner Falcon	<i>Falco biarmicus</i>	VU	Wide variety of habitat types.	Moderate	Suitable habitat present, although not recorded from relevant pentads
White-backed Vulture	<i>Gyps africanus</i>	CR	Variety of savannah / woodland types, arid shrubland	Low	Limited suitable habitat present and not recorded from any relevant pentads
Cape Vulture	<i>Gyps coprotheres</i>	EN	Arid shrubland, grassland, arid savannah; breeding on large cliffs	Low	Limited suitable habitat present and not recorded from any relevant pentads
Ludwig's Bustard	<i>Neotis ludwigii</i>	EN	Arid shrubland, arid grassland	High	Suitable habitat present; recorded from one relevant pentad, as well as an adjacent property
Martial Eagle	<i>Polemaetus bellicosus</i>	EN	Wide variety of woodland, savannah and shrubland types.	High	Suitable habitat present; recorded breeding on a nearby property (Jenkins, 2011)
Double-banded Courser	<i>Rhinoptilus africanus</i>	NT	Sparse shrubland, arid grassland	High	Suitable habitat present; recorded from one relevant pentad, as well as an adjacent property
Sclater's Lark	<i>Spizocorys sclateri</i>	NT	Sparse shrubland on arid, stony plains; often in areas with very little vegetation	High	Suitable habitat present; recorded from all the pentads in which the project area is located
Secretarybird	<i>Sagittarius serpentarius</i>	VU	Various grassland and open savannah types	Moderate	Suitable habitat present, although not recorded from relevant pentads
Lappet-faced Vulture	<i>Torgos tracheliotus</i>	EN	Variety of savannah / woodland types, arid shrubland	Low	Limited suitable habitat present and not recorded from any relevant pentads

CR = Critically Endangered

EN = Endangered

VU = Vulnerable

NT = Near Threatened

\* = IUCN classification

### 8.1.10 WATER SOURCES

The study area falls within the Orange (D) Primary catchment, the D5 Secondary catchment and the Lower Orange DWS Water Management Area. It falls within the D54G and D54D quaternary catchments. The watershed associated with the survey area drains toward the Basterput se Leegte River within the adjacent catchment, which drains northwards into the Hartbees River, which then confluences with the Orange River near the town of Kakamas.

Pans that are found within the study area are typically endorheic (inward draining) salt pans (also called “vloere”). The pan bottoms are usually formed by shales of the Ecca group (Mokgope, 2016). Several non-perennial rivers traverse the surface area. (Appendix B, Map 2).

### 8.1.11 AIR QUALITY

There are no ambient air quality monitoring stations near Copperton. The ambient air quality in the area is however expected to be within the acceptable range of all the pollutants specified in the National Ambient Air Quality Standards, Government Notice 1210, promulgated in terms of the National Environmental Management: Air Quality Act 39 of 2004. This is attributed to the remoteness of the site and the absence of any significant atmospheric emission sources in the region.

Existing sources of emissions to the local airshed are expected to be from the following activities:

- Dust entrainment from vehicles using unsurfaced roads and tracks;
- Ammunitions testing and associated activities at the Alkantpan Test Range;
- Burning of biomass; and
- Windblown dust and particulate emissions from exposed areas.

At a regional scale, the PKSD SDF (2013- 2018) also identifies overgrazing and poor farming management systems as contributing factors to dust pollution. Environmental Noise

In general, the area can be described as quiet, with very few sources of noise nuisance or disturbing noise.

Noise sensitive receptors generally include places of residence and areas where members of the public may be affected by noise generated by prospecting and transport activities. Office workers and employees, and any on-site accommodation structures may also be affected.

Existing noise sources in the study area include agricultural machinery and equipment, vehicular traffic from public and secondary gravel roads. Noise from explosions from activities at the Alkantpan Test Range also contribute to the noise profile of the area.

#### 8.1.11.1 *Environmental Noise Propagation and Attenuation Potential*

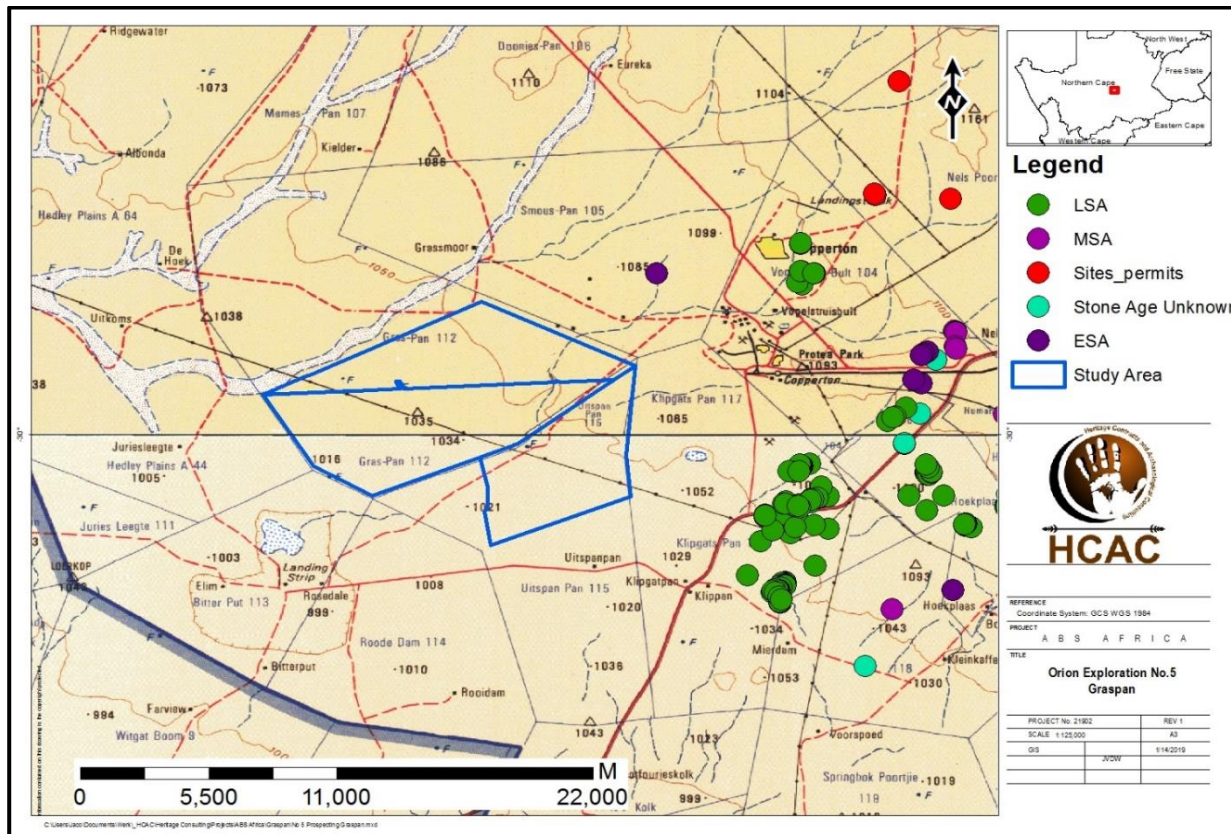
Site conditions which may influence noise propagation and attenuation potential include the following:

- At wind speeds of more than 5 m/s, ambient noise levels are mostly dominated by wind generated noise;
- There are no natural terrain features between potential sources of noise and the closest noise sensitive receptors that would provide acoustic shielding; and
- Based on observations made during the visit to site, ground cover is acoustically hard, that is, not conducive to noise attenuation.

### 8.1.12 HERITAGE AND ARCHAEOLOGY

Heritage Contracts and Archaeological Consulting CC (HCAC) has undertaken a desktop scoping study to inform the section below. The full report is attached as Appendix D.

According to SAHRIS, several heritage studies were conducted in the greater study area (Van Ryneveld (2006); Orton (2011 & 2015), Orton & Webley (2013a & b), Kaplan and Wiltshire (2011). All the studies recorded ESA, MSA and LSA artefacts scattered over the landscape with MSA and LSA sites centred on pans and watercourses. Studies by Van der Walt (2012, 2013, 2017) concurred with these findings and also recorded widespread Stone Age scatters and some discreet MSA and LSA sites. Although the current area under investigation does not seem to have been covered by heritage surveys the wealth of recorded sites to the south and southwest of the area (Figure 8-2) indicates that a similar high frequency of sites can be expected in the study area. An Early Stone Age site occurred in the study area but was mitigated and subsequently destroyed.



**FIGURE 8-2: ARCHAEOLOGICAL SITES RECORDED IN RELATION TO THE STUDY AREA.**

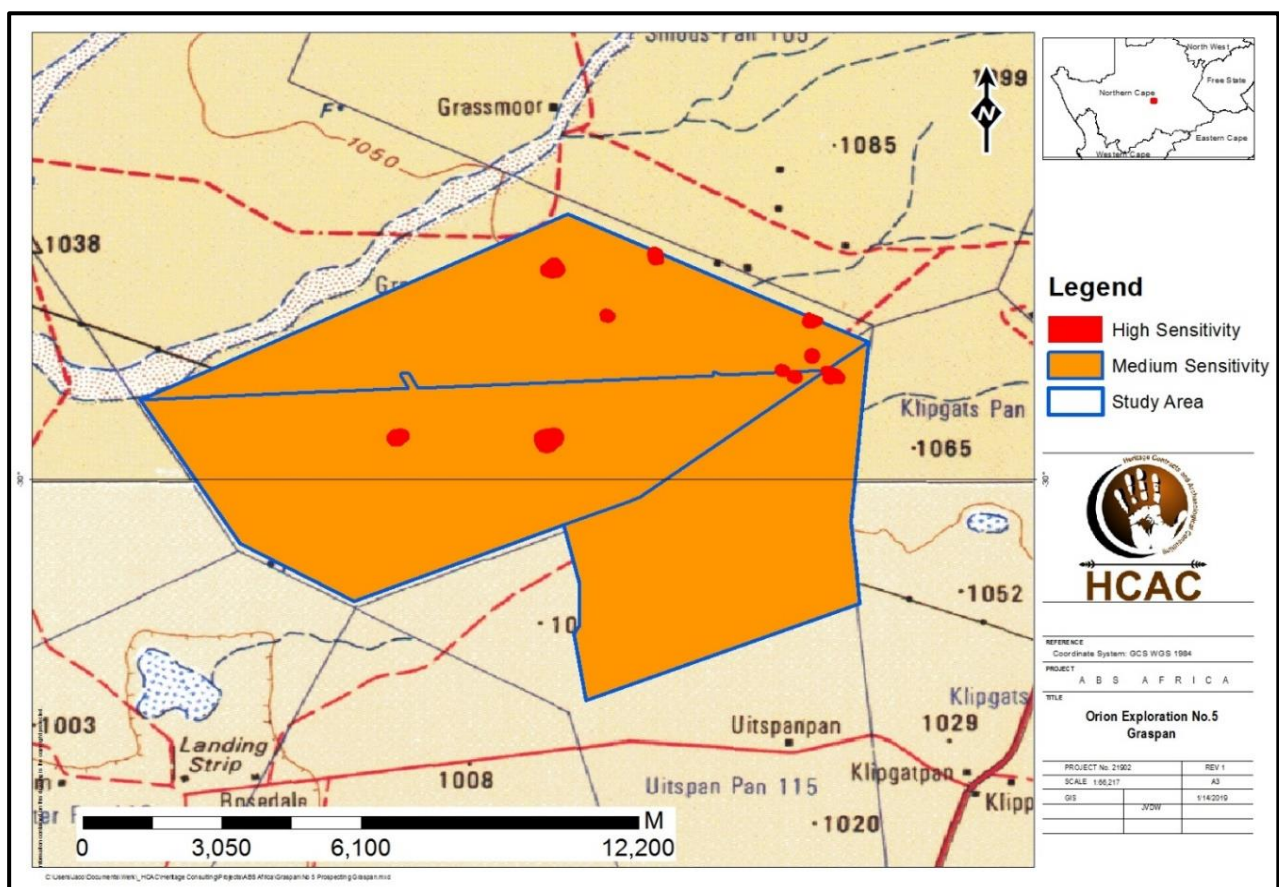
Beaumont *et al.* (1995: 240) observed that “thousands of square kilometres of Bushmanland are covered by a low-density lithic scatter”. These artefacts are generally very well weathered and mostly pertain to the ESA and MSA. Occasional LSA artefacts are also noted. What is noteworthy of the Northern Cape archaeological record is the presence of pans which frequently display associated archaeological material. Of interest, is the work of Kiberd (2001, 2005, 2006) who excavated Bundu Pan, some 25 to 30 km northwest of Copperton. The site yielded ESA, MSA and LSA horizons and the artefacts were accompanied by warthog and equid teeth to name a few (Beaumont *et al.* 1995).

Orton (2011) noted that to the northwest, west and southwest of Copperton sites have been investigated by Beaumont and colleagues (1995), Smith (1995) and Parsons (2003, 2004, 2007, 2008) yielding LSA deposits. Work on these sites led to a distinction between hunter-gatherer and herder sites, based on stone artefact assemblages (Beaumont *et al.* 1995). All these Later Stone Age sites have very few, if any, organic items on them. The only organic material found on sites like these is fragments of ostrich eggshell probably belonging to broken water containers. Such flasks have been widely recorded across the Northern Cape (Morris 1994).

The archaeological importance of pans in the area are now well documented (Kiberd 2006, Kaplan & Wiltshire 2011, Orton 2012) and if any occur in the study area they could be of significance. Van der Walt (2012) recorded low densities of ESA, MSA and LSA scatters and these occurrences were given a field rating of low archaeological significance. However, several discrete MSA and LSA sites were also documented.

Most of the material expected for the study area is MSA in nature consisting of large flakes, radial and bipolar cores, points, end scrapers, large utilized and retouched blade tools, and utilized and retouched flakes.

Based on previous studies conducted the area has a wealth of heritage sites and a cultural layering dating back to the Stone Age with scatters and sites dating to the ESA, MSA and LSA. Sites and artefacts dating to these periods are scattered over the landscape with MSA and LSA sites centred on pans and watercourses. Due to the importance of water sources on the landscape that attracted human activity in antiquity, this was used as the main criteria for generating a four-tier sensitivity map of the study area (Figure 8-3).



**FIGURE 8-3: HERITAGE SENSITIVITY MAP**

### 8.1.12.1 Paleontology

The oldest rocks in the area are those of the Keimos Suite and they are a group of syn- to post-tectonic granitoids that have intruded into the igneous and metamorphic rocks of the Namaqua-Natal Province. There are also outcrops of the quartzites of the Uitdraai Formation and the Dagbreek Formation. The rocks of the Prieska Copper Mine are known as the Copperton Volcanic Centre (Cornell *et al.*, 2006) and include the Copperton Formation, the Kielder Formation, topped by the Dagbreek Formation.

## **Palaeontological context**

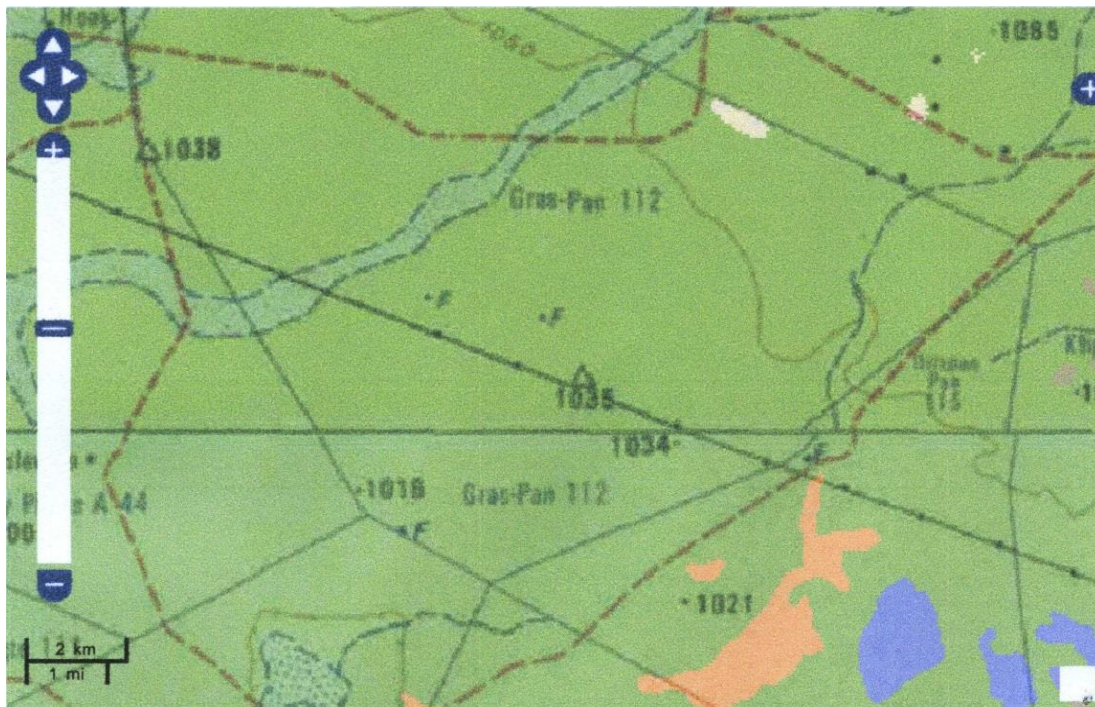
The palaeontological sensitivity of the area under consideration is presented in Figure 8-4. The proposed site is in the Dwyka Group tillites, sandstone, mudstone and shales, and these potentially could preserve fossils. Around 300-290 Ma the climate in southern Africa was still relatively cool, but there were well developed Carboniferous floras in the northern hemisphere. In South Africa, however, much of the land surface was covered by ice sheets. As they melted, they dropped the moraine trapped in the ice, together with limited plant matter from the vegetation that gradually recovered and colonised the land surface.

Terrestrial vertebrates had not evolved at this time. The late Carboniferous flora comprised *Glossopteris* leaves and seeds, wood, and other plants such as lycopods, sphenophytes and ferns.

The Dwyka Group is made up of seven facies that were deposited in a marine basin under differing environmental settings of glacial formation and retreat (Visser, 1986, 1989; Johnson *et al.*, 2006). In the north these are called the Mbizane Formation, and the Elandsvlei Formation in the south. Described below are the seven facies (Johnson *et al.*, 2006 p463-465):

- The massive diamictite facies comprises highly compacted diamictite that is clast-poor in the north. It was deposited in subaqueous or subglacial positions.
- The stratified diamictite comprises alternating diamictite, mudrock, sandstone and conglomerate beds. They are interpreted as being rapidly deposited, sediment gravity flows but with some possible reworking of the subglacial diamictites.
- The massive carbonate-rich diamictite facies is clast-poor and was formed by the rainout of debris, with the carbonate probably originating by crystallisation from interstitial waters.
- The conglomerate facies ranges from single layer boulder beds to poorly sorted pebble and granule conglomerates. The boulder beds are interpreted as lodgement deposits whereas the poorly sorted conglomerates are a product of water-reworking of diamicton by high-density sediment gravity flows.
- The sandstone facies were formed as turbidite deposits.
- The mudrock with stones facies represents rainout deposits in the distal iceberg zone.
- The mudrock facies consists of dark-coloured, commonly carbonaceous mudstone, shale or silty rhythmite that was formed when the mud or silt in suspension settled. This is the only fossiliferous facies of the Dwyka Group.

The Dwyka *Glossopteris* flora outcrops are very sporadic and rare. Of the seven facies that have been recognised in the Dwyka Group fossil plant fragments have only been recognised from the mudrock facies. They have been recorded from around Douglas only (Johnson *et al.*, 2006; Anderson and McLachlan 1976) although the Dwyka Group exposures are very extensive. Jurassic Dolerites do not contain fossils as they are igneous intrusions.



**FIGURE 8-4: SAHRIS PALAEOSENSITIVITY MAPS FOR THE PROPOSED PROSPECTING RIGHT**

*Degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.*

From the SAHRIS map above, the area is indicated as moderately sensitive (green; Figure 8-4) and an associated desktop assessment by Prof. Marion Bamford was thus undertaken to inform this palaeontological study. No fossils have been reported from the Copperton area but there is a very small chance that fossil plant fragments could occur in the prospecting area, but relatively close to the surface because the underlying strata, that are the target of the project, are too old for fossils. Fossils are not likely to be seen on the land surface because of extensive weathering and previous farming or mining activities.

### 8.1.12.2 Findings

#### ARCHAEOLOGICAL FINDS

Based on CRM studies conducted in the area ESA, MSA and LSA scatters as well as distinct sites can be expected. No Impacts to heritage resources is envisaged during the non-invasive prospecting activities but invasive activities can alter/ destroy heritage resources. Mitigation measures have been included in the EMP.

#### HISTORICAL FINDS

Historical finds include middens, structural remains and the cultural landscape. Impacts to heritage resources will occur primarily during invasive activities and no impacts are expected during the initial non-invasive activities.

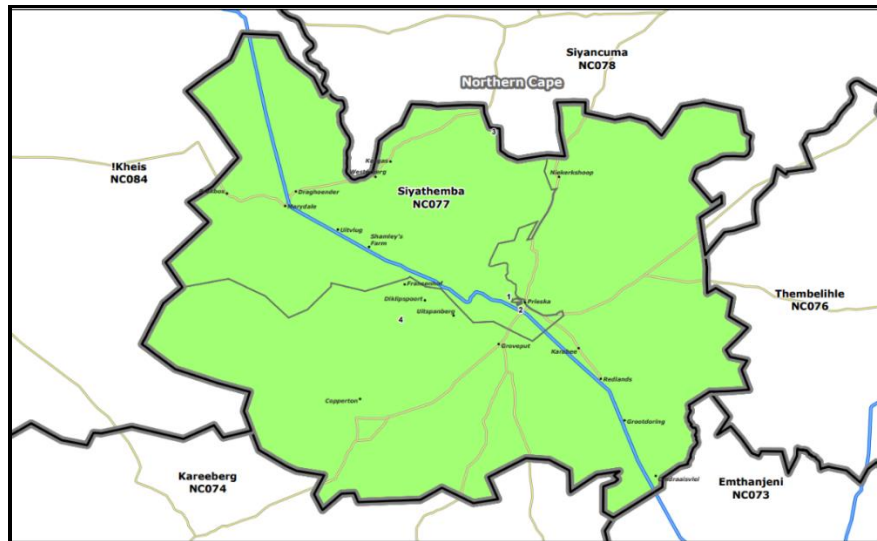
#### BURIALS AND CEMETERIES

There are no graves on record for the study area but graves and informal cemeteries can be expected anywhere on the landscape.

## 8.1.13 SOCIO-ECONOMIC ENVIRONMENT<sup>1</sup>

### 8.1.13.1 Siyathemba Local Municipality

The proposed prospecting right area is located within Ward 4 of the Siyathemba Local Municipality (SLM), which is managed by the Pixley Ka Seme District Municipality, within the Northern Cape Province of South Africa. The towns of Brakbos, Brulpoort, Draghoender, Koegas, Marydale, Niekerkshoop, Prieska, Shamley's Farm, Uitvlug, and Westerberg fall within the boundaries of the SLM (Figure 8-5).



**FIGURE 8-5: GEOGRAPHICAL BOUNDARY OF THE SLM**

SLM was established in 2001 and is a category B municipality. It is located within the central easterly parts of the Northern Cape Province along the Orange River. It is approximately 220 km away from the nearest business center of Kimberley. The surface area of the municipality is approximately 8 200 km<sup>2</sup>, accounting for 8% of the total district surface area and approximately 3% of the provincial area. A summary of the key statistics of the municipality is provided in Table 8-7.

### 8.1.13.2 Spatial and Regional Development Planning

There are currently two spatial development frameworks of relevance to the study area, namely the Northern Cape Provincial Spatial Development Framework (2012) and the PKSD SDF (2013-2018). No specific development planning guidelines or objectives have been defined by the SLM for Copperton or the proposed prospecting right area.

The Northern Cape Provincial Spatial Development Framework (2012) identifies several development regions and corridors based on location and type of natural resources (soil potential, availability of water, minerals, etc.) and built infrastructure (roads, bulk engineering infrastructure, electricity) Figure 8-6.

In addition, the Northern Cape Provincial Spatial Development Framework (2012) provides a composite spatial plan for the province, based on six spatial planning categories, namely:

- Core (statutory protected areas);
- Buffer (non-statutory protected areas and other ecological areas);
- Agricultural areas;

<sup>1</sup> There is a general lack of recent published demographic and other socio-economic data for the SLM. Except where noted, the information in this section has been summarised from Statistics South Africa Census Data (2011) and the SLM Local Economic Development Strategy (2012)



- Urban related;
- Industrial areas; and
- Surface infrastructure and buildings.

The proposed prospecting right area is situated within the Agriculture spatial planning category, outside of the high potential agricultural land spatial designation. The implementation guidelines make provision for the re-zoning of low-potential agricultural land for non-agricultural development.

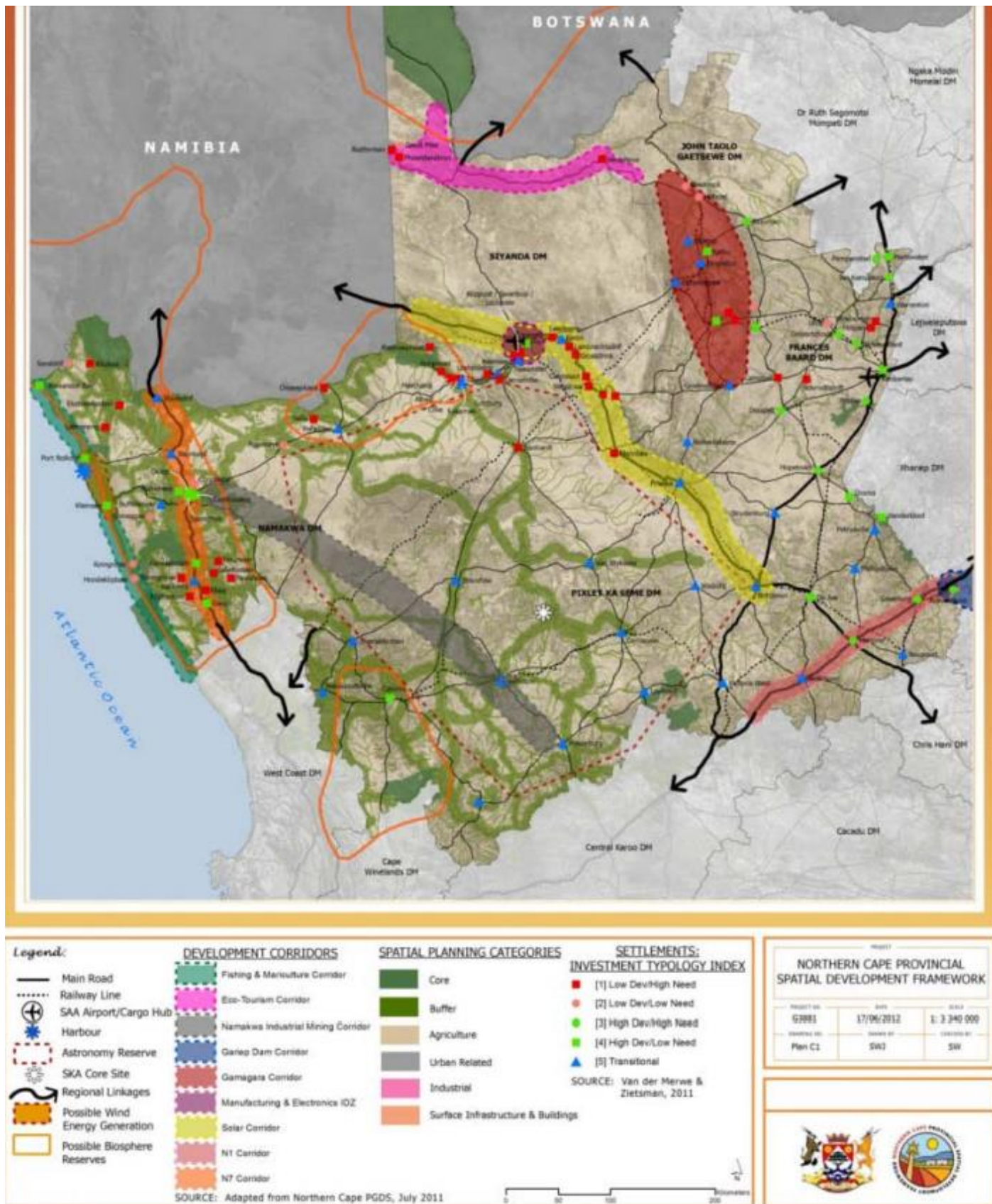


FIGURE 8-6: NORTHERN CAPE COMPOSITE SPATIAL PLAN

Source: Northern Cape Provincial Spatial Development Framework (2011)

The PKSD SDF (2013-2018) adopts the development corridors and spatial development categories referenced in the Northern Cape Provincial Spatial Development Framework (2012).

The PKSD SDF (2013-2018) proposes a Renewable Energy Hub extending from De Aar through Upington and is described as a corridor 100 km in width, 50 km either side of the Orange River. According to the SDF, the purpose of the Renewable Energy Hub is to attract foreign direct investment into solar, wind, hydro and biomass projects. No spatial planning guidelines or policies for development within the Renewable Energy Hub are provided within the PKSD SDF (2013-2018). The SLM IDP (2017-2018) does not provide any reference to the Renewable Energy Hub.

The proposed Upington Special Economic Zone (SEZ) is situated north of Upington on an area of land approximately 440 ha in extent. The purpose of the SEZ is to attract investment to the broader Upington region, with a focus on key sectors, namely solar energy, aeronautics, agro-processing, mining, defence technology, astronomy, and microtechnology<sup>2</sup>. The Upington SEZ is awaiting declaration in terms of the Special Economic Zones Act 16 of 2014.

The nearest boundary of the proposed prospecting right area is approximately 8 km from the western boundary of the spatially designated Renewable Energy Hub. The Upington SEZ is approximately 140 km north of the proposed prospecting right area.

### 8.1.13.3 Population

There are approximately 22 000 people residing in the municipality. This represents approximately 1.9% of the total population in the Northern Cape. The population of Siyathemba contracted by 0.4% on average per annum between 2000 and 2010. The decline of the Siyathemba population was mainly driven by lower fertility rates.

The death rate (the number of deaths per 1,000 people in a year) increased from 11.2 deaths per 1,000 people in 1995 to 11.6 during 2010.

This is significantly lower than the death rates recorded over the same period for the Northern Cape and South Africa. The reason for the lower death rate in the study area was mainly the result of lower HIV/AIDS prevalence rates when compared with South African averages.

The most dominant population group in the SLM are Coloured individuals, who represent more than 75% of the total population in the municipal area. Black African and White population groups comprise around 12% and 8% of the population respectively. The dominant languages in the SLM are Xhosa and Afrikaans. Afrikaans is the most widely spoken language (78%).

**TABLE 8-7: KEY STATISTICS OF SIYATHEMBA LOCAL MUNICIPALITY**

KEY STATISTICS	NUMERICAL VALUE
Total population	21,591
Young (0-14)	30,8%
Working age	63,2%
Elderly (65+)	6%
Dependency Ratio	58,2%
Gender Ratio	99,3%
Growth Rate	1.57% (2001 - 2011)
Population density	1 person/km <sup>2</sup>
Unemployment rate	24.3%

<sup>2</sup> <https://www.upington-sez.co.za/pages/investment-opportunities>

Youth unemployment rate	30.2%
No schooling aged 20+	11.5%
Higher education aged 20+	5.3%
Matric aged 20+	18%
Number of Households	5.831%
Number of Agricultural Households	1.334%
Average Household size (person)	3.6
Female headed households	36.1%
Formal dwellings	88.6%
Housing owned/paying off	54.3%
Flush toilet connected to sewerage	64.9%
Weekly refuse removal	73.9%
Piped water inside dwelling	43.1%
Electricity for lighting	86.2%

Source: Statistics South Africa (2011)

#### 8.1.13.4 Educational Facilities and Education

There is a total of 10 schools (3 combined, 6 primary and 1 secondary) within the SLM (SLM IDP 2017-2018).

4.2% of the municipal population has not attended any type of a schooling system, while 48.5% have primary school education. A little over 1700 individuals (4%) have graduated from a University / Technikon.

In Siyathemba, around 14% of adults have a matric certificate compared to 24.7% in the Northern Cape. The percentage of the population with a tertiary education in Siyathemba (5.1%) is also lower than that for the Northern Cape (7.3%).

#### 8.1.13.5 Access to Water, Sewage and Solid Waste Services

SLM is the Water Services Authority (WSA) and Water Services Provider (WSP) for the 3 towns within their area of authority. Piped water is accessed by about 98% of the SLM population and about 90% of the municipal population have access to flush toilets<sup>3</sup>.

Siyathemba has three water supply schemes. For PCM, water is provided from the Water Treatment Works in Prieska. Water abstraction is from the Orange River. Waterborne sanitation is only available in the urban areas of Prieska.

About 75% of the population have access to a weekly refuse collection service<sup>4</sup>. There is an existing licensed waste disposal site in Prieska. This facility is a G:C:B<sup>1</sup> licensed facility and can only accept general waste. According to the SLM IDP (2017-2018), the site has a remaining airspace of 20 years. SLM has indicated that the site is not well managed at present due to financial and personnel constraints<sup>6</sup>. A new incinerator is proposed to be installed at the facility, the timing of which is unclear.

#### 8.1.13.6 Housing

Within the Pixley Ka Seme District Municipality, 87.2% of households live in formal units, while 12.8% are found in informal housing units.

<sup>3</sup> SLM Water Services Development Plan, 2017

<sup>4</sup> SLM IDP (2017-2018)

A variety of residential components are available within the municipal boundaries. More than 81% of household dwellings found in Siyathemba can be classified as houses or brick structures on separate stands. The average for the Northern Cape is 77.4%. Some 8.6% of local dwellings can be described as shacks.

The average household size in the larger Pixley Ka Seme District Municipality is about 3.7, female headed households is about 36.90%, formal dwellings at 86.30% and the housing owned is at 52.00%.

#### **8.1.13.7 Public Safety and Security**

There are three police stations within the SLM, situated in Marydale, Niekerkshoop, and Prieska respectively. There is no municipal fire-fighting capability in the SLM and no disaster manager plan for the municipality.

#### **8.1.13.8 Community Health and Health Facilities**

There is a total of 4 health facilities within the SLM, namely Niekerkshoop Clinic, E'Thembeni Clinic, Marydale PHCC, and Prieska Clinic.

The 2010 HIV/AIDS prevalence rate of the Siyathemba population was 6%. This is lower than the prevalence rates in the Northern Cape (8%) and South Africa (13%). However, since 2000, the number of people living with HIV/AIDS in the Siyathemba municipal area more than doubled from about 400 to just over 1,200 people in 2010. The prevalence rate is expanding faster in Siyathemba (at 11% p.a.) when compared with South Africa (at 6% on average p.a. since 2000).

SLM manages 3 cemeteries in Prieska, and 2 cemeteries in Niekerkshoop and Marydale. Expansion of the cemeteries in each of these towns is planned.

#### **8.1.13.9 Electricity and Energy**

Around 86% of household dwellings found in Siyathemba have access to electricity. This indicator is on par with the provincial average.

Between 2006 and 2011, there was a general increase in the use of electricity as a primary source of energy. This is due to local electrical infrastructure improvements across the province (SLM IDP, 2016).

As shown in the graph below, the majority of the population have access to electricity, which is used primarily for cooking, heating and lighting. The proportion of households within the municipality that use electricity for lighting has increased from 57% in 1996 to approximately 84% in 2011.

Although relatively expensive, paraffin and gas are used for cooking and heating in some places. Households using electricity as a source of energy for cooking increased from 48% in 1993 to 74% in 2011.

#### **8.1.13.10 Employment<sup>5</sup>**

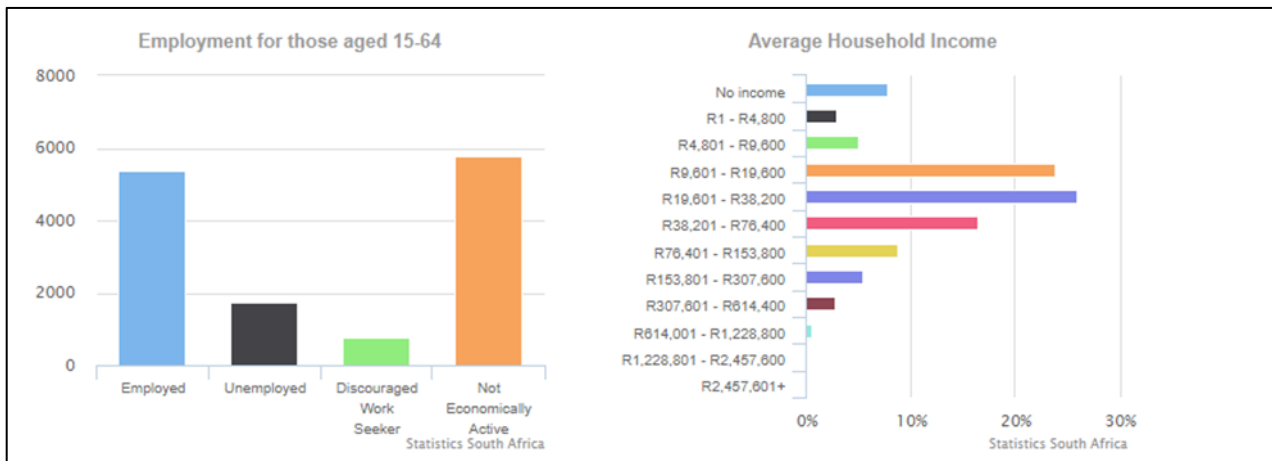
Between 2001 and 2011, there has been a decrease in the number of people employed and a concomitant increase in the number of unemployed people across the Pixley Ka Seme District Municipality.

For Siyathemba, 5 787 individuals remain as being economically inactive, while 5 370 are employed. The unemployment rate in SLM in 2011 was 24.3%.

The average household income is approximately R9 000 – R19 500. Obtaining any form of income generating employment within the municipality has become increasingly difficult in recent years. This is attributed to the lack of education, resulting in the uneducated experiencing the highest incidences of poverty.

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<sup>5</sup> SLM IDP (2017-2018)



Source: Statistics South Africa (2011)

**FIGURE 8-7: SUMMARY OF EMPLOYMENT AND INCOME IN SLM**

### 8.1.13.11 Labour

The labour participation rate across the Pixley Ka Seme District Municipality is 50%. The labour dependency ratio for Siyathemba is estimated at 2 (An additional two persons are supported by every person in the labour force).

Other significant labour ratio statistics for SLM are provided in Table 8-8.

**TABLE 8-8: LABOUR RATIOS FOR SLM**

LABOUR PARTICIPATION RATE	LABOUR DEPENDENCY RATIO	LABOUR YOUTH DEPENDENCY RATIO	LABOUR AGED DEPENDENCY RATIO
48	2	0.4	84

Source: SLM IDP (2017-2018)

### 8.1.13.12 Economy

The SLM Local Economic Development (LED) Vision is “Ensuring long term economic sustainability through local value addition and social upliftment, as well as integrated community development. We strive towards an economy owned by local people.”

The SLM IDP (2017-2018) identifies the following economic opportunities:

- IDP Infrastructure Projects;
- Renewable energy development opportunities for SMMEs and entrepreneurs;
- Gateway to SKA opportunities;
- New mining development opportunities;
- Tigers Eye beneficiation Plant; and
- Secondary industry opportunities;
- Aquaculture – Fish farming;
- Agro processing (Value Adding of agricultural produce);
- Enterprise Development;
- Tourism Development;

- Eradicate former Economic (racial) Buffer Zones;
- Casino near Prieska;
- Infrastructure Development;
- Housing Development and invention of Architectural Designing opportunities;
- Water Bottling Plant Development;
- Expansion of Municipal Services;
- Increase Municipal revenue;
- Pecan nuts on a 7Ha of Land;
- Cotton Gin Development;
- Hydroponics Development;
- Crop Farming;
- Aloe-vera Development;
- AGAAF Development;
- Leather Tannery and
- Disaster Management.

The SLM IDP (2018-2019) also recognizes untapped mining development and value-adding as a development opportunity within the municipality.

#### **8.1.14 ENVIRONMENTAL AND CURRENT LAND USE MAP**

Please refer to Appendix B (Map 4).

#### **8.1.15 DESCRIPTION OF THE CURRENT LAND USES**

The dominant land use within the proposed prospecting right area is grazing for small livestock.

Current land uses within the boundary of the proposed prospecting right area are as follows:

- The majority of the prospecting right area is within the boundary of the Alkantpan Test Range;
- Secondary road;
- Non-perennial rivers and wetlands;
- Windmills and agricultural infrastructure;
- Grazing of livestock, mainly sheep;
- Game farms; and
- Farmsteads and access roads.

#### **8.1.16 ADJACENT LAND USE**

- Alkantpan Test Range;
- Grazing of livestock, mainly sheep;
- Game farms;
- Non-perennial rivers and wetlands;
- Overhead transmission line infrastructure;

- Windmills and agricultural infrastructure; and .

Other land uses within 10 km of the proposed prospecting right area include:

- The proposed Alkantpan landing strip;
- Non-perennial rivers and wetlands;
- Road to Copperton and Alkantpan from the R357;
- Various structures and infrastructure associated with the historical PCM; and
- Residential town of Copperton.

There are several operational and proposed renewable energy developments to the east of the proposed prospecting right area (Appendix B, Map 4). The nearest renewable energy development is the Mulilo Prieska PV 75 MW solar PV facility, situated approximately 5 km from the eastern boundary of the proposed prospecting right area.

## 8.2 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE

### 8.2.1 SURFACE WATER FEATURES AND WETLANDS

#### 8.2.1.1 *Wetlands and Pans*

The region has an arid climate and therefore persistent surface water ecosystems are rare. Poorly-developed watercourses are commonplace, but defined channels are rare due to the generally low volumes of rainfall events. Most watercourses are barely perceptible and convey small volumes of water only during rainfall events.

In addition to the non-perennial watercourses, there are several wetlands (endorheic pans) present within the proposed prospecting right area.

The location of watercourses and the applicable buffers, namely 100 m for non-perennial rivers and 500 m for wetlands (pans) are shown in the environmental sensitivity map (Appendix B, Map 2).

#### 8.2.2 PROTECTED AREAS (PA)

The objective of the National Environmental Management: Protective Areas Act (Act No. 57 of 2003) is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascape.

There are no protected areas in close proximity (within 10 km) of the proposed prospecting right area. The nearest protected area is the Witsand Provincial Nature Reserve, located approximately 165 km to the north of the boundary (Appendix B, Map 3).

#### 8.2.3 CRITICAL BIODIVERSITY AREA (CBA) AND ECOLOGICAL SUPPORT AREA (ESA)

Critical Biodiversity Areas (CBAs) are defined as features critical for the conservation of biodiversity and maintenance of ecosystem functioning and should remain in a natural state as far as possible.

CBAs incorporate:

- (a) Areas that need to be safeguarded in order to meet national biodiversity thresholds.
- (b) Areas required for the continued existence and functioning of species and ecosystems, and the delivery of ecosystem services.
- (c) Important locations for biodiversity features or rare species.



**TABLE 8-9: A FRAMEWORK FOR LINKING SPATIAL PLANNING CATEGORIES (CBA“S) TO LAND-USE PLANNING AND DECISION-MAKING GUIDELINES BASED ON A SET OF HIGH-LEVEL LAND BIODIVERSITY MANAGEMENT OBJECTIVES**

CBA CATEGORY	LAND MANAGEMENT OBJECTIVE
PA & CBA 1	<ul style="list-style-type: none"> <li>➤ Natural landscapes:</li> <li>➤ Ecosystems and species fully intact and undisturbed These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets.</li> <li>➤ These areas are lost then targets will not be met. These are landscapes that are at or past their limits of acceptable changes. If the biodiversity features targeted in</li> </ul>
CBA 2	<ul style="list-style-type: none"> <li>➤ Near-natural landscapes:</li> <li>➤ Ecosystems and species largely intact and undisturbed.</li> <li>➤ Areas with intermediate irreplaceability or some flexibility in terms of area required to meet biodiversity targets. There are options for loss of some components of biodiversity in these landscapes without compromising our ability to achieve targets.</li> <li>➤ These are landscapes that are approaching but have not passed their limits of acceptable change</li> </ul>
Ecological Support Areas (ESA)	<ul style="list-style-type: none"> <li>➤ Functional landscapes:</li> <li>➤ Ecosystems moderately to significantly disturbed but still able to maintain basic functionality.</li> <li>➤ Individual species or other biodiversity indicators may be severely disturbed or reduced.</li> <li>➤ These are areas with low irreplaceability with respect to biodiversity pattern targets only</li> </ul>

Source: NCDENC (2010)

A CBA 1 area has been spatially designated on portion RE and 5 of Graspan and portion 1 of Uitspan. This area appears to relate to the non-perennial watercourse which traverses through the central-eastern section of the proposed prospecting right area.

A CBA 2 area has been spatially designated on the western border of portion RE and 5 of the Farm Graspan. The extent of these areas is small, relative to the extent of the proposed prospecting right area. These sites will be avoided during the invasive prospecting activities (Appendix B, Map 3).

## 8.2.4 DECLARED KAROO CENTRAL ASTRONOMY ADVANTAGE AREA

### 8.2.4.1 Background

Although not a specific environmental feature on site, it is important to note that the proposed prospecting right area is situated within two declared Astronomy Advantage Areas (AAA), namely as follows:

- The Northern Cape Province; and
- The Karoo Central AAA.

Specifically, the proposed prospecting right area is located within Advantage Area 3 of the Karoo Central AAA (Appendix B Map 7).

The AAAs are established in terms of the Astronomy Geographic Advantage Act 21 of 2007. The purpose of establishing the AAAs is to protect the radio astronomy work associated with the Square Kilometre Array (SKA) Project in Carnarvon.

The cosmic rays which the SKA radio telescopes receive and interpret are extremely faint and are thus sensitive to interference from other radio devices as well as electromagnetic interference from electrical equipment. The radio interference protection philosophy associated with the AAAs is as follows<sup>6</sup>:

- Maximise the radio frequency (RF) spectrum available for the SKA so that the scientific work is not significantly compromised;
- Minimise the impact on local people and residual radio interference, and facilitate access to alternative radio communications;
- Restrictions on sources of radio frequency interference, for where there are no alternative options, will be highest close to the SKA Virtual Centre (or core) but decrease with distance.

The nearest radio telescope is approximately 40 km from the centre of the proposed prospecting right area.

The prospecting activities may cause interference with the SKA radio telescopes through the use of electrical equipment, including communication devices used during prospecting and the TDEM survey.

Permission from the South African Radio Astronomy Observatory (SARAO) will need to be obtained by Orion Exploration No. 5 prior to proceeding with any prospecting activities, which may have an RF or EM impact.

## **9 IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY**

The impacts and risks identified for the proposed prospecting activities is summarised in Table 16-1.

## **10 METHODOLOGY USED IN DETERMINING AND RANKING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT, DURATION AND PROBABILITY OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS**

### **10.1 OVERVIEW**

The impact assessment methodology comprised of a risk-based impact matrix in which the outcomes, impacts and residual risk of the project activities was determined as follows:

- Step 1: Identify and describe the impact in terms of its nature (negative or positive) and type (direct or indirect);
- Step 2: Assess the impact severity (including reversibility and the potential for irreplaceable loss of resources), impact duration and impact spatial scale (extent);
- Step 3: Assign an impact consequence rating;
- Step 4: Assess the impact probability;
- Step 5: Assign the impact significance rating;

<sup>6</sup> [http://www.ska.ac.za/wp-content/uploads/2016/07/ska\\_sa\\_gaa\\_eng.pdf](http://www.ska.ac.za/wp-content/uploads/2016/07/ska_sa_gaa_eng.pdf)

- Step 6: Identify measures and controls by which the impact can be avoided, managed or mitigated; and
- Step: Repeat the impact assessment on the assumption that the mitigation measures are applied and assign the residual impact (post mitigation) significance rating.

The purpose of the impact assessment was not to identify every possible risk and impact which the proposed project activities may have on the receiving social environment. Rather, the assessment was focused on identifying and assessing the most material impacts, commensurate with the nature of the project activity and the characteristics of the receiving social environment.

## 10.2 APPLICATION OF IMPACT RATING CRITERIA

The various impact rating criteria used and how they were applied are described in the section that follows.

The first phase of impact assessment is the identification of the various project activities which may impact upon the identified environmental categories.

The identification of significant project activities is supported by the identification of the various receiving environmental receptors and resources. These receptors and resources allow for an understanding of the impact pathways and assessment of the sensitivity of the receiving environment to change.

The significance of the impact is then assessed by rating each variable numerically, according to defined criteria as provided in Table 10-1. The purpose of the significance rating of the identified impacts is to develop a clear understanding of the influences and processes associated with each impact.

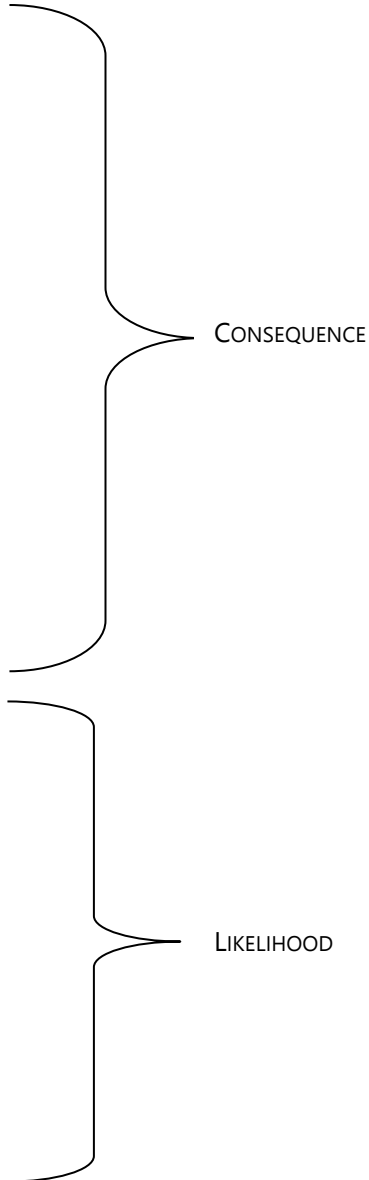
The severity, spatial scope and duration of the impact together comprise the consequence of the impact; and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact and can obtain a maximum value of 10.

The values for likelihood and consequence of the impact are then read from a significance rating matrix as shown in Table 10-1 and Table 10-2.

The model outcome of the impacts is then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in instances of uncertainty or lack of information by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations the model outcomes are adjusted. Arguments and descriptions for such adjustments, as well as arguments for each specific impact assessments are presented in the text and encapsulated in the assessment summary table linked to each impact discussion.

**TABLE 10-1: CRITERIA FOR ASSESSING THE SIGNIFICANCE OF IMPACTS**

SEVERITY OF IMPACT	RATING
Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful	5
SPATIAL SCOPE OF IMPACT	RATING
Activity specific	1
Area specific	2
Whole project site / local area	3
Regional	4
National/International	5
DURATION OF IMPACT	RATING
One day to one month	1
One month to one year	2
One year to ten years	3
Life of operation	4
Post closure / permanent	5
FREQUENCY OF ACTIVITY / DURATION OF ASPECT	RATING
Annually or less / low	1
6 monthly / temporary	2
Monthly / infrequent	3
Weekly / life of operation / regularly / likely	4
Daily / permanent / high	5
FREQUENCY OF IMPACT	RATING
Almost never / almost impossible	1
Very seldom / highly unlikely	2
Infrequent / unlikely / seldom	3
Often / regularly / likely / possible	4
Daily / highly likely / definitely	5



**Activity:** a distinct process or task undertaken by an organisation for which a responsibility can be assigned.

**Environmental aspect:** an element of an organisation’s activities, products or services which can interact with the environment.

**Environmental impacts:** consequences of these aspects on environmental resources or receptors.

**Receptors:** comprise, but are not limited to people or man-made structures.

**Resources:** include components of the biophysical environment.

**Frequency of activity:** refers to how often the proposed activity will take place.

**Frequency of impact:** refers to the frequency with which a stressor will impact on the receptor.

**Severity:** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.

**Spatial scope:** refers to the geographical scale of the impact.

**Duration:** refers to the length of time over which the stressor will cause a change in the resource or receptor.

**TABLE 10-2: SIGNIFICANCE RATING MATRIX**

		CONSEQUENCE (SEVERITY + SPATIAL SCOPE + DURATION)													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
LIKELIHOOD (FREQUENCY OF ACTIVITY + FREQUENCY OF IMPACT)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

**TABLE 10-3: POSITIVE/NEGATIVE MITIGATION RATINGS**

COLOUR CODE	SIGNIFICANCE RATING	VALUE	NEGATIVE IMPACT MANAGEMENT RECOMMENDATION	POSITIVE IMPACT MANAGEMENT RECOMMENDATION
	Very High	126-150	Improve current management	Maintain current management
	High	101-125	Improve current management	Maintain current management
	Medium-High	76-100	Improve current management	Maintain current management
	Low-Medium	51-75	Maintain current management	Improve current management
	Low	26-50	Maintain current management	Improve current management
	Very Low	1-25	Maintain current management	Improve current management

## 11 THE POSITIVE AND NEGATIVE IMPACTS THAT THE PROPOSED ACTIVITY AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY THAT MAY BE AFFECTED

The positive and negative impacts are presented in the stipulated format in Table 16-1.

## 12 THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK

Proposed mitigation measures are summarised in Table 12-1.

**TABLE 12-1: PROPOSED MITIGATION MEASURES**

<b>ACTIVITY</b> <b>whether listed or not listed.</b> (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc...etc...etc.)	<b>POTENTIAL IMPACT</b> (e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc...)	<b>ASPECTS AFFECTED</b>	<b>PHASE</b> In which impact is anticipated	<b>SIGNIFICANCE</b> if not mitigated	<b>MITIGATION TYPE<sup>7</sup></b> (modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc) E.g. Modify through alternative method. Control through noise control. Control through management and monitoring through rehabilitation	<b>SIGNIFICANCE</b> if mitigated
<b>Summary of Socio-Economic Impacts and Risks</b>						
All activities involving employment and procurement of goods and services	Local procurement of goods and services during the prospecting activities.	Socio-Economic Environment	All Phases	Low '-'	Enhance through implementation of the SLP	Low '-'
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Traffic injuries and fatalities to community members from accidents with prospecting vehicles / equipment	Socio-Economic Environment	All Phases	Medium-High '-'	Control through planning, design and operational controls	Low - Medium '-'
<b>Summary of Groundwater Impacts and Risks</b>						
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Groundwater contamination through pollution from the uncontrolled release of drilling fluids and/or the establishment	Groundwater	Site Preparation, Operational and Closure	Low - Medium '-'	Control through design and operational controls	Low '-'

<sup>7</sup> Please refer to the EMPr for details of the mitigation measures

	of a preferential pathway for contaminants during and after drilling has been completed.					
<b>Summary of Air Quality Impacts and Risks</b>						
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Increased dustfall, PM10 and PM2.5 Levels	Air quality	Site Preparation, Operational and Closure	Low - Medium '-'	Control through design and operational controls	Low '-'
<b>Summary of Soils Impacts and Risks</b>						
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Loss of soil resources due to soil disturbance, erosion as well as contamination.	Soils	Site Preparation, Operational and Closure	Medium-High '-'	Avoid / minimise through design and operational controls	Low - Medium '-'
<b>Summary of Noise Impacts and Risks</b>						
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Increased ambient noise levels from prospecting equipment which may disturb sensitive receptors	Noise	Site Preparation, Operational and Closure	Low-Medium '-'	Avoid / minimise through design and operational controls	Low -
<b>Summary of Surface Water Impacts and Risks</b>						
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Surface water contamination from hydrocarbon spills	Surface Water	Site Preparation, Operational and Closure	Low-Medium '-'	Avoid / minimise through design and operational controls	Low '-'
<b>Summary of Terrestrial Ecology Impacts and Risks</b>						
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Loss of natural habitat	Flora	Site Preparation, Operational and Closure	Low-Medium '-'	Avoid / minimise through design and operational controls	Low '-'
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Loss of medicinal / conservation important plant species	Flora	Site Preparation, Operational and Closure	Low-Medium '-'	Avoid / minimise through design and operational controls	Low '-'

Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Loss of faunal habitat	Fauna	Site Preparation, Operational and Closure	Low-Medium '-'	Avoid / minimise through design and operational controls	Low '-'
<b>Summary of Heritage Impacts and Risks</b>						
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Disturbance/loss of significant archaeological or cultural heritage sites/remains	Archaeology, palaeontology, and cultural heritage	Site Preparation, Operational and Closure	Low-Medium '-'	Maintain / monitor through implementation of chance-find procedure	Low '-'
<b>Summary of Impacts to MeerKAT/SKA Observatory</b>						
Airborne survey using EM. Operating of drilling equipment and machinery, including communication devices	EM and RF interference within the declared Karoo Central AAA and the impact this may have on the operation of the MeerKAT/SKA Observatory	EM and RF Interference	Site Preparation, Operational and Closure	Medium-High '-'	Avoid / minimise through design and operational controls	Low '-'



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### **13 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED**

The properties included in the prospecting right application represent the cadastral units relating to the geological formation of interest, namely a portion of the Areachap Group. In addition to the geological formation, the proposed prospecting right area properties have also been selected based on several other factors such as access to available mineral rights, infrastructure, the availability of properties for which a mining right or prospecting right has not been applied for and the proximity to the existing PCM mine.

The proposed location of the prospecting activities on each property is similarly determined by the location of the resource on that property.

### **14 STATEMENT MOTIVATING THE ALTERNATIVE DEVELOPMENT LOCATION WITHIN THE OVERALL SITE**

The location of the invasive prospecting activities (drilling and trenching) will be informed by the information obtained through the non-invasive prospecting activities, particularly the TDEM survey data. The invasive prospecting activities will, where possible, avoid the areas identified in the environmental sensitivity plan.

### **15 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY**

The impact assessment methodology is described in Section 10 of this report.

### **16 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK**

The assessment is presented in the required format in Table 16-1.

**TABLE 16-1: ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK**

<b>SOILS</b>								
Project Activity	Soils		Likelihood		Consequence			Significance Rating
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	
	Impact Classification	Direct Impact	Significance Pre-Mitigation					
	Resulting Impact from Activity	Disturbance Loss of soil resources due to soil disturbance, erosion as well as contamination.	5	5	3	3	3	90
			Significance Post-Mitigation					
		5	4	2	2	2	54	
<b>AIR QUALITY</b>								
Project Activity	Air Quality		Likelihood		Consequence			Significance Rating
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	
	Impact Classification	Direct Impact	Significance Pre-Mitigation					
	Resulting Impact from Activity	Increased dustfall, PM10 and PM2.5 Levels	5	4	3	3	2	72
			Significance Post- Mitigation					
		5	3	2	2	2	48	
<b>NOISE</b>								
Project Activity	Noise		Likelihood		Consequence			Significance Rating
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	
	Impact Classification	Direct Impact	Significance Pre-Mitigation					
	Resulting Impact from Activity	Increased ambient noise levels from prospecting	5	4	2	3	3	72
			Significance Post- Mitigation					

		equipment which may disturb sensitive receptors	5	2	2	2	2	42
<b>SURFACE WATER RESOURCES</b>								
Project Activity	Surface Water Resources		Likelihood		Consequence			
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	Significance Rating
	Impact Classification	Direct Impact	Significance Pre-Mitigation					
	Resulting Impact from Activity	Surface water contamination from hydrocarbon spills	5	3	3	3	2	64
			Significance Post- Mitigation					
		5	2	1	1	1	21	
<b>FLORA</b>								
Project Activity	Flora		Likelihood		Consequence			
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	Significance Rating
	Impact Classification	Direct Impact	Significance Pre-Mitigation					
	Resulting Impact from Activity	Loss of natural habitat	5	4	4	2	2	72
			Significance Post-Mitigation					
		5	3	2	2	2	48	
Project Activity	Flora		Likelihood		Consequence			
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	Significance Rating
	Impact Classification	Direct Impact	Significance Pre-Mitigation					
	Resulting Impact from Activity		5	2	3	2	3	56
			Significance Post-Mitigation					

		Loss of Medicinal / Conservation Important Plant Species	5	1	3	2	3	48
<b>FAUNA</b>								
Project Activity	Fauna		Likelihood		Consequence			
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	Significance Rating
	Impact Classification	Direct Impact	Significance Pre-Mitigation					
	Resulting Impact from Activity	Loss of Faunal Habitat	5	3	3	2	3	64
			Significance Post-Mitigation					
		5	2	2	1	3	42	
<b>ARCHAEOLOGY</b>								
Project Activity	Archaeology & Cultural Heritage		Likelihood		Consequence			Significance Rating
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	
	Impact Classification	Direct Impact	Significance Pre-Mitigation					
	Resulting Impact from Activity	Disturbance/Loss of Significant Archaeological or Cultural Heritage Sites/Remains	5	3	4	1	4	72
			Significance Post-Mitigation					
		5	2	2	1	4	49	
<b>PALAEONTOLOGY</b>								
Project Activity	Palaeontology		Likelihood		Consequence			
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	Significance Rating
	Impact Classification	Indirect	Significance Pre-Mitigation					
	Resulting Impact from Activity		5	2	2	2	4	56
			Significance Post- Mitigation					

		Disturbance/Loss of Significant palaeontological features	5	1	2	2	4	48
<b>HEALTH AND SAFETY</b>								
Project Activity	Health and Safety		Likelihood		Consequence			
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	Significance Rating
	Impact Classification	Indirect	Significance Pre-Mitigation					
	Resulting Impact from Activity	Traffic Injuries and fatalities to community members from accidents with prospecting vehicles / equipment	5	3	4	3	4	88
			Significance Post- Mitigation					
			5	1	4	3	4	66
<b>SOCIO-ECONOMIC</b>								
Project Activity	Socio-economic		Likelihood		Consequence			
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	Significance Rating
	Impact Classification	Direct <b>Positive</b> Impact	Significance Pre-Mitigation					
	Resulting Impact from Activity	Local procurement of goods and services during the prospecting activities	5	2	2	2	2	42
			Significance Post- Mitigation					
			5	2	2	2	2	42
<b>GROUNDWATER</b>								
Project Activity	Groundwater		Likelihood		Consequence			
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	Significance Rating
	Impact Classification	Direct Impact	5	3	3	3	2	64
	Resulting Impact from Activity	Groundwater contamination through pollution from the uncontrolled release of drilling fluids and/or the establishment of a	Significance Pre-Mitigation					
5			2	2	1	2	35	

		preferential pathway for contaminants during and after drilling has been completed							
<b>MeerKAT/SKA OBSERVATORY</b>									
Project Activity	Groundwater		Likelihood		Consequence				
Operating of drilling equipment and machinery, including communication devices	Phase of Project	Site Preparation, Operational and Closure	Frequency of Activity	Frequency of Impact	Severity	Spatial Scope	Duration	Significance Rating	
	Impact Classification	Direct Impact	Significance Pre-Mitigation						
	Resulting Impact from Activity	EM and RF interference within the declared Karoo Central AAA and the impact this may have on the operation of the MeerKAT/SKA Observatory	5	3	3	4	3	80	
			Significance Post- Mitigation						
		5	2	2	2	2	42		

## 17 SUMMARY OF SPECIALIST REPORTS

The proposed prospecting right area is large and the drilling site locations can only be established once the non-invasive prospecting has been concluded. If no anomaly is identified through the non-invasive prospecting phase, it is possible that there will be no invasive prospecting.

To undertake specialist studies across the entire proposed prospecting right area when the actual area of disturbance from the proposed 5 drill sites is estimated to be less than one hectare in extent, is impractical. Thus, once the preliminary drilling locations have been established (following the non-invasive prospecting phase), a heritage and ecological site assessment will be undertaken to establish any sensitive fauna, flora or heritage attributes of significance which may be associated with intended drilling locations. The recommendations from these studies will be used to optimise the drilling locations and an updated site layout map showing the drilling site locations will be submitted to the DMR.

A summary of the desktop heritage specialist study undertaken for the proposed prospecting right area is provided below.

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED
Heritage and Palaeontological Assessment	<p>A Heritage and Palaeontological desktop assessment have been undertaken and the recommendations is summarised as follows:</p> <p><b>Paleontological resources</b></p> <p>The proposed site lies on the Late Carboniferous-Early Permian Dwyka Group tillites, sands, shales, mudstones. Although fossils have not been reported from this site there is a small chance that typical (but very infrequent) early Glossopteris flora plants could occur in the sediments just below the surface. Surface exposures are likely to be very weathered. Therefore, a Fossil Chance Find Protocol should be added to the EMPr. Based on this information it is recommended that no palaeontological site visit is required unless fossils are revealed once excavations and drilling has commenced. As far as the palaeontology is concerned a prospecting right should be granted (Bamford 2019).</p>	X	Section 8 Section 18 Part B-EMPr

	<p><b>Widespread Stone Age scatters and sites (ESA; MSA and LSA)</b></p> <p>Every site is relevant to the Heritage Landscape, but it is anticipated that few sites in the study area could have conservation value. The archaeological importance of pans in the area are now well documented (Kiberd 2006, Kaplan &amp; Wiltshire 2011, Orton 2012) and pans should be avoided with a 100-meter buffer. The impact of non-invasive exploration on these features is considered negligible however pans should be avoided during planning stages for intrusive exploration.</p> <p><b>Historical finds and Cultural landscape</b></p> <p>Some structures could occur that are older than 60 years. No impact on structures older than 60 years is foreseen during prospecting activities, however if structures are to be impacted destruction/ alteration permits will have to be applied for.</p> <p><b>Burials and cemeteries</b></p> <p>Formal and informal cemeteries as well as pre-colonial graves occur widely across Southern Africa. It is generally recommended that these sites are preserved in situ and within a development. These sites can however be relocated if conservation is not possible, but this option must be seen as a last resort and is not advisable. The presence of any grave sites must be confirmed during a field survey and the public consultation process when exploration localities are fixed.</p> <p><b>General</b></p> <p>It is anticipated that any sites that occur within the project area will have a Generally Protected B (GP. B) or lower field rating, all sites should be mitigatable, and no red flags have been identified. It is therefore recommended that non-invasive exploration can commence (based on approval from SAHRA) with the following conditions of authorisation in the EMPr:</p> <ul style="list-style-type: none"> <li>• Before commencing invasive prospecting activities, the impact areas should be subjected to a heritage walk down.</li> <li>• Inclusion of a chance find protocol (both archaeology and palaeontology) as outlined below.</li> </ul>		
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	<p><b>Chance Find Procedure – Archaeology</b></p> <p>The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, if during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find and therefor chance find procedures should be put in place as part of the EMPr. A short summary of chance find procedures is discussed below.</p> <p>This procedure applies to the developer’s permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.</p> <ul style="list-style-type: none"> <li>• If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.</li> <li>• It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area.</li> <li>• The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.</li> </ul>		
Terrestrial Ecology	<p>The Graspan Prospecting Right Area covers just under 9 000 ha, most of which can be classified as Natural Habitat that is representative of Bushmanland Basin Shrubland. Scattered small pans are representative of the Bushmanland Vloere vegetational type. MacDonald (2013) classified eight different vegetation communities on adjacent properties and at least five have a high likelihood of being present in the project area. Ephemeral pans and seasonal drainage lines in the project area should be considered to have high ecological sensitivity. Natural Habitat in the project area has a moderate to high likelihood of supporting populations of three plant SCC, four mammal SCC, nine avifauna SCC and one amphibian SCC. Most of this habitat has been classified as Other Natural Habitat by Holness &amp; Oosthuysen (2016), while small pans have been classified as Ecological Support Areas. Seasonal drainage lines are classified as CBA1.</p>	X	<p>Section 8 Section 18 Part B-EMPr</p>

	<p>If the prospecting rights application is approved, the following areas need to be excluded from any invasive prospecting activities (drilling, trenching):</p> <ul style="list-style-type: none"> <li>• All seasonal drainage lines, particularly the large one in the eastern part of the property that is classified as CBA1, including a 50 meter buffer;</li> <li>• All ephemeral pans, including a 50 metre buffer;</li> <li>• The CBA2 along the western boundary, including a 50 meter buffer.</li> </ul> <p>In addition, if any rocky hills are present in the prospecting right area, these should be surveyed in advance by an ecologist to ascertain whether any plant SCC are present or not. If surveys detect these species, changes to access road routes and drilling sites are recommended. The general mitigation measures for Terrestrial Ecology (Flora and Fauna) as included in the Environmental Management Plan are considered to be satisfactory for other areas of Natural Habitat in the prospecting right area.</p>		
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## 18 ENVIRONMENTAL IMPACT STATEMENT

### 18.1 SUMMARY OF THE KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

Key findings of the impact assessment for the proposed prospecting activities are as follows:

- Sufficient and appropriate information on the proposed prospecting activities and the receiving environment was available for conducting the impact assessment;
- With mitigation measures applied, the proposed prospecting activities are compatible with current land uses; and
- No significant negative impacts have been identified. Impacts identified have been assessed to be reversible and can be satisfactorily mitigated.

### 18.2 FINAL SITE MAP

The locations for invasive prospecting activities can only be established after the non-invasive prospecting phase has been completed. The environmentally sensitive areas identified in the sensitivity map will, where possible, be avoided.

### 18.3 SUMMARY OF THE POSITIVE AND NEGATIVE IMPLICATIONS AND RISKS OF THE PROPOSED ACTIVITY AND IDENTIFIED ALTERNATIVES

A summary of the positive and negative impacts and risks associated with the proposed development are provided below:

#### 18.3.1 POSITIVE IMPACTS

Although limited, the prospecting activities will have a positive impact on the procurement of local goods and services by the applicant, employees and contractors. If the

#### 18.3.2 NEGATIVE IMPACTS

The potentially negative impacts of the development which were assessed to be of most importance were as follows:

##### 18.3.2.1 Soils

- Loss of soil resources due to soil disturbance, erosion as well as contamination

##### 18.3.2.2 Air Quality

- Increased dustfall, PM10 and PM2.5 Levels

##### 18.3.2.3 Noise

- Increased ambient noise levels from prospecting equipment which may disturb sensitive receptors

##### 18.3.2.4 Water

- Surface water contamination from hydrocarbon spills

##### 18.3.2.5 Groundwater

- Groundwater contamination through pollution from the uncontrolled release of drilling fluids and/or the establishment of a preferential pathway for contaminants during and after drilling has been completed

##### 18.3.2.6 Terrestrial Ecology

- Loss of natural habitat

- Loss of medicinal / conservation important plant species

### 18.3.2.7 Traffic

- Traffic injuries and fatalities to community members from accidents with prospecting vehicles / equipment

### 18.3.2.8 Archaeology

- Disturbance/loss of significant archaeological or cultural heritage sites/remains

### 18.3.2.9 EM and RF Interference

- EM and RF interference from prospecting electrical equipment and machinery and the impact this may have on the MeerKAT/SKA Observatory.

## 19 PROPOSED IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR

The key objectives of an EMPr are to set out the management and monitoring measures required to both minimise any potentially adverse environmental impacts and enhance the environmental benefits of the proposed prospecting activities, and to ensure that responsibilities and appropriate resources are efficiently allocated to implement the plan.

The aspects which are considered to be of most importance to the development, including the respective management objectives and outcomes for the impacts associated with these aspects are provided in Table 19-1.

The management objectives and outcomes will be achieved through the implementation of the management actions in the EMPr.

**TABLE 19-1: IMPACT MANAGEMENT OBJECTIVES AND OUTCOMES**

ASPECT	MANAGEMENT OBJECTIVE	MANAGEMENT OUTCOME
Soil	<ul style="list-style-type: none"> <li>➤ Manage suitable onsite soil resources for rehabilitation activities.</li> <li>➤ Prevent the contamination of soil resources.</li> <li>➤ Managed response to the clean-up of accidental spillages and leaks.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Soil resources protected from contamination.</li> <li>➤ Accidental leaks and spillages responded to rapidly and all contamination remediated in accordance with legal requirements.</li> </ul>
Air	<ul style="list-style-type: none"> <li>➤ Surrounding land users minimally affected by prospecting activities.</li> <li>➤ Control and minimise particulate and dust emissions to air.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Good stakeholder relations with community members.</li> <li>➤ Air emissions from the development managed in accordance with legal requirements.</li> </ul>
Water resources	<ul style="list-style-type: none"> <li>➤ Prevent the contamination of surface and groundwater resources.</li> <li>➤ Managed response to the clean-up of accidental spillages and leaks.</li> <li>➤ Water conservation.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Good stakeholder relations with community members.</li> <li>➤ Surface and groundwater resources protected from contamination.</li> <li>➤ Accidental leaks and spillages responded to rapidly and all contamination remediated in accordance with legal requirements.</li> <li>➤ Water used efficiently.</li> </ul>
Health and Safety	<ul style="list-style-type: none"> <li>➤ Prevent criminal activities onsite.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Secure and safe site.</li> </ul>

	<ul style="list-style-type: none"> <li>➤ Prevent occupational and community health and safety incidents.</li> </ul>	
Noise	<ul style="list-style-type: none"> <li>➤ Prevent noise impacts from prospecting activities at sensitive noise receptors.</li> <li>➤ Complaints which are received are properly investigated and responded to appropriately.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Good stakeholder relations with community members and authorities.</li> </ul>
Heritage	<ul style="list-style-type: none"> <li>➤ Protection of heritage resources.</li> </ul>	<ul style="list-style-type: none"> <li>➤ No heritage resources damaged or destroyed during prospecting activities.</li> </ul>
Traffic and Road Safety	<ul style="list-style-type: none"> <li>➤ Prevent road safety incidents and limit disruptions to traffic flow.</li> <li>➤ Complaints which are received are properly investigated and responded to appropriately.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Damage to road surfaces minimised.</li> <li>➤ Good stakeholder relations with community members and authorities.</li> </ul>
Socio-Economic	<ul style="list-style-type: none"> <li>➤ Support for the development by the local community is enhanced.</li> <li>➤ Maximise the local economic development potential of the development.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Employment from local community where possible.</li> <li>➤ Local procurement.</li> <li>➤ Good stakeholder relations with community members and authorities.</li> </ul>

## 20 FINAL PROPOSED ALTERNATIVES

No other alternatives to those identified and assessed through the impact assessment process are proposed for the prospecting activities.

## 21 ASPECTS FOR INCLUSION IN THE ENVIRONMENTAL AUTHORISATION.

The following conditions should be included in the authorisation:

- The Applicant must continue to reassess the risks and impacts of the prospecting activities for the duration of the prospecting programme. Should any change in the risk and impact profile of the development be determined, additional management controls and mitigation measures must be implemented and the EMPr amended to reflect these changes;
- The EMPr, including all management and monitoring measures must be implemented;
- No drilling may take place within 100 m of a watercourse or within 500 m of a wetland, unless prior approval has been obtained from the relevant authorities, should this be required.
- Once the preliminary drilling locations have been established (following the non-invasive prospecting phase), a heritage and ecological site assessment must be undertaken to establish any sensitive fauna, flora or heritage attributes of significance which may be associated with intended drilling locations and associated access routes;
- The drilling site locations must avoid disturbance to any identified sensitive environmental features; and
- The specialist reports and updated site layout map showing the drilling site locations must be submitted to the DMR, together with an updated EMPr, as may be required.

## 22 DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES, AND GAPS IN KNOWLEDGE

Advisory on Business and Sustainability Africa (Pty) Ltd. (ABS Africa) has prepared this report specifically for Exploration No. 5 (Pty) Ltd. The contents of this report:

- Are based on the legal requirements for undertaking a Basic Assessment Process, as defined in the National Environmental Management Act, 1998 (Act No. 107 of 1998), the EIA Regulations (2014) and the scope of services as defined within the contractual undertakings between Orion Exploration No.5 and ABS Africa;
- Are specific to the intended development at the proposed site. The report shall not be used nor relied upon neither by any other party nor for any other purpose without the written consent of ABS Africa. ABS Africa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report;
- Reflect the best judgement of ABS Africa in light of the information available at the time of preparation. The analyses contained in this report has been developed from information provided by Orion Exploration No.5 and other parties. This information is not within the control of ABS Africa and ABS Africa has not audited such information and makes no representations as to the validity or accuracy thereof; and
- The assessment has been based on the project description provided by the Applicant. Changes to this project description may influence the assessment and the mitigation measures in the EMPr.

## 23 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

### 23.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORISED OR NOT

Based on the findings of the impact assessment, and with the understanding that the mitigation measures will continue to be implemented throughout the prospecting period, the EAP is of the opinion that an environmental authorisation for the prospecting activities may be granted.

### 23.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

#### 23.2.1 SPECIFIC CONDITIONS TO BE INCLUDED INTO THE COMPILATION AND APPROVAL OF EMPr

The following conditions should be included in the authorisation:

- The Applicant must continue to reassess the risks and impacts of the prospecting activities for the duration of the prospecting programme. Should any change in the risk and impact profile of the development be determined, additional management controls and mitigation measures must be implemented and the EMPr amended to reflect these changes;
- The EMPr, including all management and monitoring measures must be implemented;
- No drilling may take place within 100 m of a watercourse or within 500 m of a wetland, unless prior approval has been obtained from the relevant authorities, should this be required.
- Once the preliminary drilling locations have been established (following the non-invasive prospecting phase), a heritage and ecological site assessment must be undertaken to establish any sensitive fauna, flora or heritage attributes of significance which may be associated with intended drilling locations and associated access routes;
- The drilling site locations must avoid disturbance to any identified sensitive environmental features; and

- The specialist reports and updated site layout map showing the drilling site locations must be submitted to the DMR, together with an updated EMPr, as may be required.

## 24 PERIOD FOR WHICH ENVIRONMENTAL AUTHORISATION IS REQUIRED

The environmental authorisation is required for a period of 5 years.

## 25 FINANCIAL PROVISION

### 25.1 DETERMINATION OF THE AMOUNT OF FINANCIAL PROVISION

Financial provisioning was determined by calculating the cost of rehabilitation for drilling sites and access tracks by ripping, reinstating topsoil and reseeding affected areas. The DMR master rate, as published in the DMR Guideline<sup>8</sup> adjusted for inflation for the period 2018, was applied to the area of disturbance.

### 25.2 CONFIRM THAT THIS AMOUNT CAN BE DERIVED FROM THE OPERATING EXPENDITURE

In compiling and submitting their Prospecting Work Programme, the Applicant has confirmed that the required amount for financial provision for rehabilitation and closure can be derived from operating expenditure.

## 26 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

In compliance with the provisions of sections 24(4) (a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998), the EIA report must include the:

### **(1) Impact on the socio-economic conditions of any directly affected person.**

Positive and negative socio-economic impacts were identified, and mitigation measures have been recommended and included in the EMPr.

### **(2) Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.**

The desktop heritage specialist study compiled for the application concluded that it is anticipated that any heritage sites that occur within the project area will have a Generally Protected B (GP. B) or lower field rating, all sites should be mitigatable, and no red flags have been identified. It is therefore recommended that non-invasive exploration can commence (based on approval from SAHRA) with the following conditions of authorisation in the EMPr:

- Before commencing invasive prospecting activities, the impact areas should be subjected to a heritage walk down.
- Inclusion of a chance find protocol (both archaeology and palaeontology).

### **(3) Other matters required in terms of sections 24(4) (a) and (b) of the Act.**

All reasonable and feasible alternatives in terms of site layout, location, public participation, potential impacts and mitigation have been addressed throughout this report.

<sup>8</sup> Department of Minerals and Energy, 2005. Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine

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## UNDERTAKING

The EAP herewith confirms

- a. the correctness of the information provided in the reports
- b. the inclusion of comments and inputs from stakeholders and I&APs
- c. the inclusion of inputs and recommendations from the specialist reports where relevant; and
- d. the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

## DISCLAIMER

Advisory on Business and Sustainability Africa (Pty) Ltd. (ABS Africa) has prepared this report specifically for Orion Exploration No.5 (Pty) Ltd.

The contents of this report:

- Are based on the legal requirements for undertaking a Basic Assessment, as defined in the National Environmental Management Act, 1998 (Act No. 107 of 1998) and the scope of services as defined within the contractual undertakings between Orion Exploration No. 5 and ABS Africa.
- Are specific to the intended development at the proposed site. The report shall not be used nor relied upon neither by any other party nor for any other purpose without the written consent of ABS Africa. ABS Africa accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.
- Reflect the best judgement of ABS Africa in light of the information available at the time of preparation. The analyses contained in this report has been developed from information provided by Orion Exploration No. 5 and other parties. This information is not within the control of ABS Africa and ABS Africa has not audited such information and makes no representations as to the validity or accuracy thereof.

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## PART B

# ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

## 27 ENVIRONMENTAL PROGRAMME REPORT

### 27.1 DETAILS OF THE EAP

Name of the Practitioner:	ABS Africa (Pty) Ltd. Chané Pretorius
Tel No.:	+27 21 403 6570
E-mail address:	<a href="mailto:chane@abs-africa.com">chane@abs-africa.com</a>

Details of the EAPs experience and qualifications are provided in Part A, Section 1.

### 27.2 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

The description of the aspects of the activity are provided in Part A, Section 3.

## 28 COMPOSITE MAP

The environmental sensitivity map identifying areas to be avoided by the proposed prospecting activities, where this is possible, is provided in Appendix B (Map 2).

## 29 DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

The key objectives of an EMPr are to set out the management and monitoring measures required to both minimise any potentially adverse environmental impacts and enhance the environmental benefits of the Project, and to ensure that responsibilities and appropriate resources are efficiently allocated to implement the plan.

The aspects which are considered to be of most importance to the development, including the respective management objectives and outcomes for the impacts associated with these aspects are provided in Table 19-1.

The management objectives and outcomes will be achieved through the implementation of the management actions in the EMPr.

### 29.1 DETERMINATION OF CLOSURE OBJECTIVES

The main closure objectives of the proposed prospecting activities are:

- To restore the site to its current land capability in a sustainable matter;
- To prevent the establishment of any permanent structures or features, unless otherwise agreed with stakeholders;
- To establish a stable and self-sustainable vegetation cover in areas disturbed by prospecting;
- To limit and rehabilitate any erosion features and prevent any permanent impact to the soil capability in areas disturbed by prospecting;
- To limit and manage the visual impact of the prospecting activities;
- To safeguard the safety and health of humans and animals on the site;

- To close the prospecting operation efficiently, cost effectively and in accordance with legal requirements;
- Cleaning up of the sources of possible contamination still present on the site to protect the downstream receiving environment;
- Removing waste material;
- Cleaning-up and rehabilitating of contaminated soil areas, if applicable; and
- Limiting the possible loss of topsoil by committing the available topsoil to key pre-determined rehabilitation areas.

## 29.2 VOLUMES AND RATES OF WATER USE REQUIRED FOR THE OPERATION

Water required for the diamond-core drilling will be 10 kl per day (per drill rig) and will be obtained from existing licensed sources. A brief description of the manner in which the water is used in the exploration drilling process is provided below:

- The drilling process recirculates water through a system of three High-Density Polyethylene (HDPE) Lined settling ponds. The latter are excavated next to the selected drilling location and are each approximately 2 m (length) x 1 m (width) x 1 m (depth) in size;
- The excavated material is stockpiled upgradient of the three settling ponds;
- The water supply is pumped into the first pond through an HDPE pipeline from where it gravitates into a second and third pond. Water for the drilling is abstracted from one of the ponds and returned to a different pond through a separate return water pipeline. In the ponds, suspended material arising from the drilling through the rock settles, so that the water can be reused and does not cause a blockage in the pipe; and
- Once the drilling is complete, the HDPE-lining is removed, and the settling ponds backfilled with the stockpiled excavated material. The small amount of wastewater remaining in the hole after drilling is complete is absorbed into the soil matrix during the backfilling process.

Sanitary wastewater generated by drill rig personnel is managed through chemical toilets which are serviced by a contractor.



**FIGURE 29-1: SETTLING PONDS USED FOR THE RECYCLING OF WATER AT A DRILLING RIG**

**29.2.1 HAS A WATER USE LICENCE BEEN APPLIED FOR?**

A water use licence is not required for the proposed prospecting activities. No abstraction of water will be required, and no prospecting will take place in a manner which will result in the need for a water use licence in terms of Section 21 c or i of the National Water Act 36 of 1998. As a precaution, the environmental sensitivity plan has included a buffer of 100 m from non-perennial rivers and 500 m from pans.

**TABLE 29-1: IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES**

ACTIVITY	PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION TYPES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
<b>Soils and Land Use</b>					
Clearing of Vegetation and Stockpiling of Topsoil	All phases	1525 m <sup>2</sup>	<ul style="list-style-type: none"> <li>➤ Vegetation clearing and topsoil removal must be kept to a minimum to that needed for accessing drilling sites and completion of the prospecting works programme.</li> <li>➤ Avoidance of areas identified as sensitive in the environmental sensitivity plan including applicable buffer areas around wetlands and other watercourses.</li> <li>➤ All vehicles and equipment maintained according to manufacturer specifications and regular inspections undertaken to ensure that leaks and spills are identified and corrected as soon as possible.</li> <li>➤ Spill response kits available for all vehicles / machinery used for the prospecting.</li> <li>➤ Provision and maintenance of chemical toilets.</li> <li>➤ Apply dust control measures including vehicle speed limits, wet suppression of access tracks, and covering temporary stockpiles during high wind speed conditions.</li> <li>➤ Training on EMPr provided to all personnel involved in the prospecting, including aspects such as site access protocol, waste management, water management and dust control.</li> </ul>	MPRDA and NEMA Regulations  MHSA  Water management measures in compliance with NWA and GN704.  SANS Noise Standards  Dust mitigation to comply with Dust Control Regulation GNR 827 of 2013 and NEM:AQA, 2004	Throughout Prospecting Activities

Housekeeping and Management of Stockpiles and Exposed Soils	Construction and operation phases	As above	<ul style="list-style-type: none"> <li>➤ Topsoil and subsoil stockpiles should preferably be placed in a free draining location to minimize soil erosion and possible water logging.</li> <li>➤ The stripped soils should be stockpiled upslope of areas of disturbance to prevent contamination of stockpiled soils by dirty runoff or seepage.</li> <li>➤ Erosion control and protection measures installed as part of the construction of the project will be adapted for the specific area and situation should signs of erosion appear.</li> <li>➤ Rehabilitate eroded areas as soon as possible.</li> <li>➤ Prospecting and related activities will be conducted in such a manner that it will minimize the amount of soil exposed at a certain period of time.</li> <li>➤ Top-soil recovered from lay down areas and drill sumps will then be used to rehabilitate the exposed surfaces.</li> </ul>		Throughout Prospecting Activities
<b>Air Quality</b>					
Preparation and Use of Access Tracks to Drill Sites  Drilling	Construction and operation phases	As above	<ul style="list-style-type: none"> <li>➤ Any agreement pertaining to dust mitigation measures between Orion and Mulilo must be implemented during prospecting activities.</li> <li>➤ Stockpiled soil or sand utilised during the drilling operations for borehole establishment ("Stockpiles") will be covered in windy conditions.</li> <li>➤ Stockpiles will not exceed 2m in height.</li> <li>➤ Wind breaks / demarcation with wind protective covers will be considered in case dust generation becomes a continuous issue.</li> <li>➤ Cement will be stored in weather proof containers to prevent the wind from blowing cement dust.</li> <li>➤ Vehicle speed are to be set at no more than 40 km/h on gravel roads within a 1km distance from any solar plant and 60 km/h on gravel access roads within 2-4km distance from the solar plant.</li> <li>➤ Vehicles transporting material due to Orion's activities which have the potential of becoming airborns will either be appropriately covered but if not practical, they will be sprayed with water, at a frequency as</li> </ul>	Dust suppression to comply with Dust Control Regulation GNR 827 of 2013 and NEM:AQA, 2004.	Throughout Prospecting Activities

			<p>necessary to ensure dust generation is minimised within the 4km radius.</p> <ul style="list-style-type: none"> <li>➤ The R357 Regional road from Prieska is to be avoided at all costs beyond the Copperton turn off (29°58'10.34"S 22°22'58.20"E 30°) to the Slimes Dam intersection (1°57.48"S 22°17'40.87"E). Prior experience during construction of the Solar Projects showed that this portion of road results in significant dust generation and soiling of the two larger 75MW Solar Projects. Should this section be required as a main transport route for prospecting or mining, strict speed limits will be enforced &lt;40km/h. Alternatively, application can be made to the Department of Public Road Works to upgrade the surface material (ie tarred) for this portion.</li> <li>➤ All gravel access roads and internal roads will be sprayed with water to control dust with the use of a spraying truck.</li> <li>➤ The Orion Environmental Control Officer will be consulted on the best and practical way forward.</li> <li>➤ The prospecting rights make provision for water from the Siyathemba Municipal supply from Prieska via the Alkantpan pipeline. Orion has a working agreement for water supply from the Siyathemba Municipality. Water Use Licenses will be obtained for any planned groundwater extraction as is required by law.</li> <li>➤ The natural vegetation will be disturbed to a minimum and vegetative cover will be protected and kept in a good condition and maintained to keep all surfaces covered. Vehicle movement will be restricted to existing roads or pre-approved routes and drilling pads confined to as small a footprint as possible.</li> <li>➤ Employees will be informed in the awareness training sessions to control dust emissions and report dust conditions to management.</li> <li>➤ Daily Inspections will be carried to regulate dust emissions on site.</li> <li>➤ Complaints will be considered as a critical issue and will be corrected immediately.</li> </ul>		
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			<ul style="list-style-type: none"> <li>➤ Prospecting and related activities will be conducted in such a manner that it will minimize the amount of soil exposed at a certain period of time.</li> <li>➤ Only the required area for prospecting will be cleared.</li> <li>➤ Top-soil recovered from roads, lay down areas etc. will then be used to cover exposed soil surfaces for rehabilitation.</li> <li>➤ The movement of heavy vehicles will be restricted to pre-approved access routes to the drill rigs.</li> <li>➤ Dust masks will be readably available on request</li> <li>➤ Goggles will be readably available on request</li> <li>➤ Personal protective equipment will be the last resort if dust generation could not be complete mitigated.</li> <li>➤ Cement bags will be stored in weather proof containers to avoid the wind from blowing cement dust that might be harmful to employees in the immediate environment, for the immediate soil or contaminates water sources in the immediate environment.</li> <li>➤ Dustfall will be reported on a monthly basis as a mass per area per time (mg/m<sup>2</sup>/day) and evaluated against the dustfall limits as provided in Table 1 and Table 2 in the Dust Monitoring Report example provided in Appendix A.</li> <li>➤ Meteorological parameters will be monitored on-site and stored as 10 minute- average values. Wind speed and wind direction, temperature and rainfall will be reported on together with the dust fallout results in the Dust Monitoring report.</li> <li>➤ Dust emitting activities will be closely monitored and mitigation will be diligently maintained and actively enforced when the wind is blowing in the direction of any of the solar facilities.</li> <li>➤ Shade-cloth enclosure of the primary drill rigs / hoppers / dust producing activity Mist sprays on all transfer points and screens;</li> </ul>		
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			<ul style="list-style-type: none"> <li>➤ Sprinkler and water cart wetting of manoeuvring areas where dust pulverisation by vehicles or machinery occurs.</li> </ul>		
<b>Noise</b>					
Diamond-Core Drilling	All phases	Not Applicable	<ul style="list-style-type: none"> <li>➤ All vehicles and equipment maintained according to manufacturer specifications.</li> <li>➤ Operations must meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993);</li> <li>➤ In managing noise specifically related to truck and vehicle traffic, efforts should be directed at: <ul style="list-style-type: none"> <li>○ Minimising individual vehicle engine, transmission, and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.</li> <li>○ Avoid unnecessary idling times.</li> </ul> </li> <li>➤ A noise complaints register must be maintained on site.</li> </ul>	SANS Environmental Noise Standards IFC Performance Standards	Throughout Prospecting Activities
<b>Surface Water Resources</b>					
<p>All invasive prospecting phase activities</p> <p>Hydrocarbon spills and product spills</p> <p>Storage and handling of hazardous materials and chemicals</p> <p>Management and disposal of general waste,</p>	All phases	As above	<ul style="list-style-type: none"> <li>➤ Monitor and maintain the separation of clean and dirty water.</li> <li>➤ Reuse and recycling of water.</li> <li>➤ Provision and maintenance of chemical toilets.</li> <li>➤ Spill response kits available for all vehicles / machinery used for the prospecting.</li> <li>➤ The transport, storage, use and disposal of chemicals and hydrocarbons carefully controlled and recorded.</li> <li>➤ Secondary containment facilities and pollution control structures to be provided for any on-site fuel storage containers.</li> <li>➤ No drilling may take place within 100 m of a watercourse or within 500 m of a wetland, unless prior approval has been obtained from the relevant authorities, should this be required.</li> </ul>	MPRDA, NEMA and NEM:WA Regulations  MHTSA  Water management measures in compliance with NWA and GN704.	Throughout Prospecting Activities



including liquid wastes			<ul style="list-style-type: none"> <li>➤ All solid waste to be stored in appropriate receptacles and removed from site for offsite disposal daily</li> <li>➤ All vehicles and equipment maintained according to manufacturer specifications and regular inspections undertaken to ensure that leaks and spills are identified and corrected as soon as possible.</li> </ul>		
<b>Groundwater</b>					
Invasive Prospecting; Drilling	All phases	As above	<ul style="list-style-type: none"> <li>➤ Use to be made of drilling fluids which do not present a contamination risk to groundwater.</li> <li>➤ Exploration boreholes will be rehabilitated and closed after drilling.</li> <li>➤ Any exploration boreholes which are agreed to remain must be capped.</li> <li>➤ Groundwater abstraction for drilling activities shall not take place without the required regulatory approvals.</li> </ul>	MPRDA, NEMA and NEM:WA Regulations	Throughout Prospecting Activities
<b>Terrestrial Ecology (Fauna and Flora)</b>					
Clearing of vegetation for drilling and access tracks  Drilling and movement of equipment	All phases	As above	<ul style="list-style-type: none"> <li>➤ Before invasive prospecting may commence, an ecological specialist must do a walk-through of the proposed drill locations to identify any sensitive species or environments and further advise the drilling locations.</li> <li>➤ Limit vegetation clearing to drilling site areas and access.</li> <li>➤ Monitoring of man and machinery movement and prevention of access to areas outside of the drilling area.</li> <li>➤ The site speed limit should be set at a maximum of 40 kph for all vehicles.</li> <li>➤ No hunting or open fires are to be permitted.</li> <li>➤ All noise generating activities are to be within legal noise limits.</li> <li>➤ Establishment of an appropriate safety barrier to prevent unauthorised man/animal access to the drilling area.</li> <li>➤ The natural vegetation will be disturbed to a minimum and vegetative cover will be protected and kept in a good condition and maintained to keep all surfaces covered.</li> </ul>	NEMBA MPRDA NEMA	Throughout Prospecting Activities

			<ul style="list-style-type: none"> <li>➤ Vehicle movement will be restricted to existing roads or pre-approved routes and drilling pads confined to as small a footprint as possible.</li> </ul>		
<b>Heritage</b>					
All invasive prospecting activities	All phases	As above	<ul style="list-style-type: none"> <li>➤ Before commencing invasive prospecting activities, the impact areas should be subjected to a heritage walk down.</li> <li>➤ Historical farmsteads and graves will not be affected (altered, demolished, renovated, removed) prior to the investigation of these structures by a historical architect. The historical architect has to apply for a permit from SAHRA who would authorise any (recommended) changes to these historical structures which may include alterations, restoration, demolition, removal etc.</li> <li>➤ If any potential heritage resources or human remains are unearthed during prospecting, the site will be demarcated and access restricted. An archaeologist will then be commissioned to visit the site and advise on further steps to be taken.</li> </ul> <p><b><u>Chance Find Procedure</u></b></p> <ul style="list-style-type: none"> <li>➤ If during the any phase of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.</li> <li>➤ It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area.</li> <li>➤ The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.</li> </ul>	SAHRA	Throughout Prospecting Activities

<b>Rehabilitation and Closure</b>					
Rehabilitation of Mining Area	All phases	As above	<ul style="list-style-type: none"> <li>➤ Financial provisioning established and maintenance in accordance with the Financial Provisioning Regulations, 2015.</li> <li>➤ Rehabilitation of all areas disturbed by prospecting activities concurrently with prospecting.</li> <li>➤ Rehabilitate drilling sites and access tracks by ripping, reinstating topsoil and reseeding affected areas.</li> <li>➤ Removal of all remaining solid waste from site and disposal at a licensed waste disposal facility.</li> <li>➤ Removal of all remaining prospecting equipment from the area.</li> <li>➤ Reinstatement and compensation for any property damage / losses to landowners.</li> </ul>	<p>Water management measures in compliance with NWA and GN704.</p> <p>Rehabilitation in terms of MPRDA and NEMA and relevant Regulations</p>	Throughout Prospecting Activities
<b>Traffic</b>					
Movement of Man and Machinery	All phases		<ul style="list-style-type: none"> <li>➤ Avoid / minimise road traffic impacts through design and operational controls.</li> <li>➤ The site speed limit should be set at a maximum of 40 kph for all vehicles.</li> <li>➤ Apply dust suppression.</li> <li>➤ Limit traffic times to between 6:00 and 18:00.</li> <li>➤ Vehicles are to remain on existing or otherwise agreed access tracks.</li> </ul>	<p>Health and Safety</p> <p>SANS Environmental Noise Standards IFC Performance Standards</p> <p>National Road Traffic Act</p> <p>NEMA</p>	Throughout Prospecting Activities
<b>Socio-Economic</b>					
Employment  Invasive Prospecting Activities	All Phases		<ul style="list-style-type: none"> <li>➤ Enhance/prioritise employment of local people. Goods and services to be procured from local service providers.</li> <li>➤ The site speed limit should be set at a maximum of 40 kph for all vehicles.</li> <li>➤ A complaints register must be maintained on site.</li> </ul>	MPRDA	Throughout Prospecting Activities

EM and RF interference with MEERKAT / SKA Observatory					
All prospecting activities involving the use of machinery and equipment	All Phases	As above	<ul style="list-style-type: none"> <li>➤ Approval obtained prior to commencing with any prospecting activities which may have an RF or EM interference impact.</li> <li>➤ Radio frequency transmitters to comply with the Saturation threshold of (minus) -100 dBm in the territory of any of the radio astronomy stations.</li> <li>➤ Radio frequency transmitters to comply with the SARAS protection levels at the SKA Virtual Centre.</li> <li>➤ Electromagnetic emissions by electrical infrastructure and electrical equipment to comply with the SARAS protection levels in the territory of any of the radio astronomy stations.</li> </ul>	Astronomy Geographic Advantage Act, 2007 and the regulations promulgated in terms thereof	Throughout the LOM

**TABLE 29-2: IMPACT MANAGEMENT OUTCOMES<sup>9</sup>**

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE / MEASURES	COMPLIANCE WITH STANDARDS
<b>Soils and Land Use</b>					
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Loss of soil resources due to soil disturbance, erosion as well as contamination	Soils	All phases	<ul style="list-style-type: none"> <li>➤ Avoid/ minimise through design and operational controls.</li> </ul>	MPRDA NEMA NEMBA GN704
<b>Air Quality</b>					
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Increased dustfall, PM10 and PM2.5 Levels	Air quality	All phases	<ul style="list-style-type: none"> <li>➤ Control through design and operational controls</li> <li>➤ Apply dust suppression</li> </ul>	Dust suppression to comply with Dust Control Regulation GNR 827 of 2013 and NEM:AQA, 2004.
<b>Noise</b>					
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Increased ambient noise levels from prospecting equipment which may disturb sensitive receptors	Noise	All phases	<ul style="list-style-type: none"> <li>➤ Minimise through design and operational controls</li> </ul>	SANS Noise Standards IFC Performance Standards
<b>Surface Water Resources</b>					
Invasive Prospecting: Preparation of Access Tracks and Drilling	Surface water contamination from hydrocarbon spills	Surface water	All phases	<ul style="list-style-type: none"> <li>➤ Avoid/ minimise through design and operational controls.</li> </ul>	MPRDA NEMA NEMBA

<sup>9</sup> Please refer to Table 29-1 for the detailed mitigation measures

Areas, Drilling and Trenching					GN 704
<b>Groundwater</b>					
Invasive Prospecting: Drilling	Groundwater contamination through pollution from the uncontrolled release of drilling fluids and/or the establishment of a preferential pathway for contaminants during and after drilling has been complete.	Groundwater	All phases	➡ Avoid/ minimise through design and operational controls.	MPRDA NEMA NEMWA
<b>Terrestrial Ecology</b>					
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Loss of natural habitat	Terrestrial flora	All phases	➡ Avoid/ minimise through design and operational controls	MPRDA NEMA NEMWA NEMBA
	Loss of medicinal / conservation important plant species	Terrestrial flora	All phases		
	Loss of Faunal Habitat	Terrestrial fauna	All phases		

<b>Heritage</b>					
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Disturbance/loss of significant archaeological or cultural heritage sites/remains  Disturbance/Loss of Significant palaeontological features	Archaeology, palaeontology, and cultural heritage	All phases	Maintain / monitor through implementation of chance find procedure	SAHRA
<b>Traffic and Road</b>					
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Traffic injuries and fatalities to community members from accidents with prospecting vehicles / equipment	Traffic and Road Safety	All phases	➡ Avoid / minimise through design and operational controls.	Health and Safety  National Road Traffic Act
<b>Socio-Economic</b>					
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Local procurement of goods and services during the prospecting activities	Socio-Economic Environment	All Phases	Ensure that employment opportunities and skills requirements are advertised locally and that recruitment centres (labour desks) are easily accessible to the local population.  Enhance/prioritise employment of local people. Goods and services to be procured from local service providers	Community liaison

**TABLE 29-3: IMPACT MANAGEMENT ACTIONS**

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE / MEASURES	TIMEFRAME FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
<b>Soils and Land Use</b>				
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Loss of soil resources due to soil disturbance, erosion as well as contamination.	➡ Avoid/ minimise through design and operational controls.	Throughout Prospecting Phase	MPRDA NEMA NEMBA GN704
<b>Air Quality</b>				
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Increased dustfall, PM10 and PM2.5 Levels	➡ Avoid/ minimise through design and operational controls.	Throughout Prospecting Phase	Dust suppression to comply with Dust Control Regulation GNR 827 of 2013 and NEM:AQA, 2004.
<b>Noise</b>				
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Increased ambient noise levels from prospecting equipment which may disturb sensitive receptors	➡ Minimise through design and operational controls	Throughout Prospecting Phase	SANS Noise Standards IFC Performance Standards



<b>Surface Water Resources</b>				
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Surface water contamination from hydrocarbon spills	☞ Avoid/ minimise through design and operational controls.	Throughout Prospecting Phase	MPRDA, NEMA and NWA Regulations.
	Erosion and stormwater management		Throughout Prospecting Phase	
<b>Groundwater</b>				
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Groundwater contamination through pollution from the uncontrolled release of drilling fluids and/or the establishment of a preferential pathway for contaminants during and after drilling has been completed	☞ Avoid/ minimise through design and operational controls	Throughout Prospecting Phase	MPRDA  NEMA  NEMWA
<b>Terrestrial Ecology</b>				
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Loss of natural habitat	☞ Avoid/ minimise through design and operational controls	Throughout Prospecting Phase	MPRDA
	Loss of medicinal / conservation important plant species		Throughout Prospecting Phase	NEMA
	Loss of faunal habitat		Throughout Prospecting Phase	NEM:WA  NEM:BA
<b>Traffic and Road</b>				
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Traffic injuries and fatalities to community members from accidents with prospecting vehicles / equipment	☞ Avoid / minimise through design and operational controls.	Throughout Prospecting Phase	Health and Safety  National Road Traffic Act

**Heritage**

<p>Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching</p>	<p>Disturbance/loss of significant archaeological or cultural heritage sites/remains</p>	<p>The following procedure is only required if fossils are seen on the surface and when drilling or excavations commence.</p> <ul style="list-style-type: none"> <li>➤ When drilling or excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, wood, bone, coal) should be put aside in a suitably protected place. This way the prospecting activities will not be interrupted.</li> <li>➤ Photographs of similar fossil plants must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones (for example see Figure 5, 6). This information will be built into the EMP's training and awareness plan and procedures.</li> <li>➤ Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.</li> <li>➤ If there is any possible fossil material found by the developer/environmental officer/miners then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.</li> <li>➤ Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports</li> </ul>	<p>Throughout Prospecting Phase</p>	<p>SAHRA</p>
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		<p>must be submitted to SAHRA as required by the relevant permits.</p> <p>➤ If no good fossil material is recovered, then the site inspections by the palaeontologist will not be necessary. Annual reports by the palaeontologist must be sent to SAHRA.</p> <p>If no fossils are found and the excavations have finished, then no further monitoring is required.</p>		
<b>Socio-Economic</b>				
Invasive Prospecting: Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Local procurement of goods and services during the prospecting activities	No mitigation Identified	Throughout Prospecting Phase	Community liaison
<b>EM and RF interference with MeerKAT / SKA Observatory</b>				
Operating of drilling equipment and machinery, including communication devices	EM and RF interference within the declared Karoo Central AAA and the impact this may have on the operation of the MeerKAT/SKA Observatory	<ul style="list-style-type: none"> <li>➤ Radio frequency transmitters to comply with the Saturation threshold of (minus) -100 dBm in the territory of any of the radio astronomy stations</li> <li>➤ Radio frequency transmitters to comply with the SARAS protection levels at the SKA Virtual Centre</li> <li>➤ Electromagnetic emissions by electrical infrastructure and electrical equipment to comply with the SARAS protection levels in the territory of any of the radio astronomy station</li> </ul>	Throughout Prospecting Phase	Astronomy Geographic Advantage Act, 2007 and the regulations promulgated in terms thereof

## 30 FINANCIAL PROVISION

### 30.1 DETERMINATION OF THE AMOUNT OF FINANCIAL PROVISION

#### 30.1.1 DESCRIBE THE CLOSURE OBJECTIVES AND THE EXTENT TO WHICH THEY HAVE BEEN ALIGNED TO THE BASELINE ENVIRONMENT DESCRIBED UNDER THE REGULATION.

The main closure objectives of the proposed prospecting activities are:

- To restore the site to its current land capability in a sustainable matter;
- To prevent the establishment of any permanent structures or features, unless otherwise agreed with stakeholders;
- To establish a stable and self-sustainable vegetation cover in areas disturbed by prospecting;
- To limit and rehabilitate any erosion features and prevent any permanent impact to the soil capability in areas disturbed by prospecting;
- To limit and manage the visual impact of the prospecting activities;
- To safeguard the safety and health of humans and animals on the site;
- To close the prospecting operation efficiently, cost effectively and in accordance with legal requirements;
- Cleaning up of the sources of possible contamination still present on the site to protect the downstream receiving environment;
- Removing waste material;
- Cleaning-up and rehabilitating of contaminated soil areas, if applicable; and
- Limiting the possible loss of topsoil by committing the available topsoil to key pre-determined rehabilitation areas.

#### 30.2 **CONFIRM SPECIFICALLY THAT THE ENVIRONMENTAL OBJECTIVES IN RELATION TO CLOSURE HAVE BEEN CONSULTED WITH LANDOWNER AND INTERESTED AND AFFECTED PARTIES**

The Applicant has already entered into discussions with potentially affected landowners regarding the proposed prospecting activities, including the applicable rehabilitation and closure requirements.

Landowners, known land users and I&APs were notified of the availability of the Draft BAR report and provided with an opportunity to comment thereon. All comments and responses received from landowners and I&APs is included in this Final BAR.

#### 30.3 **PROVIDE A REHABILITATION PLAN THAT DESCRIBES AND SHOWS THE SCALE AND AERIAL EXTENT OF THE MAIN MINING ACTIVITIES, INCLUDING THE ANTICIPATED MINING AREA AT THE TIME OF CLOSURE.**

##### 30.3.1 REHABILITATION OF BOREHOLES

- Drill sites will be rehabilitated on an ongoing basis as they are completed.
- All shallow boreholes will be backfilled and levelled.
- All boreholes will be covered with a metal plate and 1000 mm of previously stored topsoil.

##### 30.3.2 FINAL REHABILITATION OF ACCESS TRACKS AND / ROADS

Roads that are not needed for closure and post-closure uses will be rehabilitated. This will include:

- Removal of all signage, fencing, shade structures, traffic barriers, etc.;
- All roads will be ripped, ploughed and re-vegetated; and
- All potentially contaminated soils will be removed and disposed of at a licensed landfill site.

### 30.3.3 SITE REHABILITATION

- All construction equipment must be removed from the site. This includes vehicles, temporary structures, fencing, unused pipes/culverts etc;
- All waste will be removed from site to a licensed landfill facility;
- Any contaminated soil will be removed and disposed of at a licensed landfill facility;
- All disturbed surfaces will be revegetated;
- Topography will be free draining after rehabilitation; and
- The Contractor shall ensure that all weeds and alien/invasive species cleared for prospecting activities are removed from site.

### 30.3.4 EXPLAIN WHY IT CAN BE CONFIRMED THAT THE REHABILITATION PLAN IS COMPATIBLE WITH THE CLOSURE OBJECTIVES

The objective of the rehabilitation process is to restore as much as possible of the area disturbed during the prospecting activities to a land use as close as possible to that previously practiced before prospecting. The rehabilitation activities proposed in the above rehabilitation plan will ensure that the land reverts back to its original state upon closure of the prospecting activities.

### 30.3.5 CALCULATE AND STATE THE QUANTUM OF THE FINANCIAL PROVISIONS REQUIRED TO MANAGE AND REHABILITATE THE ENVIRONMENT IN ACCORDANCE WITH THE APPLICABLE GUIDELINE

Financial provisioning was determined by calculating the cost of rehabilitation for drilling sites and access tracks by ripping, reinstating topsoil and reseeding affected areas. The DMR master rate for rehabilitation was applied to the area of disturbance.

A summary of the calculated liability for rehabilitation is provided in Table 30-1 below.

**TABLE 30-1: CALCULATED LIABILITY FOR REHABILITATION**

DESCRIPTION	DISTURBANCE AREA	UNIT	UNIT COST OF REHABILITATION	TOTAL
General surface rehabilitation, including grassing of all denuded areas	0.1125	ha	115,754	13,022
Rehabilitation of access roads	400	m2	37	14,964
2 to 3 years of maintenance and aftercare	0.1525	ha	15,404	2,349
<b>TOTAL EXCL. VAT</b>				30,336
<b>VAT (15%)</b>				4,550
<b>TOTAL</b>				<b>34,886</b>

**30.3.6 CONFIRM THAT THE FINANCIAL PROVISION WILL BE APPROVED AS DETERMINED**

Orion Exploration No.5 will provide a financial guarantee to the DMR upon request thereof and prior to the granting of the environmental authorisation.

**TABLE 30-2: MECHANISM FOR MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREON**

Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities	Implementation / Compliance Monitoring Mechanism	Monitoring and Reporting Frequency
<b>Invasive Prospecting:</b> Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Loss / disturbance of natural habitat	<ul style="list-style-type: none"> <li>➤ Site access protocol agreed with landowners</li> <li>➤ Compliance monitoring function assigned and appropriately resourced</li> </ul>	<ul style="list-style-type: none"> <li>➤ <u>Site manager</u> – accountable for ensuring that EMPr is implemented by all mine personnel and that there is overall compliance with EMPr</li> </ul>	<ul style="list-style-type: none"> <li>➤ Site inspections</li> <li>➤ Internal compliance audits</li> <li>➤ Independent performance assessment reporting / audit</li> </ul>	<ul style="list-style-type: none"> <li>➤ Daily / weekly</li> <li>➤ Quarterly</li> <li>➤ Annual</li> </ul>
<b>Invasive Prospecting:</b> Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Contamination of surface water, groundwater and soil through hydrocarbon spills	<ul style="list-style-type: none"> <li>➤ Training on EMPr provided to all personnel involved in the prospecting</li> </ul>	<ul style="list-style-type: none"> <li>➤ <u>Environmental manager</u> – responsible for monitoring compliance with the implementation of the EMPr</li> </ul>		
<b>Invasive Prospecting:</b> Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Increased dustfall, PM10 and PM2.5 levels		<ul style="list-style-type: none"> <li>➤ <u>ECO / SHE representatives</u> – day to day inspections, compliance monitoring and sampling as may be required</li> </ul>		
<b>Invasive Prospecting:</b> Preparation of Access Tracks and Drilling Areas, Drilling and Trenching	Increased ambient noise levels from prospecting equipment which may disturb sensitive receptors		<ul style="list-style-type: none"> <li>➤ <u>External auditor</u> – responsible for performance assessment reporting, and auditing compliance with conditions of the EA</li> <li>➤ <u>Independent specialists</u> – responsible for undertaking specialist work as required</li> </ul>		

### **30.3.7 INDICATE THE FREQUENCY OF THE SUBMISSIONS OF THE PERFORMANCE REPORT**

The environmental liability will be assessed annually as required by NEMA. For prospecting activities, it is recommended that a performance assessment / environmental audit be conducted once the invasive prospecting activities have been completed. The performance assessment / environmental audit report will be completed at the frequency stipulated in the conditions of the environmental authorisation.

#### **30.3.7.1 Audit and report on performance measures**

The following compliance monitoring and reporting actions shall be undertaken:

##### **Inspection**

SHE inspections of the Works shall be conducted daily on an *ad hoc* basis and formally at least once a week.

##### **Internal Auditing**

Internal SHE compliance audits shall be conducted as specified in Table 30-2. The purpose of the internal compliance audits shall be to confirm that all management actions outlined in the EMPr have been implemented. The Contractor / Owner will be responsible for the implementation of corrective measures that may result from the findings of such audits, which will investigate at least the following:

- Completeness of SHE documentation, including planning documents and inspection records;
- Compliance with monitoring requirements;
- Suitability of EMPr in addressing general environmental performance at the Site;
- Efficacy of management controls to address any non-compliance with monitoring requirements; and
- Training activities and record keeping.

#### **30.3.7.2 External Auditing**

External audits shall be completed in the manner and frequency determined in Table 30-2.

#### **30.3.7.3 Environmental Incidents and Non-Compliances**

The reporting of an environmental incident and or non-compliance shall be as follows:

- Site personnel shall, as soon as possible, inform the site manager of the incident and/or non-compliance, the severity thereof and the corrective actions taken;
- The incident and/or non-compliance details shall be recorded on a register maintained on site;
- Depending on the level of the incident the Owner shall inform the relevant authorities of the incident / non-compliance; and
- Any corrective actions required following the incident and / or non-compliance, including any rehabilitation requirements, shall be implemented by the Contractor / Operator.

### **30.3.8 MANNER IN WHICH THE APPLICANT INTENDS TO INFORM HIS OR HER EMPLOYEES OF ANY ENVIRONMENTAL RISK WHICH MAY RESULT FROM THEIR WORK**

Orion Exploration No. 5 will be responsible for ensuring implementation of the EMPr for the proposed prospecting activities. Orion Exploration No. 5 will also ensure that a procedure is developed such that all senior positions on site have their environmental responsibilities and accountabilities clearly outlined. These descriptions will form part of the contractual obligations upon which individual employees are engaged. Specific accountabilities and responsibilities outlined in the procedures will be communicated through the Project Manager.



The Company is committed to ensuring that the Occupation Health & Safety (OHS) and Environment Departments' staffs are appropriately qualified for implementing their assigned responsibilities effectively. In order to fulfil this requirement, the Company shall recruit competent individuals and put in place a continuous training and skills upgrading program. Typical duties and responsibilities for the OHS and Environment staff will include, inter alia to:

- Ensure that environmental monitoring programs are carried out on schedule and correctly;
- Review environmental data and recommend appropriate actions;
- Monitor environmental compliance of all operations;
- Train others in the team and general personnel on prospecting related environmental issues;
- Design and implement restoration of disturbed areas and re-vegetation studies;
- Establish, train and ensure readiness of the emergency response teams;
- Report on environmental data and incidents of significance as per regulations;
- Liaise with the appropriate regulatory authorities on incidences with environmental risks;
- Provide technical and environmental support to mining operations;
- Ensure commitments listed in the EMPr are met, and
- Review (periodically) the existing monitoring system and design.

### **30.3.9 MANNER IN WHICH RISK WILL BE DEALT WITH IN ORDER TO AVOID POLLUTION OR THE DEGRADATION OF THE ENVIRONMENT**

Potential risk associated with the proposed project has been assessed in Part A of the BAR and the implementation of the management measures in the EMPr will reduce the risk posed to the environment. In conjunction with the EMPr, an Emergency Preparedness and Response Plan shall be available on site dealing with different environmental and safety procedures should an emergency occur.

### **30.3.10 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY**

No specific information has been requested by the competent authority for the proposed prospecting application.

The financial provisions for closure and rehabilitation will be confirmed annually and all audits and associated statutory reporting requirements will be adhered to throughout the prospecting phase.

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#### 30.4 UNDERTAKING

The EAP herewith confirms:

- (a) The correctness of the information provided in this report
- (b) The inclusion of comments and inputs from stakeholders and I&APs
- (c) The inclusion of inputs and recommendations from the specialist reports where relevant, and
- (d) The acceptability of the project in relation to the fining of the assessment and the level of mitigation proposed,

## APPENDIX A: EAP EXPERIENCE

## APPENDIX B: MAPS

**MAP 1: REGIONAL LOCALITY MAP**

## MAP 2: SENSITIVITY



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**MAP 3: CRITICAL BIODIVERSITY AND ECOLOGICAL SUPPORT AREAS**

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**MAP 4: CURRENT LANDUSES**

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**MAP 5: SOILS**

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**MAP 6: VEGETATION**

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**MAP 7: PRA IN RELATION TO THE KAROO CENTRAL AAA**

## APPENDIX C: PUBLIC PARTICIPATION MATERIALS

**APPENDIX C1 – STAKEHOLDER NOTIFICATION LETTER**

**APPENDIX C2 - ADVERT**



## APPENDIX C3 – SITE NOTICE

**APPENDIX C4 - COMMENTS AND RESPONSES (2019 APPLICATION)**

**APPENDIX C4 - COMMENTS AND RESPONSES (2018 APPLICATION)**

## APPENDIX C5 – I&AP REGISTER

## APPENDIX C6 – I&AP CORRESPONDENCE

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## APPENDIX D: HERITAGE AND PALAEOLOGICAL ASSESSMENT

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## ECOLOGY SCREENING REPORT

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## APPENDIX E: SUMMARY LIST OF LEGISLATION





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