



# **FINAL SCOPING REPORT AND PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT**

## **KROONSTAD EXPLORATION RIGHT AND ENVIRONMENTAL AUTHORISATION APPLICATION**

**PREPARED ON BEHALF OF:**

**WESTERN ALLEN RIDGE GOLD MINES (PTY) LTD**

**SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS 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).**

**PASA REFERENCE NUMBER:**

**12/3/363 ER**

**30 OCTOBER 2020**

## WESTERN ALLEN RIDGE GOLD MINES (PTY) LTD

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#### KROONSTAD EXPLORATION RIGHT AND ENVIRONMENTAL AUTHORISATION APPLICATION

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REVISION AND AMENDMENTS		
Revision	Date	Report
1	15 September 2020	Draft Scoping Report and Plan of Study for the Environmental Impact Assessment
2	30 October 2020	Final Scoping Report and Plan of Study for the Environmental Impact Assessment

## PURPOSE OF THIS DOCUMENT

This document has been compiled in support of a Gas Exploration Right and Environmental Authorisation Application and aims to assess any impacts associated with gas exploration activities as detailed in the associated Exploration Work Programme. It is important that Interested and Affected Parties are provided with an opportunity to review and comment on the Scoping Report, thereby contributing to the Scoping process and assisting in identifying any additional risks or impacts that may be experienced. As such, a public consultation is being undertaken for this project and the results of the Draft Scoping Report 30 day review period are documented in this Final Scoping Report. This report will be made available to Interested and Affected Parties for review and comment for a period of an additional 30 days (excluding public holidays).

Members of the public, local communities and stakeholders are invited to comment on the Final Scoping Report which is made available for public review and comment from the 30<sup>th</sup> October 2020 to the 30<sup>th</sup> November 2020. This report has also been submitted to the Petroleum Agency South Africa (PASA). A hard copy of the report is available at the following public venue:

Venue	Address
Gaggle-Inn Country Estate	82 Vrischgewaagd Kroonstad 9500

An electronic copy of the Final Scoping Report is available on the Shango Solutions website (<http://www.shango.co.za/public-documents/>), for download. In addition, CD copies of the report are available from Shango Solutions upon request. All comments on the Final Scoping Report must be submitted directly to PASA, and a copy submitted to Shango Solutions, utilising the following contact details:

Petroleum Agency South Africa	Shango Solutions
Tel: 021 938 3570 Fax: 021 938 3520 Email: <a href="mailto:ngesip@petroleumagency.co.za">ngesip@petroleumagency.co.za</a> Contact person: Ms Phumla Ngesi PASA reference number: 12/3/363 ER Postal address: P.O. Box 5111, Tygervally, 7536	Tel: 011 678 6504 Fax: 011 678 9731 E-mail: <a href="mailto:zizo@shango.co.za">zizo@shango.co.za</a> Contact person: Ms Zizo Siwendu Project name: Kroonstad Exploration Right Postal address: P.O. Box 2591, Cresta, 2118

## SUMMARY OF WHAT THE FINAL SCOPING REPORT CONTAINS

This report contains:

- A description of the proposed exploration activities.
- An overview of the Environmental Impact Assessment process, including public participation.
- A description of the existing environment in the proposed project area.
- The environmental issues and impacts which were identified during the Scoping phase.
- The Plan of Study for the Environmental Impact Assessment and terms of reference of the specialist studies planned for the Environmental Impact Assessment phase.
- A list of Interested and Affected Parties involved during the Scoping phase.
- Results of the Public Participation Process undertaken during the Draft Scoping Report review period.
- The assessed environmental impacts and recommended mitigation measures.

## EXECUTIVE SUMMARY

### 1. Background

Western Allen Ridge Gold Mines (Pty) Ltd (Western Allen Ridge) (a subsidiary of White Rivers Exploration (Pty) Ltd) held a Technical Co-operation Permit (TCP) (PASA Reference No. 12-2-167). Desktop studies and preliminary geological models that were performed under the TCP provided positive indications that the area is prospective for gas. As such, Western Allen Ridge lodged an Exploration Right application with the Petroleum Agency South Africa (PASA) in June 2020 over the TCP area, in order to ascertain if viable hydrocarbon (oil, gas and condensate) deposits exist. The Exploration Right application has been allocated the reference number: 12/3/363 ER.

### 2. Introduction

Western Allen Ridge has submitted an application for an Exploration Right to PASA in order to explore for oil, gas and condensate. The application, submitted in terms of Section 79 of the Mineral and Petroleum Resources Development Act, 2002 (MPRDA, Act No. 28 of 2002) was accepted by PASA on the 16<sup>th</sup> July 2020. As per Section 10 of the MPRDA, PASA has published notice of the application in the provincial gazette.

In order to undertake exploration activities, Western Allen Ridge requires a granted Exploration Right in terms of the MPRDA, 2002 (Act No. 28 of 2002). In accordance with the National Environmental Management Act, 1998 (NEMA, Act 107 of 1998) Environmental Impact Assessment Regulations, the following environmental permitting and licensing processes are required:

1. Undertaking the Public Participation Process.
2. Completion of an Environmental Authorisation Application Form.
3. Compilation of Scoping and Environmental Impact reports.
4. Development of an Environmental Management Programme.

Western Allen Ridge has appointed Shango Solutions as the Environmental Assessment Practitioner (EAP) to manage the required environmental process for the Exploration Right application.

### 3. Legal Background and Requirements

This report has been compiled in accordance with Appendix 2 of the General Notice Regulations (GNR) 326 of the NEMA 2014 EIA Regulations (as amended on the 7<sup>th</sup> April 2017) and the Directive set out in the template prescribed by the Department of Mineral Resources.

### 4. Project Location

The area of interest occupies a total of approximately 33 605.2929 hectares (ha) in respect of farm properties located in the Magisterial Districts of Kroonstad and Lindley, which falls within the Moqhaka and Ngwathe Local Municipalities, under the Fezile Dabi District Municipality, approximately 15 kilometres (km) east of the town of Kroonstad in the Free State Province of South Africa.

The application area excludes all properties where a granting is prohibited by Section 48 of the MPRDA. These include:

1. Nature Reserves, National Parks, Protected Areas or Protected Environments, (including World Heritage Sites, and Protected Forest Areas).
2. Residential areas.
3. Public roads, railways and cemeteries.
4. Servitudes.
5. Areas identified by the Minister by notice in the Gazette in terms of Section 49 of the MPRDA.

## 5. Geological Formation and Exploration Target

The surface geology of the application area is dominated by Karoo Supergroup sediments of the Volksrust Formation, Ecca Group. Beaufort Group sediments and Karoo age dolerite intrusions also occur on and in close proximity to the application area. Quaternary sand and gravel is limited to the surface drainage patterns. Karoo Supergroup sediments and later age intrusives are underlain by rocks of the Witwatersrand, Ventersdorp and Transvaal supergroups.

Exploration targets include gas-bearing coal seams of the Karoo Supergroup and pre-Karoo gas-bearing structures. Shales of the Volksrust Formation and younger dolerite sills may act as suitable cap rocks that trap gas, especially where pre-Karoo palaeo-highs occur. Gas rich in helium and methane associated with pre-Karoo structures represents the primary target.

## 6. Project Description

Invasive and non-invasive exploration activities will be undertaken as part of the proposed Exploration Work Programme (EWP). The EWP is based on a phased approach over three years. The non-invasive activities include (i) the acquisition, capture and synthesis of historical data, (ii) desktop studies, (iii) updating of the GIS database, (iv) geological modelling, (v) laboratory analyses of gas samples (vi) interpretation and analysis of data collected and (vi) re-evaluation of exploration programme/concept study. The invasive exploration activities will include diamond drilling of 4 wells to a depth of 600 metres each. **No hydraulic fracturing will be performed as part of the exploration programme.**

## 7. Project Supporting Infrastructure and Services

No permanent infrastructure will be established to carry out the exploration activities. Sites will be accessed by using existing roads or farm tracks, where available. Where access is unavailable, access tracks to accommodate a vehicle will be created for the planned well drilling. No accommodation for staff and workers will be provided on-site unless permission is granted by the landowner. Should the landowner not grant permission, all persons will be accommodated in nearby towns (i.e. Kroonstad) and workers will be transported to and from the exploration site(s) on a daily basis. Equipment for drilling will be provided by specialist contractors. The majority of equipment, consumables and labour for these services are specialised. Contractors and suppliers will be encouraged to source locally as much as is feasible.

Electricity, if required, will be provided by on-site generators. Water required for the operation of the drilling rig, as well as potable water will be obtained locally, by agreement with land owners or the local municipality. The daily water requirements for operations will be a maximum of 5 000 litres per day. Chemical toilets will be provided for the personnel. The toilets will be supplied and managed by a specialist contractor and the sewage disposed of at the nearest wastewater management facility, or as required by the local authority.

All general and hazardous waste generated at the drilling site(s) will be separated and stored in containers, before being removed from site and disposed at an appropriate waste disposal facility. The core recovered from the drilling will most likely be stored in a core shed for analysis and record keeping.

Mineral residue produced during drilling practices will be managed in terms of the MPRDA and appropriate regulations, most notably Regulation 704 (4 June 1999) under the National Water Act, 1998 (Act 36 of 1998) (NWA) and Regulation 632 on the Planning and Management of Residue Stockpiles and Residue Deposits (July 2015) under the National Environmental Management Waste Act (Act 59 of 2008) (NEMWA). Water from the drilling operations will be disposed of in accordance with the provisions of the NWA and the NEMWA (as applicable).

## 8. Need and Desirability of the Project

Should exploration activities prove successful and a resource is quantified, it would indicate a potential viable economic activity in the form of gas production. Production will contribute greatly to local economic growth through direct employment, future business opportunities, royalties and tax revenues.

## 9. Alternatives

The identification of alternatives is a key aspect of the success of the Environmental Impact Assessment process. All reasonable and feasible alternatives must be identified and screened to determine the most suitable alternatives to consider in this application. There are however, some constraints that have to be taken into account when identifying alternatives for a project depending on the scope. Such constraints include financial, social and environment related constraints.

Alternatives can typically be identified according to:

1. Activity alternatives.
2. Location alternatives.
3. Design or layout alternatives.
4. Technology alternatives.
5. Operational alternatives.
6. No-Action alternative (No-Go).

For any alternative to be considered feasible, such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts. Alternatives are typically distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and/or Environmental Impact Assessment process. Incremental alternatives typically arise during the Environmental Impact Assessment process and are usually suggested as a means of addressing/mitigating identified impacts (exploration in low sensitivity areas). These alternatives are closely linked to the identification of mitigation measures and are therefore not specifically identified as distinct alternatives.

## 10. Scoping Specialist Studies

The compilation of the Scoping Report for the proposed exploration project required the input and contribution from several specialists, namely:

1. Soil, Land Capability and Agricultural Potential.
2. Terrestrial Biodiversity (Fauna, Avifauna and Flora).
3. Wetland Delineation.
4. Financial Provision and Final Rehabilitation, Decommissioning and Closure Plan.
5. Heritage.
6. Palaeontology.
7. Geohydrology.

## 11. Baseline Environment

The specialist studies assisted in determining the baseline information on the receiving environment and in identifying environmental sensitivities on site. The studies also assisted in the assessment of impacts associated with the project activities and in providing mitigation measures for the identified impacts. In addition, the specialist investigations concentrated most of their attention on the four exploration drilling target areas (Well A, B, C and D).

Based on the assessment of these studies, which were conducted at scoping level, and constituted mainly desktop work, no major fatal flaws were identified for this project, provided that the mitigation measures recommended by the specialists are implemented by the Applicant. Below is a summary of the baseline information.

### 11.1 Topography

The Pedology and Wetland scoping assessments focussed on regulated areas (100 m radius) of the drilling target areas. The majority of the application area is characterised by gentle slope percentages ranging from 0 and 0.5% (less than 1:100 vertical to horizontal slope ratio in meters).

### 11.2 Climate

The application area is situated in a region characterised by warm-temperate summer rainfall, with an average annual precipitation of 550 mm to 586 mm. High summer temperatures are common for this region with severe frost occurring throughout the winter (on average 37 days per year). The expected evapotranspiration is between 1 550 mm/annum and 1 600 mm/annum.

Major macroclimatic traits that characterise the application area include:

1. Seasonal precipitation.
2. The minimum temperatures in winter.

### 11.3 Fauna

Fauna within the Kroonstad project area and its surrounds has been impacted by dominant land uses, including agriculture, watercourses and informal residential areas. 209 bird species potentially occur in the vicinity of the project area, although only 9 species are listed as Species of Conservation Concern (SCC) either on a regional or global scale.

The Red Data species that may occur in the project area consists of 74 mammal species, of which eight are medium to large conservation dependant species. Of the remaining 66 small to medium sized mammal species, ten (10%) are listed as being SCC on a regional or global basis.

28 reptile species have the potential to occur in the application area. One of the expected species is a SCC, with no amphibian SCCs.

### 11.4 Flora

The exploration target areas are located within the Central Free State Grassland (Well D area) and the Vaal-Vet Sandy Grassland (Well A, B and C areas) vegetation.

Vaal-Vet Sandy Grassland vegetation type is distributed throughout the North-West and Free State Provinces. It features in areas dominated by plains with scattered and undulating hills, comprising of low-tussock grasslands. The conservation status of this vegetation type is endangered.

The Central Free State Grassland vegetation type is distributed throughout the Free State Province and continues into parts of Gauteng. It comprises of short grassland covered undulating plains and is characterised by Dwarf karoo bushes which have established due to the level of disturbances. Low-lying areas that have been overgrazed and trampled are susceptible to *Acacia karoo* overgrowth.

No serious alien flora has been observed within this vegetation type with only Dwarf karoo bushes dominating disturbed clayey areas. None of the identified plant species are classified as SCC.

Establishment of vegetation for rehabilitation should be aligned with the vegetation types typically found in the area.

### 11.5 Soils

The soils expected to occur within the drilling target areas predominantly include Avalon, Westleigh, Valsrivier and Willowbrook:

1. Soil forms associated with the project area include Bd, Bc, Ae and Ba land types, which correlates with the findings from the land type database.
2. Soil textures found in the Central Free State Grassland include the Adelaide Subgroup's Sandstone and Sedimentary mudstone which are found in the extreme northern section of this vegetation type, together with that of the Eccia Group.

### 11.6 Surface Water

The project area falls predominantly within the Renoster River catchment (C70) which is part of the Vaal Water Management Area (WMA:5). The proposed exploration study area lies within the C70G quaternary catchment associated with the Heuningspruit. The Rietspruit is a tributary of the Heuningspruit and is a key biophysical feature of the project area. The Rietspruit originates South of Edenville in the vicinity of Well C, B and A areas. The river flows in a westerly direction bisecting the project area and joining the Heuningspruit to the North West of the project area, aligning with the general surface flow direction.

### 11.7 Geology and Groundwater

The geology and geohydrology, at this initial stage of exploration, is broadly described for the whole project area. The regional geology is mainly associated with the Karoo Supergroup. The following is noteworthy:

Aeolian sands overlay the surface area (Quaternary age), they are underlain by the following sequence:

1. Karoo formations.
2. Transvaal formations.
3. Ventersdorp Supergroup formations.
4. Witwatersrand Supergroup formations and basement rocks.

The aquifers in the study area are classified as minor aquifer systems, meaning that groundwater is of limited quantity, but potentially important for local water supply and base flow for rivers. Two main aquifers are typically formed in the Karoo sediments, namely:

1. The shallow aquifer forms within the weathered zone with the following characteristics:
  - The weathered zone is around 10 m - 40 m deep across the area.
  - The depth to groundwater in the weathered aquifer varies between 1 m - 20 m (average depth of 10 m).
  - The aquifer is unconfined and is replenished through the infiltration of rainwater (recharge) from the soil horizon.
  - The rate of recharge to this aquifer is typically assumed to be around 3% of the Mean Annual Precipitation (MAP).
  - Groundwater occurrence is most often associated with the transition between weathered and fresh rock.
  - Dolerite sill(s) often form a barrier between the upper weathered and deeper fractured rock aquifers.
  - Fresh and unfractured dolerite (low permeability) acts as an aquitard or even an aquiclude, forming a barrier to the vertical flow of groundwater from the weathered to fractured rock aquifers.
2. Deeper intergranular, fractured rock aquifers are characterised by:
  - Formation in faults, fractures, joints and bedding planes of the sediments and rock formations.
  - Most of the groundwater is stored in the matrix (or unfractured) part of these rock formations and is associated with the contact zones of the dolerite sills.
  - Typically, narrow and linear aquifers along the strike of the intrusion, where zones of increased permeability allow groundwater flow through otherwise tight rock matrices.



- Highly variable permeability dependant on the nature and extent of the secondary features mentioned, although decreased with depth.
- The depth to groundwater in the deeper fractured rock aquifer varies between 5 m and 30 m.

Specialist investigations in subsequent phases will include (although not limited to) resource descriptions and groundwater chemistry.

#### 11.7.1 Hydrocensus

A hydrocensus was undertaken between the 25<sup>th</sup> August and 2<sup>nd</sup> September 2020. The survey focussed on properties inside the application area and concentrated on identifying existing boreholes to enhance the knowledge of the groundwater systems and current groundwater use. A total of 42 farm portions were surveyed.

During the 2020 hydrocensus, 120 groundwater sites (boreholes) were identified. From the 120 boreholes that were surveyed:

1. 84 boreholes are currently in use. Of these:
  - 47 boreholes are fitted with submersible pumps.
  - 28 boreholes are fitted with wind pumps.
  - 5 boreholes are fitted with solar pumps.
  - 3 boreholes are fitted with mono pumps.
  - 1 borehole has a hand pump.
2. An additional 8 boreholes are equipped, but not in use.
3. 28 open / unequipped boreholes. Of these:
  - 15 are accessible, open holes.
  - 13 are collapsed / blocked boreholes.

Groundwater level measurements were possible from 45 boreholes and 21 groundwater samples were collected for water quality analysis.

The following general observations and conclusions were made from the hydrocensus:

1. Groundwater is one of the main sources of water in the study area. In most cases it was the only source of water. It was only the properties that have access to the local surface water systems, like the Rietspruit, where surface water is another source of water. Several pools of water could still be seen during the hydrocensus, in the Rietspruit. Earth dams are also present in the local streams and rivers to help secure a source of water for the local farming activities. Edenville town is dependent on several boreholes to supplement the town water supply from Heilbron.
2. Most of the landowners in the western section of the study area refused access to their properties. The landowners were concerned about the negative impact that prospecting and mining activities have on the environment and were concerned about the negative impact on their already limited water resources.
3. The regional groundwater flow is in a westerly to north-westerly direction.
4. The highest water elevations can be found in the vicinity of the Farm Mooihoek (eastern boundary of the application area) and the lowest water table elevations to the west, on the Farms Fermanagh, Zoar and Klipfontein 2140 Portion1.
5. From the 45 measured water levels, only two were deeper than 20 m below surface. The rest were on average between 3 and 18 m below surface. The average depth for the study area is 9.1 m.
6. The depth of the water strikes, and the depth of the boreholes are unfortunately not known for many of the sites. Most of the private boreholes are 30 to 50 m deep, with pumps often installed between 20 and 45 m below surface.

7. The Edenville town boreholes seem to be the deepest, with an average pump depth of 60 m. The deepest pump is at 70 m below surface. This indicates that most of the boreholes potentially only penetrate the weathered, and the shallow weathered and fractured aquifers.
8. Borehole yields are predominantly in the 800 to 3 000 Litres per Hour (L/hr) range, with isolated high yields of 7 000 to 15 000 L/hr. Many of the higher yielding boreholes are close to surface water features (such as earth dams or streams).
9. Based on the SANS241 drinking water guideline and on the sampled borehole water results, 7 of the 21 sampled boreholes are not fit for human consumption (unless treated). This is mainly the result of elevated nitrate concentrations. Fluoride is the only other parameter with a DWS classification of Class 2. This is only applicable for borehole NOA46 on Farm Langland 517 (RE). The rest of the tested parameters are within the Class 0 and Class 1 limits.

### 11.8 Wetlands

The proposed Well areas (A to D) are characterised by a flat terrain with very little signs of wetlands within the 500 m regulated areas. No topographical river lines or any signs of convex drainage features have been identified.

### 11.9 Sites of Archaeological and Cultural Importance

The Heritage Scoping Report indicates that the cultural landscape of the regional study area predominantly comprises of the historical built environment and archaeological artefacts representing the Middle Stone Age (MSA), Early Farming Communities (EFC) and Late Farming Communities (LFM), including graves or cemeteries and some historical buildings.

### 11.10 Current and Surrounding Land Use

The exiting land uses across the various target areas include the following:

1. Well A and C areas - crop fields.
2. Well B area - 5% of the area consists of crop fields with the remainder characterised by grazing.
3. Well D area - consists of 10% grazing and 90% crop fields.

The dominant land use within the exploration right area is agriculture, more specifically crop production and to a lesser extent grazing. Other land uses in the area include tourism (lodges), livestock and game farming (aligned with grazing).

### 11.11 Preliminary Impacts

Below is a preliminary list of negative impacts identified during the Scoping phase of this project. These impacts, and any others identified, will be further assessed during the EIA phase of the project:

1. Interference with existing land uses.
2. Sense of place.
3. Safety and security.
4. Perceptions and expectations.
5. Loss of soil resources and related land capability.
6. Habitat loss/destruction.
7. Disturbance of biodiversity.
8. Increase in disturbing noise levels.
9. Contamination of groundwater.
10. Reduction of groundwater availability.

#### 11. Loss or disturbance of heritage/cultural/ palaeontological resources.

The preliminary positive implications of the proposed project are as follows:

1. Job creation.
2. Contribution to royalties and tax revenues.
3. Generation of technical and general skills to low-skilled labourers.

These impacts, and any others identified, will be further assessed during the EIA phase of the project.

#### 12. Plan of Study for the EIA Phase

The Scoping and Environmental Impact Assessment (S&EIA) process is being carried out in accordance with the NEMA 2014 EIA Regulations (as amended). Each of the specialists will undertake detailed EIA specialist assessments. Included in this report is a detailed plan of study provided by each of the appointed specialists to be implemented during the EIA phase. Potential impacts identified during the Scoping and EIA will be assessed by the specialists for each feasible development alternative and for each phase of the project. The EIA and specialist studies will provide input into the Environmental Management Programme Report (EMPR) which will provide the necessary action plans and management measures to mitigate the identified impacts.

#### 13. Public Participation Process

The Public Participation Process (PPP) for the proposed project is being undertaken in accordance with the requirements of the MPRDA and NEMA, in line with the principles of Integrated Environmental Management (IEM). IEM implies an open and transparent participatory process, whereby stakeholders and other Interested and Affected Parties (I&APs) are afforded an opportunity to comment on the project. A joint PPP has been implemented to engage with I&APs and meet the requirements for Public Participation as stipulated by the relevant legislation. The PPP provides stakeholders with information about the proposed project and several opportunities to comment throughout the EIA/EMPR process. This will ensure public involvement at each key step in the process and allow for comments, concerns, suggestions, and objections to the proposed project to be included in each of the submissions to the relevant Government Authorities.

The first phase of an EIA is the Scoping Phase. In terms of the MPRDA and the NEMA, I&APs must be given the opportunity to comment on the proposed project. The Scoping Report aims to describe the proposed project, the environment in which the project is located, and the potential impacts that may result if the project goes ahead. The Draft Scoping Report was made available for public comment for a period of at least 30 days from the 15<sup>th</sup> September 2020 to the 16<sup>th</sup> October 2020. A public Open Day was held on the 30<sup>th</sup> September 2020 to introduce I&APs to the project and discuss the results of the Scoping Phase. The comments received from I&AP's during this commenting period have been captured in an I&AP summary table included in this Final Scoping Report.

An Environmental Impact Assessment Report (EIAR), including an EMPR, will be compiled and presented for public comment as the next step of this EIA process during which time further stakeholder engagement will take place.

#### 14. Conclusion

In order to comply with national legislation, the proposed exploration project will require authorisation in terms of the MPRDA and NEMA. As such the Applicant is required to undertake and submit the following reports for adjudication by the Competent Authority (PASA):

1. Scoping Report and EMPR as per the requirements of the MPRDA.

## 2. Scoping, EIR and EMPR as per the requirements of the NEMA.

Thus, in parallel to the application in terms of the MPRDA, an application in terms of NEMA was compiled and submitted to the PASA for decision-making. The first phase of an EIA is the Scoping Phase. Specialists were appointed to undertake scoping level assessments to describe the baseline receiving environment and potential impacts that may result if the proposed exploration activities take place. Included in this report is a detailed plan of study provided by each of the appointed specialists to be implemented during the EIA phase. Potential impacts identified during the EIA will be assessed by the specialists for each development alternative and for each phase of the project. An EIAR, including an EMPR, will be compiled and presented for public comment as the next step of this EIA process during which time further stakeholder engagement will take place.



# **SCOPING REPORT**

## **FOR LISTED ACTIVITIES ASSOCIATED WITH MINING/EXPLORATION RIGHT AND/OR BULK SAMPLING ACTIVITIES INCLUDING TRENCHING IN CASES OF ALLUVIAL DIAMOND PROSPECTING**

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS 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).

### **PREPARED BY:**



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PASA File Reference Number: 12/3/363 ER

## IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act, 2002 (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, 1998 (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 instructions or guidance provided by the Competent Authority to the submission of applications.

**It is therefore the instruction that** the prescribed reports required in respect of application 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 requested 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 order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

## OBJECTIVE OF THE SCOPING PROCESS

The objective of the scoping process is to, through a consultative process-

- a) Identify the relevant policies and legislation relevant to the activity.
- b) Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location.
- c) Identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process.
- d) Identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impact and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment.
- e) Identify the key issues to be addressed in the assessment phase.
- f) Agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site.
- g) Identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

This report has been designed to meet the requirements for a Scoping Report as stipulated in the 2014 Environmental Impact Assessment (EIA) Regulations (as amended) promulgated under the National Environmental Management Act, 1998 (Act 107 of 1998, as amended). The adjudicating authority for this application is the Petroleum Agency South Africa and this report has been compiled in accordance with the applicable Department of Mineral Resources and Energy Guidelines, and Scoping Report, EIA and Environmental Management Programme template.

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## Appendices

Appendix A: Section 10 Notice

Appendix B: Exploration Work Programme

Appendix C: Details and Experience of EAP

Appendix D: Project Maps

Appendix E: Public Participation Process

Appendix F: Specialists Reports

## Abbreviations

AIA	:	Archaeological Impact Assessment
ASAPA	:	Association of South African Professional Archaeologists
CMA	:	Catchment Management Agency
CMAs	:	Catchment Management Agencies
CRM	:	Cultural Resources Management
DEA	:	Department of Environmental Affairs
DMRE	:	Department of Mineral Resources Energy
DWA	:	Department: Water Affairs
DWS	:	Department of Water Affairs and Sanitation
EC	:	Electrical Conductivity
EIA	:	Environmental Impact Assessment
EMPR	:	Environmental Management Programme Report
EA	:	Environmental Authorisation
ESA	:	Early Stone Age
GA	:	General Authorisation
GN	:	Government Notice
GPS	:	Global Positioning System
HIA	:	Heritage Impact Assessment
HIR	:	Heritage Impact Report
HSR	:	Heritage Scoping Report
I&AP	:	Interested and Affected Party
IBA	:	Important Bird Area
LIA	:	Late Iron Age
LSA	:	Later Stone Age
MAE	:	Mean Annual Evaporation
MAMSL	:	metres above mean sea level
MAP	:	Mean Annual Precipitation
MAR	:	Mean Annual Runoff
MCM	:	Million cubic metres
MIA	:	Middle Iron Age
MPRDA:		Minerals and Petroleum Resources Development Act, 2002
MSA	:	Middle Stone Age
NEM:WA:		National Environmental Management: Waste Amendment Act, 2008
NEMA	:	National Environmental Management Act, 2002
NEMA	:	National Environmental Management Act

NGDB	:	National Groundwater Database
NHRA	:	National Heritage Resources Act
NS	:	Not specified
NWA	:	National Water Act, 1998
PASA	:	Petroleum Agency South Africa
PHRA	:	Provincial Heritage Resources Authority
PSSA	:	Palaeontological Society of South Africa
SADC	:	Southern African Development Community
SAHRA	:	South African Heritage Resources Agency
SWL	:	Static Water Level
TDS	:	Total Dissolved Solids
WMA	:	Water Management Area
WUL	:	Water Use License

## 1. BACKGROUND

Western Allen Ridge Gold Mines (Pty) Ltd (Western Allen Ridge) (a subsidiary of White Rivers Exploration (Pty) Ltd) held a Technical Co-operation Permit (TCP) (PASA Reference No. 12-2-167). Desktop studies and preliminary geological models that were performed under the TCP provided positive indications that the area is prospective. As such, Western Allen Ridge lodged an Exploration Right application to the Petroleum Agency South Africa (PASA) in June 2020 over the TCP area, in order to ascertain if viable hydrocarbon (oil, gas and condensate) deposits exist. The Exploration Right application has been allocated the reference number: 12/1/363 ER.

## 2. INTRODUCTION

Western Allen Ridge has submitted an application for an Exploration Right to PASA in order to explore for oil, gas and condensate. The application, submitted in terms of Section 79 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) was accepted by PASA on the 16<sup>th</sup> July 2020. As per Section 10 of the MPRDA, PASA has published notice of the application in the provincial gazette (Appendix A).

In order to undertake exploration activities, Western Allen Ridge requires a granted Exploration Right in terms of the MPRDA, 2002 (Act 28 of 2002). In accordance with the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations, the following environmental permitting and licensing processes are required:

1. Undertaking the Public Participation Process.
2. Compilation of an Environmental Authorisation Application.
3. Compilation of Scoping and Environmental Impact reports.
4. Development of an Environmental Management Programme.

Western Allen Ridge has appointed Shango Solutions as the Environmental Assessment Practitioner (EAP) to manage the required environmental process for the Exploration Right application.

## 3. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Shango Solutions was appointed by Western Allen Ridge as the Environmental Assessment Practitioner (EAP) to compile this report. The contact details of the Shango Solutions consultant who compiled this report are as follows:

- Name of the EAP: Shango Solutions
- Contact person: Zizo Siwendu
- Tel No.: 011 678 6504
- Fax No.: 011 678 9731
- E-mail address: zizo@shango.co.za

### 3.1 Expertise of the EAP

#### 3.1.1 Qualifications of the EAP

In terms of Regulation 13 of the NEMA 2014 EIA Regulations (Government Notice R326), an independent EAP must be appointed by the applicant to manage the application. Shango Solutions have been appointed by the Applicant as the EAP and are compliant with the definition of an EAP as defined in the NEMA and the associated EIA Regulations. This includes, inter alia, the requirement that Shango Solutions is:



- Objective and independent.
- Has expertise in conducting EIAs.
- Comply with the NEMA, the Regulations and all other applicable legislation.
- Takes into account all relevant factors relating to the application.
- Provides full disclosure to the applicant and the relevant environmental authority.

### 3.1.2 Summary of EAP's Past Experience

Shango Solutions, registered as Dunrose Trading 186 (Pty) Ltd and established in April 2004, provides a diverse range of services to the mineral and mining sectors. Currently, 27 permanent multi-disciplinary employees and about 30 nationally and internationally recognised affiliates are employed. The company has a track record of successful project management and leadership, including complex multi-disciplinary assignments.

Consultancy activities straddle the entire mining value chain from exploration to beneficiation, thereby providing the client with complete solutions. Activities are performed in multi-disciplinary teams. Areas of specialisation include target generation, exploration, geodatabase compilation and management, geological modelling, resource estimation, mineral asset valuations, due diligences, desktop project reviews and technical reporting. The company services the majority of the major mining houses, but also junior exploration companies, mineral resource investment firms, government institutions and departments and the artisanal and small-scale mining sectors. Shango Solutions collaborates closely with local and international experts in the mining and corporate industries. This, in conjunction with our affiliations with academic and parastatal institutions, ensures provision of the most innovative and appropriate solutions to clients.

Shango has completed in excess of 600 projects, of which the majority were located in Africa. The company consequently has extensive ground-based mining related experience throughout Africa, especially southern, eastern and north-west African states. Our extensive knowledge of the African minerals industry has attracted some of the largest names in mineral extraction to our client base. The project portfolio highlights our cross-sectorial approach and capability.

Shango incorporates in excess of 500 years of Africa-based mining and exploration experience. This includes, but is not limited to, gold, platinum, rare earth elements, base metals, uranium, coal, natural gas, ferrochrome, aggregate, heavy mineral sands and diamonds. Over the last decades, we have established comprehensive 2D Geographic Information Systems (GIS) databases throughout Africa, which consider geological and geophysical data, mineral occurrences, defunct and existing mines, infrastructure and mining statistics.

Ms Zizo Siwendu's experience lies mainly with environmental assessments for the mining industry, including the compilation of environmental studies in support of Environment Authorisations for Prospecting, Mining, Exploration and Production Right projects as well as other development projects that require Environmental Authorisation.

The declaration of independence of the EAP and the EAP's Curriculum Vitae (indicating the experience with environmental impact assessment and relevant application processes) are attached as Appendix C.

### 3.1.3 Specialist Consultants

Specialist studies (Table 1) were undertaken to address the key issues that required further investigation. The specialist studies involved the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed project. These impacts were then assessed according to pre-defined rating

scales. Specialists also recommended appropriate mitigation/control or optimisation measures to minimise potential negative impacts or enhance potential benefits, respectively.

Table 1: Specialist Consultants.

Component	Company Responsible
Soils, Land Capability and Agricultural Potential	The Biodiversity Company
Terrestrial Biodiversity	The Biodiversity Company
Wetlands Delineation	The Biodiversity Company
Heritage	Digby Wells
Palaeontology	Digby Wells
Financial Provision	Digby Wells
Geohydrology (including a Hydrocensus)	Noa 8 Agencies

## 4. DESCRIPTION OF THE PROPOSED PROPERTY

The area of interest occupies a total of approximately 33 605.2929 hectares (ha) and it is located approximately 15 kilometres (km) east of the town of Kroonstad, in the Free State Province of South Africa. One hundred and thirty-nine (139) farm portions extend over the application area (Figure 1). The proposed exploration area is located in the Magisterial Districts of Kroonstad and Lindley, and falls within the Moqhaka and Ngwathe Local Municipalities, under the Fezile Dabi District Municipality. Table 2 indicates the property details within the application area.

The application area excludes all properties where a granting is prohibited by Section 48 of the MPRDA. These include:

1. Nature Reserves, National Parks, Protected Areas or Protected Environments, (including World Heritage Sites, and Protected Forest Areas).
2. Residential areas.
3. Public roads, railways and cemeteries.
4. Servitudes.

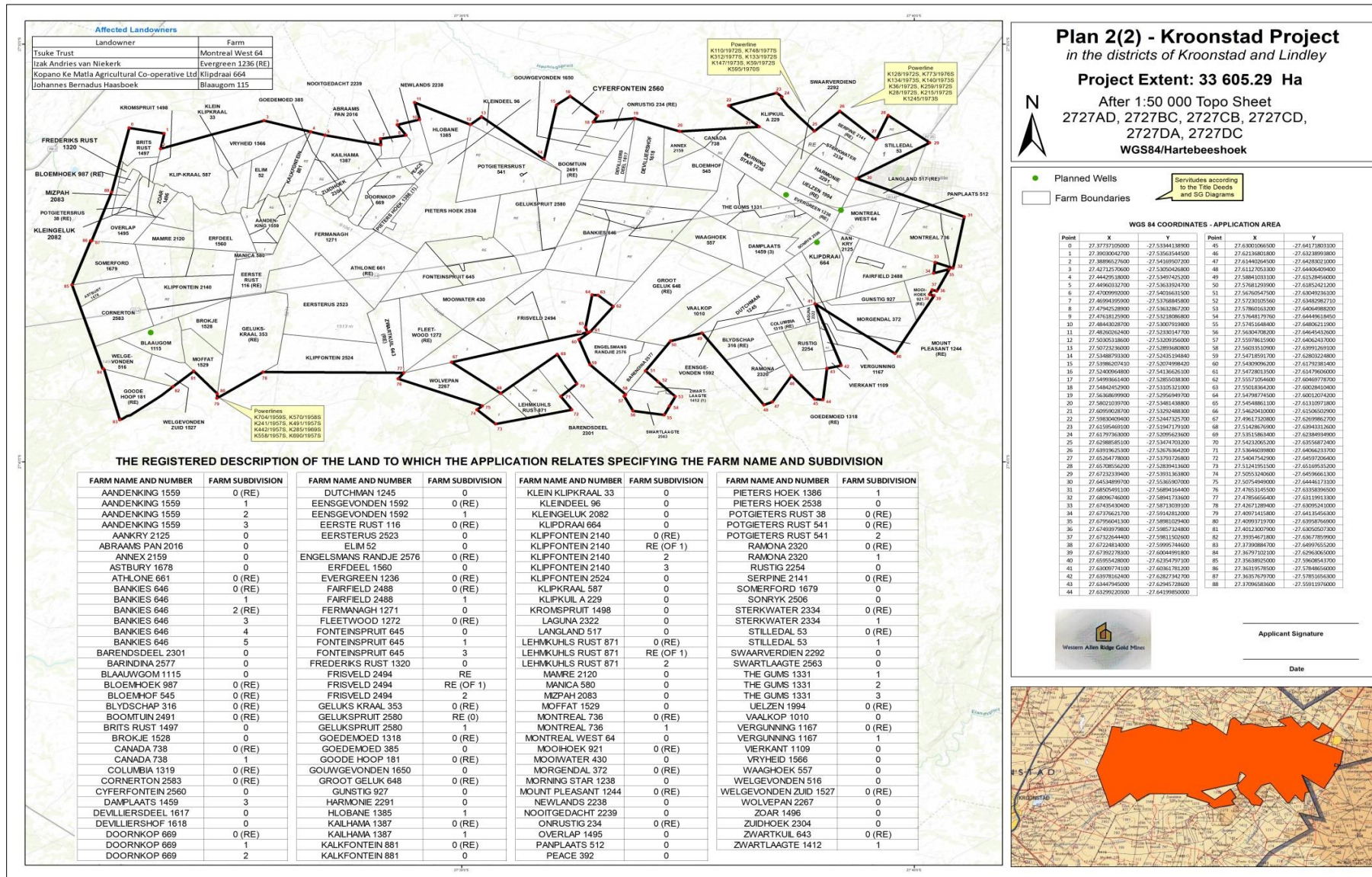


Figure 1: Locality map indicating the farm portions and planned well locations (refer to Appendix D for enlarged map).

Table 2: Property details.

No.	SG Code	Farm Name	Portion	No.	SG Code	Farm Name	Portion
1	F02000000000155900000	Aandenking 1559	RE	36	F02000000000124500000	Dutchman 1245	0
2	F02000000000155900001	Aandenking 1559	1	37	F02000000000159200000	Eensgevonden 1592	RE
3	F02000000000155900002	Aandenking 1559	2	38	F02000000000159200001	Eensgevonden 1592	1
4	F02000000000155900003	Aandenking 1559	3	39	F02000000000011600000	Eerste Rust 116	RE
5	F02000000000212500000	Aankry 2125	0	40	F020000000000252300000	Eersterus 2523	0
6	F02000000000201600000	Abraam's Pan 2016	0	41	F02000000000005200000	Elim 52	0
7	F02000000000215900000	Annex 2159	0	42	F020000000000257600000	Engelsmans Randje 2576	0
8	F02000000000167800000	Astbury 1678	0	43	F02000000000015600000	Erfdeel 1560	0
9	F02000000000066100000	Athlone 661	0	44	F020000000000123600000	Evergreen 1236	0
10	F02000000000064600000	Bankies 646	RE	45	F020000000000248800000	Fairfield 2488	RE
11	F02000000000064600001	Bankies 646	1	46	F020000000000248800001	Fairfield 2488	1
12	F02000000000064600002	Bankies 646	RE of 2	47	F020000000000127100000	Fermanagh 1271	0
13	F02000000000064600003	Bankies 646	3	48	F020000000000127200000	Fleetwood 1272	RE
14	F02000000000064600004	Bankies 646	4	49	F02000000000064500000	Fonteinspruit 645	RE
15	F02000000000064600005	Bankies 646	5	50	F02000000000064500001	Fonteinspruit 645	1
16	F02000000000230100000	Barendsdeel 2301	0	51	F02000000000064500003	Fonteinspruit 645	3
17	F020000000000257700000	Barindina 2577	0	52	F020000000000132000000	Frederiks Rust 1320	0
18	F02000000000111500000	Blaauwgom 1115	0	53	F020000000000249400000	Frisveld 2494	R/E
19	F02000000000098700000	Bloemhoek 987	0	54	F020000000000249400001	Frisveld 2494	RE of 1
20	F02000000000054500000	Bloemhof 545	RE	55	F020000000000249400002	Frisveld 2494	2
21	F02000000000031600000	Blydschap 316	RE	56	F02000000000035300000	Geluks Kraal 353	RE
22	F020000000000249100000	Boomtuin 2491	RE	57	F020000000000258000000	Gelukspuit 2580	RE
23	F020000000000149700000	Brits Rust 1497	0	58	F020000000000258000001	Gelukspuit 2580	1
24	F020000000000152800000	Brokje1528	0	59	F020000000000131800000	Goedemoed 1318	0
25	F02000000000073800000	Canada 738	RE	60	F02000000000038500000	Goedemoed 385	0
26	F02000000000073800001	Canada 738	1	61	F02000000000018100000	Goode Hoop 181	RE
27	F020000000000131900000	Columbia 1319	RE	62	F020000000000165000000	Gouwgevonden 1650	0
28	F020000000000258300000	Cornerton 2583	0	63	F02000000000064800000	Groot Geluk 648	0
29	F020000000000256000000	Cyferfontein 2560	0	64	F02200000000092700000	Gunstig 927	0
30	F020000000000145900003	Damplaats 1459	3	65	F020000000000229100000	Harmonie 2291	0
31	F020000000000161700000	Devilliersdeel 1617	0	66	F020000000000138500001	Hlobane 1385	1
32	F020000000000161800000	Devilliershof 1618	0	67	F020000000000138700000	Kailhama 1387	RE
33	F02000000000066900000	Doornkop 669	RE	68	F020000000000138700001	Kailhama 1387	1
34	F02000000000066900001	Doornkop 669	1	69	F02000000000088100000	Kalkfontein 881	RE
35	F02000000000066900002	Doornkop 669	2	70	F02000000000088100001	Kalkfontein 881	1

No.	SG Code	Farm Name	Portion	No.	SG Code	Farm Name	Portion
71	F0200000000003300000	Klein Klipkraal 33	0	106	F02000000000138600001	Pieters Hoek 1386	1
72	F02000000000009600000	Kleindeel 96	0	107	F02000000000253800000	Pieters Hoek 2538	0
73	F02000000000208200000	Kleingeluk 2082	0	108	F02000000000038000000	Potgietersrus 38	RE
74	F02000000000066400000	Klipdraai 664	0	109	F02000000000054100000	Potgittersrust 541	R/E
75	F02000000000214000000	Klipfontein 2140	RE	110	F02000000000054100002	Potgittersrust 541	2
76	F02000000000214000001	Klipfontein 2140	RE of 1	111	F02000000000232000000	Ramona 2320	RE
77	F02000000000214000002	Klipfontein 2140	2	112	F02000000000232000001	Ramona 2320	1
78	F02000000000214000003	Klipfontein 2140	3 of 1	113	F02000000000225400000	Rustig 2254	0
79	F02000000000252400000	Klipfontein 2524	0	114	F02000000000214100000	Serpine 2141	RE
80	F02000000000058700000	Klip-kraal 587	0	115	F02000000000167900000	Somerford 1679	0
81	F02000000000022900000	Klipkuil A 229	0	116	F02000000000250600000	Sonryk 2506	0
82	F02000000000149800000	Kromspruit 1498	0	117	F02000000000233400000	Sterkwater 2334	RE
83	F02000000000232200000	Laguna 2322	0	118	F02000000000233400001	Sterkwater 2334	1
84	F02000000000051700000	Langland 517	0	119	F02000000000053000000	Stilledal 53	RE
85	F02000000000087100000	Lehmkuhls Rust 871	RE	120	F02000000000053000001	Stilledal 53	1
86	F02000000000087100001	Lehmkuhls Rust 871	3 of 1	121	F02000000000229200000	Swaarverdiend 2292	0
87	F02000000000087100002	Lehmkuhls Rust 871	2	122	F02000000000256300000	Swartlaagte 2563	0
88	F02000000000212000000	Mamre 2120	0	123	F02000000000133100001	The Gums 1331	1
89	F02000000000058000000	Manica 580	0	124	F02000000000133100002	The Gums 1331	2
90	F02000000000208300000	Mizpah 2083	0	125	F02000000000133100003	The Gums 1331	3
91	F02000000000152900000	Moffat 1529	0	126	F02000000000199400000	Uelzen 1994	RE
92	F02000000000073600000	Montreal 736	RE	127	F02000000000101000000	Vaalkop 1010	0
93	F02000000000073600001	Montreal 736	1	128	F02000000000116700000	Vergunning 1167	RE
94	F02000000000064000000	Montreal West 64	0	129	F02000000000116700001	Vergunning 1167	1
95	F02200000000092100000	Mooihoek 921	RE	130	F02000000000110900000	Vierkant 1109	0
96	F02000000000043000000	Mooiwater 430	0	131	F02000000000156600000	Vryheid 1566	0
97	F02200000000037200000	Morgendal 372	RE	132	F02000000000055700000	Waaghoek 557	0
98	F02000000000123800000	Morning Star 1238	0	133	F02000000000051600000	Welgevonden 516	0
99	F02000000000124400000	Mount Pleasant 1244	RE	134	F02000000000152700000	Welgevonden Zuid 1527	RE
100	F02000000000223800000	Newlands 2238	0	135	F02000000000226700000	Wolvepan 2267	0
101	F02000000000223900000	Nooitgedacht 2239	0	136	F02000000000149600000	Zoar 1496	0
102	F02000000000234000000	Onrustig 234	0	137	F02000000000230400000	Zuidhoek 2304	0
103	F02000000000149500000	Overlap 1495	0	138	F02000000000064300000	Zwartkuil 643	RE
104	F02000000000051200000	Panplaats 512	0	139	F02000000000141200001	Zwartlaagte 1412	1
105	F02000000000039200000	Peace 392	0				



## 5. GEOLOGICAL FORMATION AND EXPLORATION TARGETS

The surface geology of the application area is dominated by Karoo Supergroup sediments of the Volksrust Formation, Eccca Group. Beaufort Group sediments and Karoo age dolerite intrusions also occur on and in close proximity to the licence area (Figure 2). Quaternary sand and gravel is limited to the surface drainage patterns. Karoo Supergroup sediments and later age intrusives are underlain by rocks of the Witwatersrand, Ventersdorp and Transvaal supergroups.

Exploration targets include gas-bearing coal seams of the Karoo Supergroup and pre-Karoo gas-bearing structures. Shales of the Volksrust Formation and younger dolerite sills may act as suitable cap rocks that trap gas, especially where pre-Karoo palaeo-highs occur. Gas rich in helium and methane associated with pre-Karoo structures is the primary exploration target.

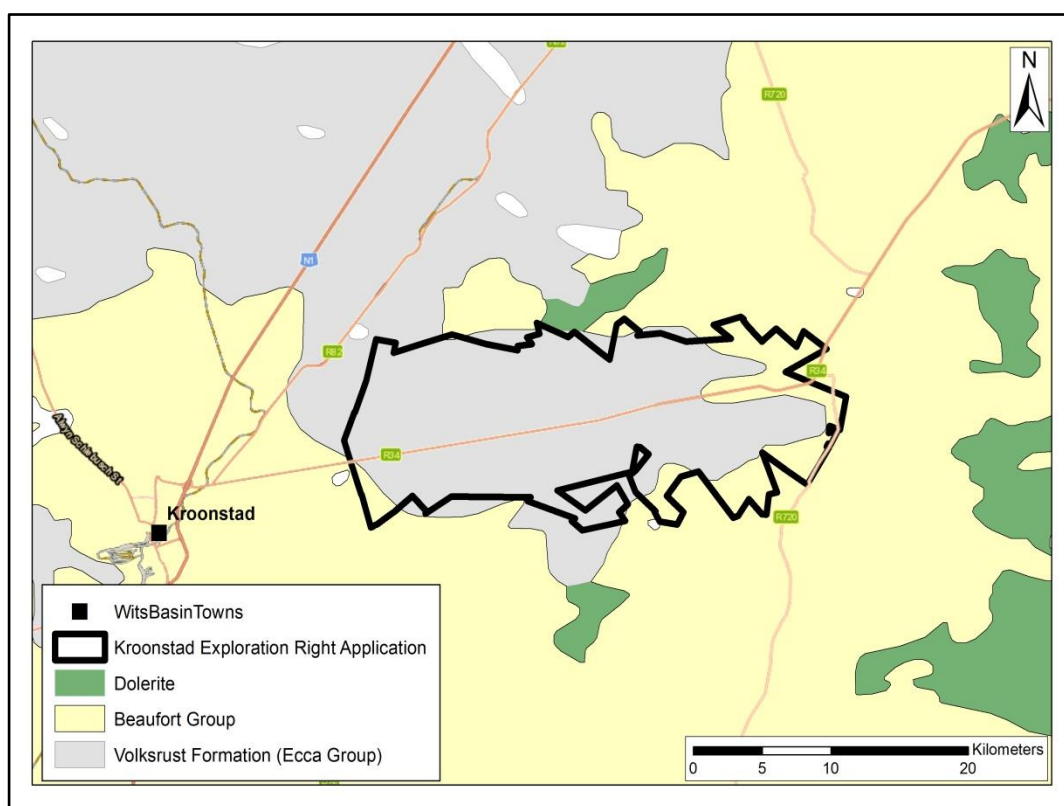


Figure 2: Surface geological map with applied farm boundaries superimposed.

## 6. DESCRIPTION AND SCOPE OF PROPOSED ACTIVITY

Invasive and non-invasive exploration activities will be undertaken as part of the proposed Exploration Work Programme (EWP). It is important to note that the specific exploration tools (methods) to be employed depend on the results generated from previous phases and this programme assumes that the results are positive in each stage. It is also noted that the first step includes an attempt to acquire and compile any existing exploration data in the area. Should this be successful, certain items in the programme could be reduced or could even become redundant and the pace of the entire programme could be accelerated. **No hydraulic fracturing will be performed as part of the exploration programme.** The scope of the exploration programme is as follows:

**Phase 1.1:** [Year One; Duration: 3 months]

Phase 1.1 includes the establishment of an MS Access database and capturing of additional borehole information into the database. Borehole data will undergo a QA/QC process before incorporation into Geographic Information Systems (GIS) format. GIS data will be analysed for various parameters relating to gas.

**Phase 1.2 and Phase 1.3:** Year One; Duration: 6 months]

2D and 3D geological modelling will be conducted during these phases. The 2D geological modelling includes the contouring of various gas parameters and establishing geological cross sections over the area of interest. These cross sections will be utilised to update and refine the 3D geological modelling. This includes revising stratigraphic layers and QA/QC of information. These two phases will run concurrently.

**Phase 1.4:** [Year One; Duration: 3 months]

During Phase 4 gas contour plans will be constructed utilising the 3D geological model. The exploration strategy will be refined based on the outcomes of the modelling and targets may be redefined to intersect optimal gas exposures.

**Phase 2.1:** [Year Two; Duration: 1 week]

Exploration drilling is planned for year two of this exploration work programme under which two gas wells are planned. During this phase, further comparable quotations for the entire drilling process will be obtained and a vendor appointed.

**Phase 2.2 and Phase 2.3:** [Year Two; Duration: 8 months and 3 weeks]

Phases 2.2 and 2.3 will run concurrently, commencing with site establishment. This will include contacting landowners for preparation of activities and access to the property. A well schematic, drilling and cementation plan and well control plan will be established for approval by PASA prior to any activities being undertaken for these phases.

Drilling will be conducted in a competent and environmentally responsible manner including rehabilitation of the well sites to their original state. Environmental rehabilitation measures will be included in the contract with the drilling company. Preceding well cementation the designated agency will be informed to enable an authorised person to be present.

Accompanying the drilling of the wells will be down hole surveys and geophysical logging (density, caliper, gamma ray, neutron porosity and optical or acoustic televiwer logs). Packer tests will be used to identify flow rate per depth interval. Samples will be taken and sent for lab analyses of CH<sub>4</sub>, H<sub>2</sub>, CO<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, C<sub>3</sub>H<sub>8</sub>, C<sub>4</sub>H<sub>10</sub>, N<sub>2</sub>, O<sub>2</sub> and CO.

**Phase 2.4:** [Year Two; Duration: 3 months]

All drilling information will be added to the 3D geological model to update information in this model. Newly drilled data will be analysed for gas potential utilising all parameters collected in the field.

**Phase 3.1:** [Year Three; Duration: 1 month]

Should the drilling programme prove to be successful in Year two, an additional two holes will be considered for Year three. It is imperative to note that the drilling in Year three is dependent on positive outcomes from the drilling in Year two. If outcomes are positive, Landowner permissions, site preparation and security access will commence.

**Phase 3.2 and Phase 3.3:****[Year Three; Duration: 8 months]**

Phases 3.2 and 3.3 encompass the drilling and the reader is referred to the detail above for phases two and three in year two of the work programme.

**Phase 3.4:****[Year Three; Duration: 3 months]**

The drilling data from the previous phases will be utilised to further update and refine the 3D geological model. All data collected thus far will be analysed as a holistic view and plans will be constructed to further refine the gas parameter information collected. The programme will be re-evaluated at this stage to confirm gas potential.

Figure 3 illustrates the location of the planned wells within the application area.

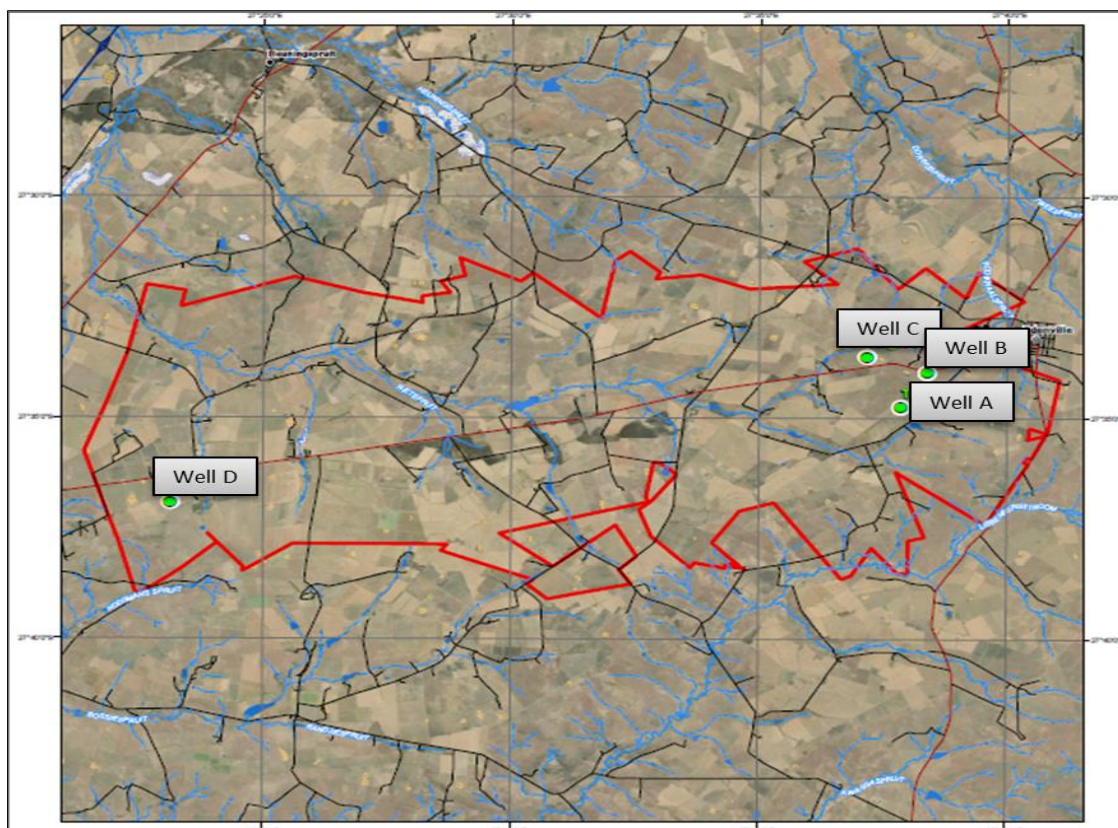


Figure 3: Planned well locations.

## 7. PROJECT SUPPORTING INFRASTRUCTURE AND SERVICES

### 7.1 Structures

No permanent infrastructure will be established to carry out the exploration activities.

### 7.2 Access

Sites will be accessed using existing roads or farm tracks, where available. Where access is not available, access tracks to accommodate a vehicle will be created for the planned well drilling.

### 7.3 Accommodation

No accommodation for staff and workers will be provided on-site unless permission is granted by the landowner. Should the landowner not grant permission, all persons will be accommodated in nearby towns (i.e. Kroonstad) and workers will be transported to and from the exploration site(s) on a daily basis.



#### **7.4 Equipment, Consumables and Labour Force**

Equipment for drilling will be provided by specialist contractors. The majority of equipment, consumables and labour for these services are specialised. Contractors and suppliers will be encouraged to source locally as much as is feasible.

#### **7.5 Power Supply**

Electricity, if required, will be provided by on-site generators.

#### **7.6 Water Supply**

Water required for the operation of the drilling rig, as well as potable water will be obtained locally, by agreement with land owners or the local municipality. The daily water requirements for operations will be a maximum of 5 000 litres per day.

#### **7.7 Ablution Facilities**

Chemical toilets will be provided for the personnel. The toilets will be supplied and managed by a specialist contractor and the sewage disposed of at the nearest wastewater management facility, or as required by the local authority.

#### **7.8 Waste**

All general and hazardous waste generated at the drilling site will be separated and stored in containers, before being removed from site and disposed at an appropriate waste disposal facility. The core recovered from the drilling will most likely be stored in a core shed for analysis and record keeping.

Mineral residues produced during drilling practices will be managed in terms of the MPRDA and appropriate regulations, most notably Regulation 704 (4 June 1999) under the NWA and Regulation 632 on the Planning and Management of Residue Stockpiles and Residue Deposits (July 2015) under the National Environmental Management Waste Act (Act 59 of 2008) (NEMWA). Water from the drilling operations will be disposed of in accordance with the provisions of the NWA and the NEMWA (as applicable).

## **8. LISTED AND SPECIFIED ACTIVITIES**

Listed activities are activities identified in terms of Section 24 of NEMA which are likely to have a detrimental effect on the environment, and which may not commence without an EA from the Competent Authority. An EA required for a listed activity is subject to the completion of an environmental process, either a Basic Assessment (BA) or a S&EIA. The applicable NEMA listed activities anticipated to be triggered by this project are outlined in Table 3. The table also includes a description of those project activities which relate to the applicable listed activities. The PASA will act as the Competent Authority on the project, with the Free State Department of Mineral Resources and Energy (DMRE), and the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) acting as the Commenting Authorities (CA).

Table 3: Listed and specified activities in terms of the NEMA EIA Regulations promulgated in December 2014 and amended on the 7<sup>th</sup> April 2017.

Listed Activity and Number	Description
<b>NEMA LISTING NOTICE 2 GNR 325</b>	
GNR 325 of 7 April 2017, Activity 18	Any activity including the operation of that activity which requires an exploration right as contemplated in section 79 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002), including (a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource [,]; or (b) [including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)] 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 this Notice applies.
<b>NEMA LISTING NOTICE 3 GNR 324</b>	
GNR 324 of 7 April 2017, Activity 12(b)	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan - (i) within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; (ii) within critical biodiversity areas identified in bioregional plans; (iii) on land, where at the time of the coming into effect of this notice or thereafter such space was zoned open space, conservation or had an equivalent zoning; or (iv) areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.

## 9. POLICY AND LEGISLATIVE CONTEXT

Western Allen Ridge requires authorisation in terms of the following interlinked pieces of legislation:

1. The Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002 - amended) (MPRDA).
2. The National Environmental Management Act, 1998 (Act 107 of 1998 – as amended) (NEMA).

These pieces of core legislation stipulate the required studies, reports and legal processes to be conducted and the results thereof submitted to the relevant authorities for approval prior to commencement. In addition to the above, there are various pieces of legislation which govern certain aspects of the mining operations and these are summarised in Table 4, together with the main legislative requirements mentioned above.

Table 4: Policy and legislative context.

Applicable legislation and guidelines	Reference where applied	How does this development comply with and respond to the legislation and policy context
<p><b>Constitution of the Republic of South Africa, 1996 ( Act 108 of 1996)</b></p> <p>The constitution of any country is the supreme law of that country. The Bill of Rights in Chapter 2 Section 24 of the Constitution of South Africa Act, 1996 (Act 108 of 1996) makes provisions for environmental issues and declares that:</p> <p>“Everyone has the right -</p> <ul style="list-style-type: none"> <li>(a) To an environment that is not harmful to their health or well-being.</li> <li>(b) To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: <ul style="list-style-type: none"> <li>i. Prevent pollution and ecological degradation.</li> <li>ii. Promote conservation.</li> <li>iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development”.</li> </ul> </li> </ul>	<p>Throughout the process.</p>	<p>EIA is conducted to fulfil the requirement of the Bill of Rights</p>
<p><b>National Environmental Management Act, 1998 (Act 107 of 1998) (as amended)</b></p> <p>The NEMA (1998) requires that a project of this nature (inclusive of an Exploration Right) must undergo a Scoping and Environmental Impact Assessment process. An Environmental Management Programme must also be compiled.</p> <p>Regulations applicable to this project include the following:</p> <ol style="list-style-type: none"> <li>1. EIA Regulations 326 (2017) in terms of NEMA.</li> <li>2. Listing Notice 2: 325 (2017) in terms of NEMA</li> <li>3. Listing Notice 3: 324 (2014) in terms of NEMA.</li> </ol>	<p>Throughout the process.</p>	<p>In terms of the National Environmental Management Act, an application for Environmental Authorisation subject to a Scoping and Environmental Impact Assessment process has been applied for.</p>
<p><b>Minerals and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (as amended)</b></p> <p>The MPRDA (2002) requires an Applicant who wishes to proceed with an exploration project to</p>	<p>Throughout the process.</p>	<p>In terms of the Mineral and Petroleum Resources Development Act, an Exploration Right Application has been applied for.</p>

Applicable legislation and guidelines	Reference where applied	How does this development comply with and respond to the legislation and policy context
obtain an Exploration Right, part of which requires the Applicant to obtain Environmental Authorisation in terms of the NEMA (1998).		
<b>National Water Act, 1998 (Act 36 of 1998)</b> The NWA recognizes that water is a scarce and unevenly distributed national resource which must be managed encompassing all aspects of water resources.  Due to the nature of the proposed exploration activities, it is not anticipated that Section 21 water uses will be triggered. Therefore, there is no requirement to apply for Water Use Authorisation in terms of the NWA.	Throughout the process.	In terms of the National Water Act, no Water Use License has been applied for.
<b>National Heritage Resources Act, 1999 (Act 25 of 1999)</b> The National Heritage Resources Act aims to promote good management of cultural heritage resources and encourages the nurturing and conservation of cultural legacy so that it may be bestowed to future generations.  Due to the nature and extent of the project, it is likely that some heritage resources and palaeontological features are likely to occur within the project boundary area.	Throughout the process.	Specialist heritage and palaeontology impact studies have been undertaken in support of this application.
<b>Specific Environmental Management Acts (SEMA's)</b> The SEMA's refer to specific portions of the environment where additional legislation over and above the NEMA (1998) is applicable. SEMA's relevant to this application include the following: <ol style="list-style-type: none"> <li>1. National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004).</li> <li>2. National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004).</li> <li>3. National Environmental Management Waste Act, 2004 (Act 26 of 2014).</li> </ol>	Throughout the process.	Relevant specialist studies have been undertaken in support of this application.

## **9.1 Applicable National Legislation**

### **9.1.1 Mineral and Petroleum Development Act**

The Mineral and Petroleum Resources Development Act, 2002 (MPRDA - Act 28 of 2002), aims to “make provision for equitable access to, and sustainable development of the nation’s mineral and petroleum resources”. The MPRDA governs the sustainable utilisation of South Africa’s mineral resources and it outlines the procedural requirements that need to be met to acquire mineral and petroleum rights in South Africa.

In terms of the MPRDA, an Exploration Right must be issued prior to the commencement of any exploration activities. As per Section 22 of the MPRDA, the Applicant is required to complete and submit a Scoping Report which has been subject to a 30 day review period by the public for approval by the Regulatory Authority, within 44 days of acceptance of the application. The MPRDA also requires adherence with related legislation, chief amongst them is the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) and the National Water Act, 1998 (Act 36 of 1998) (NWA).

Several amendments have been made to the MPRDA. These include, but are not limited to, the amendment of Section 102, concerning amendment of rights, permits, programmes and plans, to requiring the written permission of the Minister for any amendment or alteration; and the section 5A(c) requirement that landowners or land occupiers receive twenty-one (21) days’ written notice prior to any activities taking place on their properties. One of the most recent amendments requires all mining related activities to follow the full NEMA process as per the 2014 EIA Regulations (as amended), which came into effect on 8<sup>th</sup> December 2014.

An Exploration Right is exclusive, transferable and is valid for a period specified in the right, which may not exceed 3 years.

### **9.1.2 National Environmental Management Act**

The main aim of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) is to provide for co-operative governance by establishing decision-making principles on matters affecting the environment. In terms of the NEMA Environmental Impact Assessment (EIA) Regulations, the proponent is required to appoint an Environmental Assessment Practitioner (EAP) to undertake the EIA as well as the public participation process. In South Africa, EIA became a legal requirement in 1997 with the promulgation of Regulations under the Environmental Conservation Act (ECA). Subsequently, NEMA was passed in 1998. Section 24(2) of NEMA empowers the Minister and any MEC, with the concurrence of the Minister, to identify activities which must be considered, investigated, assessed and reported on to the Competent Authority responsible for granting the relevant Environmental Authorisation. On 21 April 2006, the Minister of Environmental Affairs and Tourism promulgated Regulations in terms of Chapter 5 of the NEMA.

The objective of the Regulations is to establish the procedures that must be followed in the consideration, investigation, assessment, and reporting of the activities that have been identified. The purpose of these procedures is to provide the Competent Authority with adequate information to make decisions which ensure that activities which may impact negatively on the environment to an unacceptable degree are not authorised, and that activities which are authorised are undertaken in such a manner that the environmental impacts are managed to acceptable levels.

In accordance with the provisions of Sections 24 (5) and Section 44 of the NEMA, the Minister has published Regulations (GNR. 326) pertaining to the required process for conducting EIA’s to apply for, and be considered for, the issuing of an EA. These Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity. The Regulations differentiate between a simpler Basic

Assessment process (required for activities listed in GNR 327 and 326) and a more complete EIA process (activities listed in GNR 325). In the case of this project, there are activities triggered under GNR 325 and 326 and as such, a full EIA process is necessary.

Section 24 P of the NEMA requires that an Applicant for an Environmental Authorisation relating to prospecting, mining or production must, before the Minister responsible for mineral resources issues the Environmental Authorisation, comply with the prescribed Financial Provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts. Therefore, the potential environmental liabilities associated with the proposed activity must be quantified and indicate the method of Financial Provision in line with the National Environmental Management Act (1998): Regulations Pertaining to the Financial Provision for Prospecting Exploration, Mining and Production, (2015). The requirement for mines to comply with the NEMA Financial Provisioning Regulations becomes effective as from January 2019 (as per the extension of the transitional period). As such, the Financial Provision costs in line with DMRE guidelines will be presented in the EIA report.

### 9.1.3 National Environmental Management: Waste Amendment Act

On the 2<sup>nd</sup> June 2014 the National Environmental Management: Waste Amendment Act, 2014 (NEMWAA - Act 26 of 2014) came into force. Waste is accordingly no longer governed by the MPRDA, but is subject to all the provisions of the National Environmental Management: Waste Act, 2008 (NEMWA). Section 16 of the NEMWA must also be considered which states as follows:

1. "A holder of waste must, within the holders' power, take all reasonable measures to:
  - (a) Avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated.
  - (b) Reduce, re-use, recycle and recover waste.
  - (c) Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner.
  - (d) Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour, or visual impacts.
  - (e) Prevent any employee or any person under his or her supervision from contravening the Act.
  - (f) Prevent the waste from being used for unauthorised purposes.

These general principles of responsible waste management are incorporated into the requirements in the EMPR to be implemented for this project.

Schedule 3: Defined Wastes have been broken down into two categories: Category A being hazardous wastes and category B being general wastes. Under Category A (hazardous wastes) the act makes allowance for "wastes resulting from exploration, mining, quarrying, and physical and chemical treatment of minerals".

In order to attempt to understand the implications of this it is important to ensure that the definitions of all the relevant terminologies are defined:

- Hazardous waste: means "any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristic of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles."
- Residue deposits: means "any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right."

- Residue stockpile: means “any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining area for potential re-use, or which is disposed of, by the holder of a mining right, mining permit or, production right or an old order right, including historic mines and dumps created before the implementation of this Act.”

Various regulations have been drafted in support of the NEMWA, as discussed below.

#### **9.1.3.1 NEMWA Planning And Management Of Residue Stockpiles And Residue Deposits Regulations, 2015 (GNR 632)**

The purpose of these Regulations is to regulate the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation. The identification and assessment of environmental impacts arising from residue stockpiles and residue deposits must be undertaken as part of the Environmental Impact Assessment conducted in terms of the NEMA. A risk analysis based on the characteristics and the classification as set out in Regulation 4 and 5 must be utilised to determine the appropriate mitigation and management measures.

#### **9.1.3.2 NEMWA National Norms And Standards For The Assessment Of Waste For Landfill Disposal, 2013 (GNR 635)**

These norms and standards prescribe the requirements for the assessment of waste prior to disposal to landfill. The aim of the waste assessment tests is to characterise the material to be deposited or stored in terms of the above-mentioned waste assessment guidelines set by the Department of Environmental Affairs (DEA). Analysis of representative samples will be discussed in the EIA phase where the characterisation of the materials will determine the required mitigation measures to be put forward in the EMPR.

#### **9.1.3.3 NEMWA Waste Classification And Management Regulations, 2013 (GNR 634)**

Chapter 9 of the Waste Classification and Management Regulations stipulates the requirements for a motivation for and consideration of listed Waste Management Activities that do not require a Waste Management License. The motivation must:

- Demonstrate that the waste management activity can be implemented without unacceptable impacts on, or risk to, the environment or health.
- Must provide a description of the waste.
- Description of waste minimisation or waste management plans.
- Description of potential impacts, etc.

#### **9.1.4 The National Environmental Management: Biodiversity Act**

The National Environmental Management Biodiversity Act (NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA as well as the protection of species and ecosystems that warrant national protection. Within the framework of this act, various regulations are promulgated which provide specific requirements and management measures relating to protecting threatened ecosystems, threatened or protected species as well as the control of alien and invasive species. An assessment of the application area will be undertaken by a biodiversity specialist and the findings of this assessment will be presented in the EIA phase.

A summary of these regulations is presented below.

#### 9.1.4.1 National List Of Ecosystems That Are Threatened And Need Of Protection (GNR 1002 OF 2011)

The NEMBA provides for listing of threatened or protected ecosystems in one of the following categories:

- Critically Endangered (CR) ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation.
- Endangered (EN) ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems.
- Vulnerable (VU) ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems.
- Protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.

The Biodiversity Specialist will assess whether any of these threatened or protected ecosystems occur within the study area and provide recommendations on how the development should or should not proceed based on the findings of the assessment. The results of this assessment will be presented in the EIA phase of this study.

#### 9.1.4.2 Threatened or Protected Species Regulations (GNR 152 of 2007)

The purpose of these regulations is to –

- Further regulate the permit system set out in Chapter 7 of the Biodiversity Act insofar as that system applies to restricted activities involving specimens of listed threatened or protected species.
- Provide for the registration of captive breeding operations, commercial exhibition facilities, game farms, nurseries, scientific institutions, sanctuaries and rehabilitation facilities and wildlife traders.
- Provide for the regulation of the carrying out of a specific restricted activity, namely hunting.
- Provide for the prohibition of specific restricted activities involving specific listed threatened or protected species.
- Provide for the protection of wild populations of listed threatened species.
- Provide for the composition and operating procedure of the Scientific Authority.

#### 9.1.4.3 Alien And Invasive Species List

This Act is applicable since it protects the quality and quantity of arable land in South Africa. Loss of arable land should be avoided and declared Weeds and Invaders in South Africa are categorised according to one of the following categories, and require control or removal:

- Category 1a Listed Invasive Species: Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combated or eradicated.
- Category 1b Listed Invasive Species: Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled
- Category 2 Listed Invasive Species: Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be



- **Category 3 Listed Invasive Species:** Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice

The provisions of this Act will be considered and where relevant incorporated into the proposed mitigation measures and requirements of the EMPR during the EIA phase of this application.

#### **9.1.5 The Sub-Division of Agricultural Land Act**

In terms of the Subdivision of Agricultural Land Act, 1970 (Act 70 of 1970), any application for change of land use must be approved by the Minister of Agriculture, while under the Conservation of Agricultural Resources Act (Act 43 of 1983), no degradation of natural land is permitted.

#### **9.1.6 The Conservation of Agricultural Resources Act**

The Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal. The Act requires the protection of land against soil erosion and the prevention of water logging and salinization of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed in this report.

#### **9.1.7 The National Environmental Management: Protected Areas Act**

The National Environmental Management: Protected Areas Act, 2003 (NEMPAA - Act 57 of 2003) observes to: "provide for the protection and conservation of ecologically viable areas representative of South Africa's biological biodiversity and its natural landscapes and seascape; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; for the continued existence, governance and functions of South African National Parks; and for matters in connection therewith.

The objectives of this Act are:

- (a) To provide, within the framework of the national legislation, including the National Environmental Management Act, for the declaration and management of protected areas.
- (b) To provide for co-operation governance in the declaration and management of protected areas.
- (c) To effect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity.
- (d) To provide for a diverse and representative network of protected areas on state land, private land, communal land and marine water.
- (e) To promote sustainable utilisation of protected areas for the benefit of people, in a manner that would preserve the ecological character of such areas.
- (f) To promote participation of local communities in the management of protected areas, when appropriate.
- (g) To provide for the continued existence of South African National Parks.

#### **9.1.8 National Water Act**

The National Water Act, 1998 (NWA - Act 36 of 1998) makes provision for two types of application for water use licences, namely individual applications and compulsory applications. The NWA also provides that the responsible authority may require an assessment by the Applicant of the likely effect of the proposed licence

on the resource quality, and that such assessment be subject to the EIA Regulations. A person may use water, if the use is -

- Permissible as a continuation of an Existing Lawful Water Use (ELWU).
- Permissible in terms of a General Authorisation (GA).
- Permissible under Schedule 1.
- Authorised by a License.

The NWA defines 11 water uses. A water use may only be undertaken if authorised. Water users are required to register certain water uses that actually took place on the date of registration, irrespective of whether the use was lawful or not.

Section 21 of the National Water Act 1998 lists the following 11 water uses which can only be legally undertaken through the water use authorisation issued by the Department of Water and Sanitation (DWS):

- (a) Taking water from a water resource.
- (b) Storing water.
- (c) Impeding or diverting the flow of water in a watercourse.
- (d) Engaging in a stream flow reduction activity contemplated in Section 36.
- (e) Engaging in a controlled activity identified as such in Section 37(1) or declared under Section 38(1).
- (f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduits.
- (g) Disposing of waste in a manner which may detrimentally impact on a water resource.
- (h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process.
- (i) Altering the bed, banks, course or characteristics of a watercourse.
- (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.
- (k) Using water for recreational purposes.

As part of the NWA, and with specific reference the GN704 of 1999 has been published. These regulations impose specific restrictions on activities in terms of its locality. One of these restrictions are in terms of Regulation 4(c) saying that no person in control of a mine or activity, may place or dispose of any residue or substance which causes or is likely to cause pollution of water resources, prospecting diggings, pit or any other excavation. If the waste classification results reflect pollution potential, an applicant will therefore have to apply for exemption from GN704 in order to undertake concurrent rehabilitation. If no pollution potential is revealed by the classification results, no exemption is required. GN704 also prescribes the design and construction of pollution control dams.

A Water Use License Application will not be lodged for this project.

#### **9.1.8.1 Catchment Management Strategies**

Catchment Management Agencies (CMAs) are tasked with coordinating the water demands, interests and responsibilities of all relevant government departments, institutions and water users within a specific CMA (DWA, 2012). This is to ensure that on a regional scale, water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons. The main instrument that guides and governs the activities of a CMA is the Catchment Management Strategy (CMS) which, while conforming to relevant legislation and national strategies, provides detailed arrangements for the protection, use, development, conservation, management and control of the region's water resources.

#### **9.1.9 National Heritage Resources Act**

The National Heritage Resources Act, 1999 (NHRA - Act 25 of 1999) stipulates that cultural heritage resources may not be disturbed without authorisation from the relevant heritage authority. Section 34(1) of the NHRA states that, “no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority...” The NHRA is utilised as the basis for the identification, evaluation and management of heritage resources and specifically, those resources impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA and MPRDA legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorisations are granted for development.

The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008b). The NEMA 23(2)(b) states that an integrated environmental management plan should, “...identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage”.

A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 (Fourie, 2008b).

MPRDA defines ‘environment’ as it is in the NEMA and therefore acknowledges cultural resources as part of the environment. Section 39(3)(b) of this Act specifically refers to the evaluation, assessment and identification of impacts on all heritage resources as identified in Section 3(2) of the National Heritage Resources Act that are to be impacted on by activities governed by the MPRDA. Section 40 of the same Act requires the consultation with any State Department administering any law that has relevance on such an application through Section 39 of the MPRDA. This implies the evaluation of Heritage Assessment Reports in Environmental Management Plans or Programmes by the relevant heritage authorities (Fourie, 2008b).

In accordance with the legislative requirements and EIA rating criteria, the regulations of the South African Heritage Resources Agency (SAHRA) and Association of Southern African Professional Archaeologists (ASAPA) have also been incorporated to ensure that a comprehensive and legally compatible Heritage Impact Assessment Report is compiled.

#### **9.1.10 Spatial Planning and Land Use Management Act**

The Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA) promotes optimal exploitation of minerals and mineral resources. The Act provides a framework for a planning system for the country. The Act introduces provisions to cater for development principles; norms and standards; inter-governmental support; Spatial Development Frameworks (SDFs) across national, provincial, regional and municipal areas, Land Use Schemes (LUS), and municipal planning tribunals.

## 10. NEED AND DESIRABILITY OF THE PROPOSED ACTIVITY

If this project is approved, it will allow Western Allen Ridge to determine if there is an economically viable gas resource available in the area. It is important to note that the exploration right will not provide the required authorisation for gas production activities to be undertaken. As such, any future intention to undertake production of hydrocarbons within the exploration right area would require a further application, investigation and public consultation process.

Should exploration prove successful and a gas resource quantified, it would indicate a potential viable economic activity in the form of gas production that is likely to contribute greatly to the socio-economic status quo, such as increased income, employment and other benefits that would cascade through the local, regional and national levels.

## 11. PERIOD FOR WHICH AUTHORISATION IS REQUIRED

The Environmental Authorisation is required for three (3) years.

## 12. CONSIDERATION OF ALTERNATIVES

The identification of alternatives is a key aspect of the success of the environmental impact assessment process. All reasonable and feasible alternatives must be identified and screened to determine the most suitable alternatives to consider in this application. There are however, some constraints that have to be taken into account when identifying alternatives for a project depending on the scope. Such constraints include financial, social and environment related constraints. Alternatives can typically be identified according to:

- Activity alternatives.
- Location alternatives.
- Design or layout alternatives.
- Technology alternatives.
- Operational alternatives.
- No-Action alternative (No-Go).

For any alternative to be considered feasible, such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts. Alternatives are typically distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and/or environmental impact assessment process. Incremental alternatives typically arise during the environmental impact assessment process and are usually suggested as a means of addressing/mitigating identified impacts (exploring in low sensitivity areas). These alternatives are closely linked to the identification of mitigation measures and are therefore not specifically identified as distinct alternatives.

### 12.1 Full Description of the Process Followed to Reach the Proposed Preferred Alternatives Within the Site

The NEMA (2014) EIA Regulations require a Scoping and EIA report to identify alternatives for projects applied for. In terms of the above-mentioned regulations, an alternative in relation to a proposed activity means different ways of meeting the general purpose and requirements of the activity, which may include alternatives to (i) the property on which or location where it is proposed to undertake the activity, (ii) the type of

activity to be undertaken, (iii) the design or layout of the activity, (iv) the technology to be used in the activity, (v) the operation aspects of the activity and (vi) the option of not implementing the activity.

Western Allen Ridge proposes to undertake exploration within the project area in order to determine if an economically viable gas resource exists. The proposed exploration programme will include the drilling of 4 wells, each to a depth of 600 m. The development footprint is expected to be a fraction (up to 0.8 ha) of the project area size, which is 33 065.2929 ha.

#### **12.1.1 Property**

Historically, the Kroonstad project area was explored for gold by Anglo American Prospecting Services between 1950 and 1990. White Rivers Exploration (Pty) Ltd (WRE) holds prospecting rights over the application area and previously held a TCP over the same area. The desktop activities that were carried out in the Kroonstad area indicated promising gold intersections in the Kimberley Group of reefs. A few of the boreholes also intersected gas, and it was believed that gas could form a useful co-product along with gold as it could provide a source of energy for the future mining operations in the area. WRE collected summary borehole logs for many of the boreholes drilled in the area from the Council for Geoscience (CGS) and used these boreholes to build a low resolution 3D geological model of the project area.

Based on the outcomes of the geological model WRE were of the opinion that the Kroonstad TCP area held considerable promise as a gasfield because the geological formations that are present are very similar to those in the Evander Goldfield which has yielded large quantities of gas since its discovery in 1955. In addition, the TCP area is located in close proximity to the helium-rich Smaldeel Gasfield.

The project area has also been selected based on a number of criteria, which include the environmental considerations (how sensitive the area is in terms of flora, fauna, wetlands, etc.) as well as historical and current data available for the region, which indicates the potential for economically viable gas deposits to occur.

Due to the geological features (in terms of gas deposition) present within the application area and the low sensitivity of the receiving socio-economic and biophysical environment, no property alternatives are suggested.

#### **12.1.2 Type of Activity**

The exploration activities proposed in the EWP follow a phased approach, whereby the preceding phase determines if further work is warranted. As such, no alternatives are indicated, but rather a phased approach of trusted exploration techniques/activities.

#### **12.1.3 Design or Layout**

A specific area within the application area has been identified for drilling in order to minimise land destruction during invasive exploration. Exploration is temporary in nature; consequently, no permanent or complicated surface infrastructure will be constructed on-site. Therefore, no design and layout alternatives have been proposed for this project.

#### 12.1.4 Technology Alternatives

The technologies listed in the EWP have been selected as they have proven effective in the determination of resource viability within the proposed exploration area. The exploration techniques as proposed in the EWP are dependent on the preceding phase; therefore, no alternatives are indicated, but rather a phased approach of trusted exploration techniques.

#### 12.1.5 Operational Aspects

Operational aspects that have been considered for the effective implementation of the EWP include financial arrangements, and the availability of appropriate equipment and the technical skills. An amount of ZAR 23 985 428 will be required to finance the EWP. The cost estimate depicts an exploration budget planned in phases that naturally follow each other assuming the success of the previous phase.

At any one point in time, the scope and money allocated to a follow-up phase could be affected by success or failure to intersect the gas resource in the previous stage. The above exploration budget could therefore change dramatically during the exploration process.

The Creasy Group of companies has committed to finance the exploration costs for Western Allen Ridge. This group is a long standing investor into the South African minerals industry.

#### 12.1.6 Option of Not Implementing ('No-Go')

The 'No-Go' alternative is the option of not undertaking exploration activities on the project site. The 'No-Go' option assumes the site remains in its current state. Drilling is required in order to investigate the potential and feasibility of a gasfield. There is no potential for any future investment in gas production without confirmation of a gasfield, which can only be obtained through exploration activities.

Should this gas exploration application be refused, the verification of a potential viable economic activity in the form of gas production would not occur. The socio-economic benefit and most notably the future employment potential of a gas production company will also be lost.

### 12.2 Motivation for the Overall Preferred Development Footprint

Historically, the Kroonstad project area was explored for gold by Anglo American Prospecting Services between 1950 and 1990. White Rivers Exploration (Pty) Ltd (WRE) holds prospecting rights over the application area and previously held a TCP over the same area. The desktop activities that were carried out in the Kroonstad area indicated promising gold intersections in the Kimberley Group of reefs. A few of the boreholes intersected gas as well and it was believed that gas could form a useful co-product along with gold as it could provide a source of energy for the future mining operations in the area. WRE collected summary borehole logs for many of the boreholes drilled in the area from the Council for Geoscience (CGS) and used these boreholes to build a low resolution 3D geological model of the project area.

Based on the outcomes of the geological model, WRE were of the opinion that the Kroonstad TCP area held considerable promise as a gasfield because the geological formations that are present are very similar to those in the Evander Goldfield which has yielded large quantities of gas since its discovery in 1955. In addition, the TCP area is located in close proximity to the helium-rich Smaldeel Gasfield.

The development footprint has also been selected based on a number of criteria, which include the environmental considerations (how sensitive the area is in terms of flora, fauna, wetlands, etc.) as well as

historical and current data available for the region, which indicates the potential for economically viable gas deposits to occur.

## 13. PUBLIC PARTICIPATION PROCESS

### 13.1 Public Participation Methodology

South Africa, being one of the countries with the most progressive constitutions, enshrined the public's right to be involved in decisions. Section 57(1) of the new Constitution that provides: "The National Assembly may (b) make rules and orders concerning its business, with due regard to representative and participatory democracy, accountability, transparency and public involvement". This provision, along with several others gave rise to many new trends in South African legislation. In environmental legislation, the idea of public participation (or stakeholder engagement) features strongly and especially the National Environmental Management Act, 1998 (Act 107 of 1998, as amended) (NEMA) and the recent regulations passed under the auspices of this Act make very strict provisions for public participation in environmental decision-making.

Public participation can be defined as "a process leading to a joint effort by stakeholders, technical specialists, the authorities and the proponent who work together to produce better decisions than if they had acted independently" (Greyling, 1999). From this definition, it can be seen that the input of the public is regarded as very important indeed.

The Public Participation Process (PPP) is designed to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner to assist them to:

1. During the Scoping Phase:
  - Raise issues of concern and suggestions for enhanced benefits.
  - Verify that their issues have been recorded.
  - Assist in identifying reasonable alternatives.
  - Provide relevant local information and knowledge to the environmental assessment.
2. During the Environmental Impact Assessment (EIA) Phase:
  - Contribute relevant local information and knowledge to the environmental assessment.
  - Verify that their issues have been considered in the EIA process.
  - Comment on the findings of the environmental assessments.
3. During the decision-making phase:
  - Obtain information on the outcome, i.e. the competent authority's decision, and how and by when the decision can be appealed.

### 13.2 Identification of I&APS

I&APs referred to in this report include:

1. Pre-identified and registered landowners and adjacent landowners.
2. Pre-identified and registered key stakeholders.
3. I&APs who responded to the pre-notifications and requested to be registered.
4. I&APs who responded to the initial and Draft Scoping Report notification and requested to be registered.

The pre-identified I&APs were identified through various avenues such as WinDeed Searches and identification of key interest groups and authorities.

The I&AP database was compiled containing the following categories of stakeholders:

1. National, provincial and local government.
2. Agricultural sector.
3. Organised business.
4. Host and adjacent landowners.
5. Land claimants.
6. Other organisations, clubs, communities, and unions.
7. Various Non-Government Organisations (NGOs).

### **13.3 List of Authorities Identified and Notified**

The following authorities have been identified and notified of this proposed project:

1. Moqhaka Local Municipality.
2. Ngwathe Local Municipality.
3. Fezile Dabi District Municipality.
4. Free State Department of Economic Development, Tourism, Environmental Affairs and Small Business.
5. Free State Department of Agriculture, Rural Development, Land and Environmental Affairs.
6. Free State Department of Mineral Resources.
7. Free State Department of Agriculture and Rural Development.
8. Free State Department of Human Settlements.
9. Free State Department of Cooperative Governance, Traditional Affairs and Human Settlements.
10. Free State Department of Police, Roads and Transport.
11. Free State Department of Public Works.
12. Free State Department of Water and Sanitation.
13. South African Water Research Commission.
14. South African Heritage Resources Agency.
15. National Department of Rural Development and Land Reform.
16. National Department of Mineral Resources.
17. National Department of Agriculture, Forestry and Fisheries.
18. National Department of Environmental Affairs.
19. The Council for Scientific and Industrial Research - CSIR.
20. South African National Roads Agency Ltd – SANRAL.
21. Eskom.
22. Transnet.

### **13.4 List of Key Stakeholders Identified and Notified**

The following key stakeholders have been identified and notified of this proposed project:

1. BirdLife SA.



2. Federation for a Sustainable Development.
3. Endangered Wildlife Trust – EWT.
4. Wildlife and Environment Society of South Africa – WESSA.
5. Free State Agriculture.

### 13.5 List of Surface Rights/Land Owners Identified and Notified

The following landowners have been identified for this project:

1. Gerhardus Johannes Vosloo.
2. Julian Lerock Ingram.
3. Terreblanche Familie Trust.
4. Jocelyn Percy Ingram.
5. Kopano Ke Matla Agricultural Co-operative Ltd.
6. Hendrik Steynberg.
7. Dudley Myburgh
8. Congleton Boerdery Trust.
9. Athlone Trust.
10. Myburgh Eiendoms Trust.
11. Barend Jacobus van den Berg
12. Johannes Bernardus Haasboek.
13. JC Goosen Familie Trust.
14. Evechrand Pty Ltd.
15. Blydskap Trust.
16. Vaalkop Familie Trust.
17. Danie Thomas Trust.
18. Vierfontein Voerkraal Pty Ltd.
19. Louis Jonker.
20. Owen William –Keeve.
21. Hansie Muller Jnr.
22. Izak Andries van Niekerk.
23. Berna Crause Trust.
24. Villiers David Jacobus De-Administrators.
25. Hennie Steyn Familie Trust.
26. Pietershoek Trust.
27. Koalepe Project Trust.
28. Susanna Hester Oosthuizen.
29. Theunis Johannes De Jager.
30. Techno Farm CC.
31. Hannes Swanepoel Trust.
32. H N Froneman Famillie Trust.
33. Tovic Famillie Trust.
34. Crankshaw Trading Enterprises CC.
35. Roelof Johannes Feenstra.
36. Johan Tobias Blomerus.
37. Abraham Christoffel Morrison/ Christina Morrison.

38. Stefanus Johannes de Villiers.
39. Heleen Trust.
40. Kazmierczak Family Trust.
41. Anna Greef.
42. Ramolotsi Trust.
43. Steraine Trust.
44. Hendrik Steynberg
45. Kalkfontein Trust.
46. Haapee Trust.
47. Stefan de Villiers Trust.
48. Lucas Johannes Groenewald Barend Andries Groenewald.
49. Teddy Schultz Trust.
50. Frontein Boerdery Pty Ltd.
51. Theodor Ernest Carl Schultz.
52. Susanna Johanna Le Roux.
53. Theodorus Serfontein Froneman.
54. Johann Andries Jonker.
55. Joey Motlalepule Mochela
56. Lehmkuhlsrust Trust.
57. Klipfontein Trust.
58. Jo Jo Trust.
59. Carel Rudolph Serfontein.
60. Tsuke Trust.
61. Annet Swanepoel (ID not complete).
62. Danie Thomas Trust.
63. Eskom Holdings Ltd.
64. Melinda De Klerk.
65. Andries Bernardus Wessels.
66. Josephine van Niekerk Testamentere Trust Ook Bekend As Die Cobus Trust
67. Barend Johannes Wessels
68. Department of Agriculture and Land Reform.
69. Rudolph Johannes Cilliers.
70. Jacobus Johannes van Niekerk.
71. Yvette Pozyn.
72. Berna de Villiers Trust.
73. Nicolas Jakobus Vermaak.

### **13.6 List of Adjacent Landowners Notified**

The following adjacent landowners have been identified for this project:

1. PJ Van Schalkwyk Trust.
2. S J Le Roux Trust.
3. Burmah Trust.
4. Van ZIJL Marthinus Johannes.
5. Ngwathe Local Municipality.

6. Gardras Afslaers (Pty) Ltd.
7. J C Goosen Familie Trust.
8. Hansie Muller Voerkraal Trust.
9. Jurie Swart (Pty) Ltd.
10. Issabella Elizabeth de Bruyn.
11. Niel Wege Familie Trust.
12. C J Theron Trust.
13. Wessels Andries Bernardus.
14. Swanepoel Cornelius Alwyn.
15. Johann Hendrik Enslin Testamentere Trust Ook Bekend Albert Enslin Trust.
16. Fixane Trust.
17. Koffielaagte Trust.
18. Blomerus Johan Tobias.
19. Mooirus Trust.
20. John Leonard Familie Trust.
21. Crots Pietrich Freidrich Gerhardus.
22. Die Denne Boerdery (Pty) Ltd.
23. Crots Landgoed CC.
24. De Bruyn Issabella Elizabeth.
25. J & R Farmlands (Pty) Ltd.
26. DS Plant Hire (Pty) Ltd.
27. Claassen Barend Johannes-Trustees.
28. National Government of the Republic of South Africa.
29. Wild Melody Investments 116 CC.
30. Eden Trust.
31. C & C (Pty) Ltd.
32. Schultz Norman Teddy.

### 13.7 List of Registered IAPs

Following receipt of correspondence from PASA regarding their consultation with the DMRE in terms of Section 10 of the MPRDA (2002), the following I&APs have been registered for this project:

1. White Rivers Exploration (Pty) Ltd.
2. Muelekanyi Resources (Pty) Ltd.

### 13.8 Notification of I&APs

This section provides details on the notification that was distributed as part of the S&EIA process to date.

#### 13.8.1 Initial Project Notification

The PPP commenced on the 11<sup>th</sup> September 2020 with an initial notification and call to register period ending on the 16<sup>th</sup> October 2020. Initial notification was given in the following manner.

##### 13.8.1.1 Registered Letters, Faxes and E-mails

Notification letters, faxes and e-mails were distributed to all pre-identified I&APs (including affected and adjacent surface landowners, government organisations, NGOs, relevant municipalities, ward councillors and other organisations that might be affected). The notification letters included the following information:

1. Background information on the Applicant.
2. List of anticipated activities to be authorised.
3. Scale and extent of activities to be authorised.
4. Sufficient detail of the intended operation (to enable I&APs to assess/surmise what impact the activities will have on them or on the use of their land).
5. The purpose of the proposed project.
6. Details of the affected properties (including a locality map).
7. Details of the MPRDA and NEMA Regulations that must be adhered to.
8. Date by which any request to registers as an I&AP must be forwarded to Shango Solutions.
9. Contact details of the EAP.

In addition, a questionnaire was included in the registered mail, e-mails and faxes sent, and requested the following information from I&APs:

1. Information on any potential impacts from the proposed project.
2. Suggestions on potential mitigation measures for the anticipated impacts.
3. Information on current land uses and their location within the area.
4. Information on the location of any environmental features of note within and in the vicinity of the study area.
5. Details of the landowner and information (contact details) of lawful property occupiers, if any.
6. Details of any other I&APs that should be notified.
7. Details on any land developments proposed in the near future.
8. Any specific comments or concerns regarding the application.

#### **13.8.1.2 Background Information Document (BID)**

A Background Information Document (BID) (in English, Afrikaans and Sesotho) was prepared, distributed to I&APs and made available on the Shango Solutions website (<http://www.shango.co.za/public-documents>). The BID includes the following information:

1. Background information on the Applicant.
2. Project location.
3. Map of the proposed project area.
4. Project description and associated infrastructure.
5. Anticipated services.
6. Details of the MPRDA and NEMA Regulations that must be adhered to.
7. Preliminary potential impacts.
8. Specialist assessments undertaken in support of this application.
9. Description of the application process.
10. Information on document review.
11. Relevant Shango Solutions contact person for the project.

#### **13.8.1.3 Newspaper Advertisement**

Newspaper advertisements (in English, Afrikaans and Sesotho) describing the proposed project were placed in The Star, which is a national newspaper with adequate circulation in the area. The newspaper advertisements included the following information:

1. Project name.
2. Applicant name.
3. Project location.
4. Nature of the activity.
5. Details of the MPRDA and NEMA Regulations that must be adhered.
6. Information on document review.

#### **13.8.1.4 Site Notice Placement**

Twenty (20) A1 correx board site notices (in English, Afrikaans and Sesotho) were placed within and around the perimeter of the proposed project area. The on-site notices included the following information:

1. Applicant name and background information on the Applicant.
2. Project description and associated infrastructure.
3. Details of the MPRDA and NEMA Regulations that must be adhered.
4. Project location and a map of the proposed project area.
5. Information on document review.
6. Relevant Shango Solutions contact person for the project.

#### **13.8.1.5 Poster Placement**

A3 posters (in English, Afrikaans and Sesotho) were placed at local public gathering places within and around the application area. The notices and written notification afforded all pre-identified I&APs the opportunity to register for the project as well as to submit their issues/queries/concerns and indicate the contact details of any other potential I&APs that should be contacted.

#### **13.8.2 Availability of the Draft Scoping Report Notification**

The Draft Scoping Report was made available for public review and comment for a period of 30 days, from the 15<sup>th</sup> September 2020 to 16<sup>th</sup> October 2020. All pre-identified I&APs were notified of the availability of the Draft Scoping Report and where to locate it on the 11<sup>th</sup> September 2020. I&APs were also informed of the timeframes for comments/concerns and queries to be submitted to Shango Solutions.

The Draft Scoping Report was made available at the Gaggie-Inn Country Estate in Kroonstad for perusal and comment by all I&APs. Furthermore, the report was made available on the Shango Solutions website for download. Comments received from I&APs during the Draft Scoping Report review period are included in the updated Issues and Responses Report that is submitted to the PASA as part of this Final Scoping Report.

Notification regarding the availability of the Draft Scoping Report, a component of the PPP, was given in the following manner:

##### **13.8.2.1 Notification Letters**

Notification letters (in English, Afrikaans and Sesotho) were distributed to I&APs (pre-identified I&APs, as well as adjacent and surrounding landowners) via fax, e-mail and/or registered mail on the 15<sup>th</sup> September 2020.

##### **13.8.2.2 Newspaper Advertisements**

Newspaper advertisements specifying where the Draft Scoping Report is located were placed in The Star, which is a national newspaper with adequate circulation in the area, on the 11<sup>th</sup> September 2020.

### 13.8.3 Scoping Phase Open Day Notification

Notification regarding the Scoping Phase Open Day session was given in the following manner:

#### 13.8.3.1 Notification Letters

Notification letters (in English, Afrikaans and Sesotho) were distributed to I&APs via fax, e-mail and registered mail on the 11<sup>th</sup> September 2020. Notification documents included details on the venue, date as well as the duration of the Open Day. A hard copy of the Draft Scoping Report was made available at the Open Day venue (Gaggle-Inn Country Estate in Kroonstad).

#### 13.8.3.2 Newspaper Advertisements

Newspaper advertisements specifying the venue, date and duration of the Open Day were placed in The Star on the 11<sup>th</sup> September 2020.

#### 13.8.3.3 WhatsApp Notification

Pre-identified landowners were reminded of the Open Day via WhatsApp Notifications (in Afrikaans) on the 30<sup>th</sup> September 2020 (Figure 4).

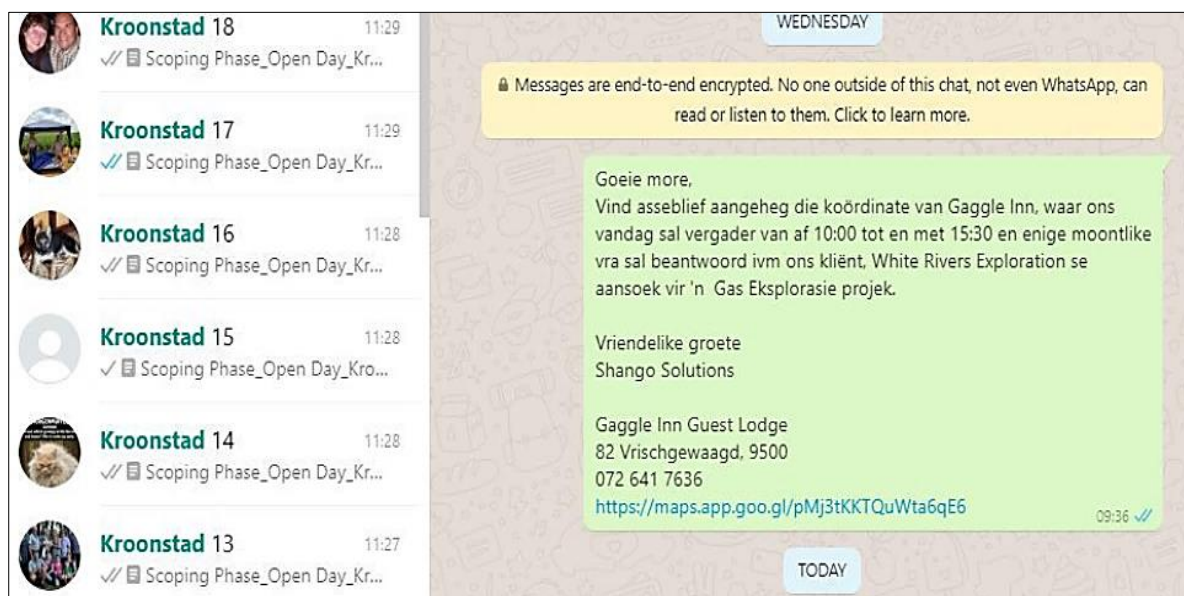


Figure 4: WhatsApp Notification regarding the Open Day.

### 13.8.4 Scoping Phase Open Day

During the 30 day Draft Scoping Report review period, an Open Day was held to present the findings of the Scoping Phase. The Open Day took place on the 30<sup>th</sup> September 2020. Notification documents regarding the Open Day were sent out to all pre-identified and registered I&APs. The documents included details on the venue, date as well as the duration of the Open Day.

During the Open Day session, 26 informative posters were displayed on the walls by Shango Solutions (the EAP) prior to commencement of the open session. A4 English hardcopy versions of the Open Day posters were provided to the attendees. In addition, A4 Afrikaans versions of the posters were sent to landowners via WhatsApp (Figure 5). The Shango team was available during the public Open Day for one on one discussions and questions from the attendees.

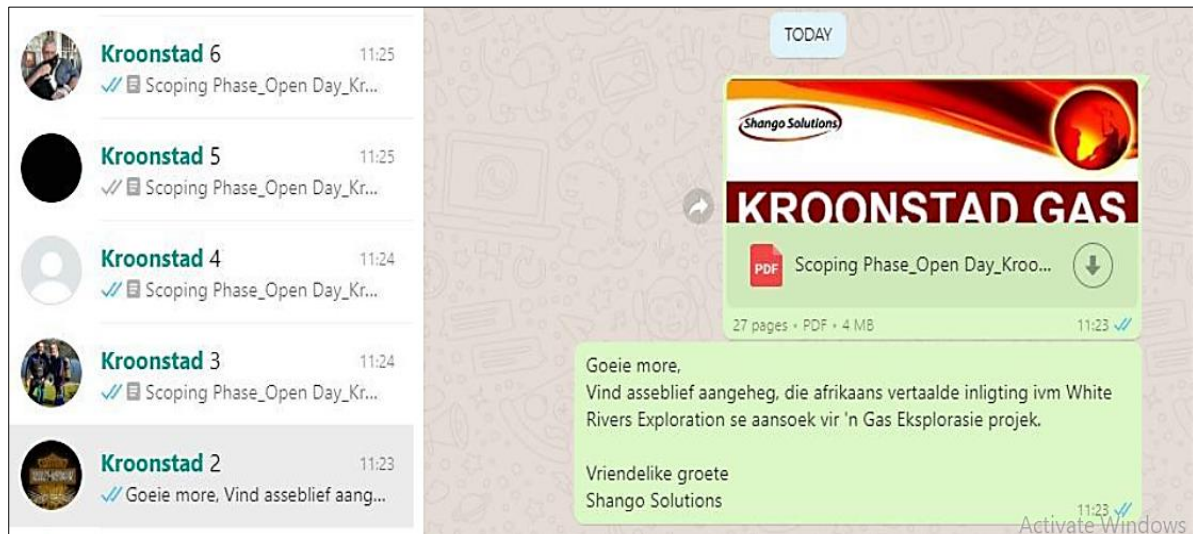


Figure 5: A4 Afrikaans versions of the Open Day posters sent to landowners via WhatsApp.

### 13.9 How Issues Raised Were Addressed

Issues raised during the Draft Scoping Report review period, including oral and written comments submitted by I&APS during the Open Day, are included in the Final Scoping Report for submission to the PASA.

### 13.10 Summary of Issues Raised by I&APs

Table 5 details comments received by Shango Solutions to date, and these comments have been included in the Issues and Responses Report (Appendix E) as part of the report submission to the PASA (the Competent Authority).

Table 5: Summary of issues raised by I&amp;APs (comments have been edited for typing or grammatical errors).

I&AP	Method	Date	Issue	Response
<b>Key Stakeholders</b>				
<b>Landowner/s</b>				
Gerhardus Johannes Vosloo			No comment received at this stage.	
Julian Lerock Ingram			No comment received at this stage.	
Terreblanche Familie Trust	Scoping Phase Open Day	30 September 2020	<p>During the Scoping Phase Open Day, Alex Terreblanche raised the following issues with regard to the proposed exploration project:</p> <ol style="list-style-type: none"> <li>1. There is a limited supply of groundwater in application area and as farmers, this is our biggest concern. What will happen if the holes hit the water table? It cannot be granted that we will not lose our water.</li> <li>2. I understand that the landowners will be compensated. However, compensation will not bring back the lost water resource.</li> <li>3. Why was this specific area selected for exploration activities?</li> <li>4. How many boreholes are they planning to drill?</li> </ol>	<p>Shango Solutions provided the following responses:</p> <ol style="list-style-type: none"> <li>1. During drilling activities, the Licence Holder needs to ensure that the holes are cemented to prevent groundwater contamination. In terms of loss of groundwater resources, we are not geohydrologists and we therefore cannot provide a detailed response in this regard. A Geohydrologist has been appointed for this project. The appointed specialist has collected water samples in the application area to determine the groundwater quantity and quality from the boreholes in the area.</li> </ol> <p>Kindly note that landowners whose water may be impacted by the exploration activities will be compensated.</p> <ol style="list-style-type: none"> <li>2. Noted. The holes will be drilled in such a way that groundwater contamination will be minimised as far as is practically possible. An Engineer and Geohydrologist sign off on the drilling plan, and PASA, the regulatory body, will also be involved in the process. PASA has strict requirements on how drilling</li> </ol>



I&AP	Method	Date	Issue	Response
				<p>activities should be undertaken.</p> <p>3. Gas tends to be associated with what we call palaeo-highs. Some of these palaeo-highs are located within the proposed application area. There are also known gas shells in the area. Those are the reasons why this specific area was selected. In a nutshell, the geology determines where exploration will take place.</p> <p>4. The Applicant intends to drill four gas wells - three on the north eastern portion of the application area, and one on the south western portion.</p>
	E-mail	30 September 2020	<p>Mr Alex Terreblanche completed the Interested and Affected Party Open Day Comment Sheet during the Scoping Phase Open Day held on the 30<sup>th</sup> September 2020 and provided the following comment:</p> <p>1. We would like to stop the exploration due to the scarcity of water supply and the pollution of our water. There is no guarantee that the drilling would not affect our water supply. As is we do not have enough water for home use and animals. So no drilling.</p>	<p>Dear Alex,</p> <p>Thank you for completing the Interested and Affected Party Open Day Comment Sheet and for providing us with a copy of the analytical results for you treated borehole water.</p> <p>Your objection to the proposed project and reasons thereof are noted. A response to your comment is written in red font colour:</p> <p>1. We would like to stop the exploration due to the scarcity of water supply and the pollution of our water. There is no guarantee that the drilling would not affect our water supply. As is we do not have enough water for home use and animals. So no drilling.</p> <p>Your concerns regarding the impact of the proposed exploration activities on water quality and quantity are duly noted. Kindly note that the gas wells will be drilled in such a way that</p>

I&AP	Method	Date	Issue	Response
				<p>groundwater contamination will be minimised as far as is practically possible, and that the drilling process will follow the MPRDA Regulations (GNR 466 of 2015).</p> <p>In order to prevent groundwater contamination, the MPRDA GNR 466 Regulations regarding the casing of the wells will be adhered to. Section 98 of GNR 466 indicates the following:</p> <p>“Surface casing for exploration or production wells must be set to a depth of 60 m below the base of the deepest fresh water or at least 100 m above the top of expected petroleum bearing zones, whichever comes first, and cemented to a surface”. The appointed Geohydrology specialist for this project has made a recommendation that the Applicant cement the top 200 m of the gas well.</p> <p>Upon completion of drilling activities, The Regulatory Authority (Petroleum Agency South Africa) will assess that the well has indeed been cemented according to the required specifications and/or best practice, and sign off on the well. The groundwater quality will be monitored for 10 years or to the point where a Geohydrologist can indicate with confidence that leakages and contamination of groundwater is no longer a significant risk.</p> <p>In addition to cementing of the holes, mitigation measures such as placement of drip trays under vehicles to prevent spills, leaks and possible contamination of groundwater have been proposed. It is not foreseen that there will be any</p>

I&AP	Method	Date	Issue	Response
				<p>significant impact on surface water as the development will not take place within 100 m of any identified watercourses (rivers, streams or dams).</p> <p>In terms of groundwater quantity, kindly note that no groundwater will be abstracted during drilling activities. In order to minimise potential impacts on groundwater quantity, mitigation measures such as monitoring of borehole yields during the drilling operation have been proposed.</p> <p>According to the mitigation measures proposed for the project, should it be proven that the operation is indeed affecting the quantity and quality of groundwater available to users, the affected parties will be compensated.</p> <p>Should you have any questions in this regard, please do not hesitate to contact me.</p> <p>Regards, Mmakoen</p>
Jocelyn Percy Ingram			No comment received at this stage.	
Kopano Ke Matla Agricultural Co-operative Ltd			No comment received at this stage.	
Hendrik Steynberg			No comment received at this stage.	
Dudley Myburgh			No comment received at this stage.	
Congleton Boerdery Trust			No comment received at this stage.	

I&AP	Method	Date	Issue	Response
Athlone Trust			No comment received at this stage.	
Myburgh Eiendoms Trust			No comment received at this stage.	
Barend Jacobus van den Berg			No comment received at this stage.	
Johannes Bernardus Haasboek	Scoping Phase Open Day	30 September 2020	<p>During the Scoping Phase Open Day, Bernardus Haasboek provided the following comment with regard to the proposed exploration project:</p> <p>1. I own the property Blaauwgom115 where one of the planned gas wells is located. There is a soil dam on this property where I am currently growing pecan nuts. I do not want anyone entering or trespassing on my property.</p>	This comment is noted.
JC Goosen Familie Trust			No comment received at this stage.	
Evechrand Pty Ltd			No comment received at this stage.	
Blydskap Trust			No comment received at this stage.	
Vaalkop Familie Trust			No comment received at this stage.	
Danie Thomas Trust			No comment received at this stage.	
Vierfontein Voerkraal Pty Ltd			No comment received at this stage.	

I&AP	Method	Date	Issue	Response
Louis Jonker			No comment received at this stage.	
Owen William – Keeve	Scoping Phase Open Day	30 September	<p>During the Scoping Phase Open Day, Reghaard and Frans Keeve raised the following issues with regard to the proposed exploration project:</p> <ol style="list-style-type: none"> <li>1. Will fracking be undertaken during the drilling activities?</li> <li>2. Will the Applicant be mining for helium gas?</li> <li>3. Should the Applicant intersect gas at the planned well locations, will drilling activities also be conducted on other farm properties within the application area?</li> <li>4. I gather that the wells will not be drilled to great depths?</li> <li>5. What influence will the travelling of gas along these structures have on the groundwater resource?</li> <li>6. Will the groundwater flow be disrupted by the drilling activities?</li> <li>7. Did Shango Solutions send someone to conduct water-related studies on the properties under application?</li> <li>8. What is the name of the company that is conducting geohydrological studies on your behalf?</li> </ol>	<p>Shango Solutions provided the following responses:</p> <ol style="list-style-type: none"> <li>1. No hydraulic fracking will be undertaken as part of the exploration programme. The drilling process will be similar to that undertaken during drilling of a water borehole. Each gas well will be drilled to a depth of 600 metres.</li> <li>2. Whether mining will take place or not will depend on the data gathered during the exploration phase. The Applicant will not be mining nor undertaking any production activities. Mining/production will entail a new application and a new process. For now, the Applicant will only be undertaking drilling activities to determine whether an economically viable gas resource exists in the area.</li> <li>3. Drilling activities will only be undertaken at the planned well locations. The basis for selecting the four drilling sites is the existence of palaeo-highs, approximately 300 – 400 metres below surface. Drilling will be undertaken on top of these palaeo-highs. Where there are structures (fissures) underneath the palaeo-highs, efforts will be made to intersect these structures as it is believed that the gas flows along the structures.</li> <li>4. The wells will not be drilled to great depths.</li> </ol>

I&AP	Method	Date	Issue	Response
				<p>Drilling activities will only be limited to where the palaeo-highs are located. If a gas resource is present in the area, the gas will travel along the structures and eventually be emitted where the gas wells will be drilled. There will be no need to drill additional wells on other properties as the gas will travel along these structures, throughout the entire application area.</p> <p>5. According to the PASA Regulations, the Licence Holder is required to cement the drill hole in order to avoid any contamination of groundwater. The Licence Holder has to drill and cement the top portion of the hole (the first 200 metres of the hole). If the top portion of the hole is not cemented, drilling activities could have an impact on the groundwater. Upon completion of drilling activities, PASA will check the cementation and sign off on the hole to ensure that there is no contamination of groundwater. The groundwater quantity and quality will be monitored for 10 years or to the point where a Geohydrologist can indicate with confidence that gas leakages and contamination of groundwater is no longer a significant risk.</p> <p>The Applicant has appointed a Geohydrologist to undertake geohydrological studies as part of the application process. Geohydrologists are experts in this field. The appointed Geohydrologist will monitor the groundwater quality and quantity before exploration takes place, throughout the</p>

I&AP	Method	Date	Issue	Response
				<p>exploration phase, and once exploration activities are complete. This will ensure that there is no legal liability during the exploration process.</p> <p>6. It is not foreseen that groundwater flow will be disrupted by drilling as no groundwater will be extracted during the drilling activities. There are a number of water tables in the application area: (i) one close to the surface, (ii) another approximately 150 - 200 metres below surface and (iii) an additional water table at greater depths, close to where the palaeo highs are located. The third water table, which is the oldest, is more saline. The top portion of the hole must be cemented to ensure that the saline water does not get mixed with freshwater. The requirement to cement the top portion of the hole forms part of the environmental legislation, and PASA is quite strict in this regard.</p> <p>7. The appointed Geohydrologist recently visited the properties under application to collect water samples. The geohydrological study forms part of this project.</p> <p>8. The name of the company is Noa 8 Agencies. We will provide you with the contact details of the specialist.</p>
Hansie Muller Jnr			No comment received at this stage.	
Izak Andries van Niekerk			No comment received at this stage.	

I&AP	Method	Date	Issue	Response
Berna Crause Trust			No comment received at this stage.	
Villiers David Jacobus De-Administrators			No comment received at this stage.	
Hennie Steyn Familie Trust			No comment received at this stage.	
Pietershoek Trust			No comment received at this stage.	
Koalepe Project Trust			No comment received at this stage.	
Susanna Hester Oosthuizen			No comment received at this stage.	
Theunis Johannes De Jager			No comment received at this stage.	
Techno Farm CC			No comment received at this stage.	
Hannes Swanepoel Trust	E-mail	29 September 2020	<p>Writing in connection with phone call about exploration of ground on Farm Fairfield, Edenville district.</p> <p>As we had a farm attack a while ago, we absolutely do not allow any strangers to enter on the farm</p> <p>We would appreciate you forwarding the message to whom it may concern</p> <p>Thank you.</p> <p>Sarel Haefele</p> <p>(LONGTERM tenant of farms Fairfield and Gunstig)</p>	This correspondence is noted.



I&AP	Method	Date	Issue	Response
			The owner, Mr Hannes Swanepoel also replied that he does not give permission to enter his farms.	
H N Froneman Famillie Trust			No comment received at this stage.	
Tovic Famillie Trust			No comment received at this stage.	
Crankshaw Trading Enterprises CC	Scoping Phase Open Day	30 September 2020	<p>During the Scoping Phase Open Day, Eddy Crankshaw the raised the following issues with regard to the proposed exploration project:</p> <ol style="list-style-type: none"> <li>1. I am looking at the locality plan, and I would like to understand why the specific drilling sites were selected.</li> <li>2. Will the gas be extracted through fracking?</li> <li>3. How will the gas exploration project affect those with properties in the middle of the application area? I own Fonteinspruit 645, which is located at the centre of the proposed application area.</li> <li>4. Where will contractors be accommodated during the drilling phase?</li> <li>5. My property is situated close to the main road (R34). Should the Exploration Right be granted and drilling activities be undertaken, I am willing to supply ground for the</li> </ol>	<p>Shango Solutions provided the following responses:</p> <ol style="list-style-type: none"> <li>1. As geologists, we look at areas in 3D space. If you look below the actual surface, you will find that there are two hills in the application area – one where wells C, B and A are located, and another where well D is located. Years ago, there was a glacial event. The glacier scoured the land surface and the two hills were left behind. There are fault structures where the two hills are located. Attempts will be made to intersect these fault structures during drilling as it is believed that this is where the gas will most likely be found.</li> <li>2. Since there is already a fault in the area, the rock is already fractured. Once the fault is intersected during drilling, the gas will come out automatically. Fracking will not be undertaken as part of the exploration works programme.</li> <li>3. The client is applying for an Exploration Right over the entire area indicated on the locality plan. In the next three years, four holes will be drilled as part of the exploration works</li> </ol>

I&AP	Method	Date	Issue	Response
			contractors. I have a storage yard, sanitation facilities and clean running water on my property.	<p>programme. Each well will be drilled to a depth of 600 m. Drilling will only be undertaken on four properties within the application area. The remaining properties will not be directly affected by the drilling activities.</p> <p>4. As it stands, no accommodation for staff and workers will be provided on-site unless permission is granted by the landowner. Should the landowner not grant permission, all persons will be accommodated in nearby towns, and workers will be transported to and from the exploration sites on a daily basis. The project is still in the initial phase and as such, a decision on where the appointed contractors will reside during the drilling phase has not been reached.</p> <p>5. Noted. Should drilling activities be undertaken, we will try to contact you to see if you could be of any assistance.</p>
Roelof Johannes Feenstra			No comment received at this stage.	
Johan Tobias Blomerus	Scoping Phase Open Day	30 September 2020	<p>During the Scoping Phase Open Day, Reghaard and Frans Keeve the raised the following issues with regard to the proposed exploration project:</p> <ol style="list-style-type: none"> <li>1. Where will the drill holes be located?</li> <li>2. What size will the drill holes be?</li> <li>3. What will happen after the completion of exploration activities?</li> </ol>	<p>Shango Solutions provided the following responses:</p> <ol style="list-style-type: none"> <li>1. Four gas wells will be drilled as part of the exploration works programme. The planned gas wells are located on Montreal West 64, the remaining portion of Evergreen 1236, Klipdraai 664 and Blaaugom 115.</li> <li>2. The minimum drill hole size will be HQ (88.9 mm).</li> </ol>

I&AP	Method	Date	Issue	Response
				<p>3. If the final geological model indicates that there is an economically viable gas resource in the area, Western Allen Ridge will have to apply for a Production Right, which will entail a new application process, and a new public participation process. The Exploration Right does not permit the Licence Holder to extract gas. Gas extraction can only be undertaken once a Production Right has been acquired, and the Production Right has to be granted by PASA. For now, the Applicant only wants to determine whether an economically viable gas resource exists in the area.</p> <p>Should exploration activities indicate that there is not enough gas in the area; the drill holes will be completely sealed.</p>
Abraham Christoffel Morrison/ Christina Morrison			No comment received at this stage.	
Stefanus Johannes de Villiers			No comment received at this stage.	
Heleen Trust			No comment received at this stage.	
Kazmierczak Family Trust			No comment received at this stage.	
Anna Greef			No comment received at this stage.	
Ramolotsi Trust			No comment received at this stage.	
Steraine Trust			No comment received at this stage.	

I&AP	Method	Date	Issue	Response
Hendrik Steynberg			No comment received at this stage.	
Kalkfontein Trust			No comment received at this stage.	
Haapee Trust			No comment received at this stage.	
Stefan de Villiers Trust			No comment received at this stage.	
Lucas Johannes Groenewald Barend Andries Groenewald			No comment received at this stage.	
Teddy Schultz Trust			No comment received at this stage.	
Frontein Boerdery Pty Ltd			No comment received at this stage.	
Theodor Ernest Carl Schultz			No comment received at this stage.	
Susanna Johanna Le Roux			No comment received at this stage.	
Theodorus Serfontein Froneman			No comment received at this stage.	
Johann Andries Jonker			No comment received at this stage.	
Joey Motlalepule Mochela			No comment received at this stage.	
Lehmkuhlsrust Trust			No comment received at this stage.	
Klipfontein Trust			No comment received at this stage.	
Jo Jo Trust			No comment received at this stage.	

I&AP	Method	Date	Issue	Response
Carel Rudolph Serfontein			No comment received at this stage.	
Tsuke Trust			No comment received at this stage.	
Annet Swanepoel (ID not complete)			No comment received at this stage.	
Danie Thomas Trust			No comment received at this stage.	
Eskom Holdings Ltd			No comment received at this stage.	
Melinda De Klerk			No comment received at this stage.	
Andries Bernardus Wessels			No comment received at this stage.	
Josephine van Niekerk Testamentere Trust Ook Bekend As Die Cobus Trust			No comment received at this stage.	
Barend Johannes Wessels			No comment received at this stage.	
Department of Agriculture and Land Reform			No comment received at this stage.	
Rudolph Johannes Cilliers			No comment received at this stage.	
Jacobus Johannes van Niekerk			No comment received at this stage.	
Yvette Pozyn			No comment received at this stage.	
Berna de Villiers Trust			No comment received at this stage.	

I&AP	Method	Date	Issue	Response
Nicolas Jakobus Vermaak			No comment received at this stage.	
<b>Adjacent Landowner/s</b>				
PJ Van Schalkwyk Trust			No comment received at this stage.	
S J Le Roux Trust			No comment received at this stage.	
Burmah Trust			No comment received at this stage.	
Van ZIJL Marthinus Johannes			No comment received at this stage.	
Ngwathe Local Municipality			No comment received at this stage.	
Gardras Afslaers (Pty) Ltd			No comment received at this stage.	
J C Goosen Familie Trust			No comment received at this stage.	
Hansie Muller Voerkraal Trust			No comment received at this stage.	
Jurie Swart (Pty) Ltd			No comment received at this stage.	
Issabella Elizabeth de Bruyn			No comment received at this stage.	
Niel Wege Familie Trust			No comment received at this stage.	

I&AP	Method	Date	Issue	Response
C J Theron Trust			No comment received at this stage.	
Wessels Andries Bernardus			No comment received at this stage.	
Swanepoel Cornelius Alwyn			No comment received at this stage.	
Johann Hendrik Enslin Testamentere Trust Ook Bekend Albert Enslin Trust			No comment received at this stage.	
Fixane Trust			No comment received at this stage.	
Koffielaagte Trust			No comment received at this stage.	
Blomerus Johan Tobias			No comment received at this stage.	
Mooirus Trust			No comment received at this stage.	
John Leonard Familie Trust			No comment received at this stage.	
Crots Pietrich Freidrich Gerhardus			No comment received at this stage.	
Die Denne Boerdery (Pty) Ltd			No comment received at this stage.	
Crots Landgoed CC			No comment received at this stage.	

I&AP	Method	Date	Issue	Response
De Bruyn Issabella Elizabeth			No comment received at this stage.	
J & R Farmlands (Pty) Ltd			No comment received at this stage.	
DS Plant Hire (Pty) Ltd			No comment received at this stage.	
<b>Local Municipality – Moqhaka Local Municipality</b>				
Executive Mayor			No comment received at this stage.	
Municipal Manager			No comment received at this stage.	
Speaker			No comment received at this stage.	
Ward 2 Councilor			No comment received at this stage.	
Ward 18 Councilor			No comment received at this stage.	
<b>Local Municipality – Ngwathe Local Municipality</b>				
Executive Mayor			No comment received at this stage.	
Municipal Manager			No comment received at this stage.	
Speaker			No comment received at this stage.	
Ward 8 Councilor			No comment received at this stage.	

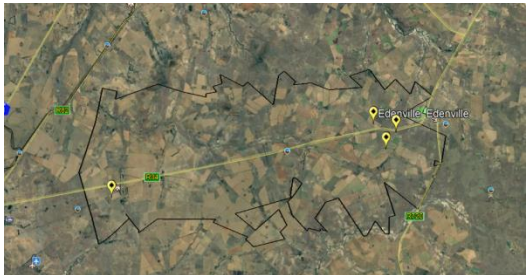


I&AP	Method	Date	Issue	Response
<b>District Municipality – Fezile Dabi District Municipality</b>				
Executive Mayor			No comment received at this stage.	
Municipal Manager			No comment received at this stage.	
<b>Organs of State (Free State Province)</b>				
Petroleum Agency South Africa			No comment received at this stage.	
Free State Department of Mineral Resources and Energy			No comment received at this stage.	
Free State Department of Economic Development, Tourism, Environmental Affairs and Small Business			No comment received at this stage.	
Free State Department of Agriculture, Rural Development, Land and Environmental Affairs			No comment received at this stage.	
Free State Department of Rural Development and Land Reform			No comment received at this stage.	
Free State Department of Agriculture and Rural Development			No comment received at this stage.	
Free State Department of Human Settlements			No comment received at this stage.	

I&AP	Method	Date	Issue	Response
Free State Department of Cooperative Governance, Traditional Affairs and Human Settlements			No comment received at this stage.	
Free State Department of Police, Roads and Transport			No comment received at this stage.	
Free State Department of Public Works			No comment received at this stage.	
Free State Department of Water and Sanitation	E-mail	16 October 2020	<p>Good day,</p> <p>Hope this mail finds you well.</p> <p>Herewith please find the interested and affected part registration form for your further attention.</p> <p>Regards,</p> <p>Boitumelo Melato</p> <p>Boitumelo completed the Interested and Affected Party Registration Form and provided the following comments:</p> <ol style="list-style-type: none"> <li>1. Interested in the proposed project due to water and waste/water management during the invasive stage of the project.</li> <li>2. It is noted that the project consists of invasive and non-invasive stages. The applicant is advised to consult this Department during the invasive stage of the project to establish if a water use</li> </ol>	<p>Dear Boitumelo,</p> <p>Thank you for completing the Interested and Affected Party registration form.</p> <p>Your comment that the Department should be consulted during the invasive stage of the project to establish if a water use authorisation will be required is duly noted and will be adhered to.</p> <p>Best regards,</p> <p>Mmakoen</p>

I&AP	Method	Date	Issue	Response
			authorisation will be required.	
<b>Organs of State (National)</b>				
South African Water Research Commission			No comment received at this stage.	
South African Heritage Resources Agency			No comment received at this stage.	
National Department of Rural Development and Land Reform			No comment received at this stage.	
National Department of Mineral Resources			No comment received at this stage.	
National Department of Agriculture, Forestry and Fisheries			No comment received at this stage.	
National Department of Environmental Affairs			No comment received at this stage.	
The Council for Scientific and Industrial Research -CSIR			No comment received at this stage.	
South African National Roads Agency - SANRAL	E-mail	14 September 2020	<p>Good Day Nqobile</p> <p>Hope all is well.</p> <p>Please receive attached the fax for a proposed development in Mangaung.</p> <p>Please register and provide consolidated feedback.</p>	<p>Dear Thobile,</p> <p>Thank you for your mail.</p> <p>Attached please receive a clear copy of the BID.</p> <p>Should you require further assistant, please do not hesitate to contact me.</p>

I&AP	Method	Date	Issue	Response
			<p>Ravi and Andrew, please confirm if there is no conflict with any of our proposed quarries as the proposed development covers approximately 39 farms.</p> <p>Zizo, please forward us a clear copy of the BID.</p> <p>Kind Regards</p> <p>Thobile Duma</p>	<p>Keep well and may you enjoy the day further.</p>
	E-mail and Telephone	19 September 2020	<p>Good day</p> <p>Your application with regard to the above subject matter was received by our office. Please take note of the following concerns before your application can be processed;</p> <ol style="list-style-type: none"> <li>1. Your application must only include farms that are 500m from the national routes /junction</li> <li>2. Copies of title deeds of all affected farms/farm portions must accompany every application</li> <li>3. Power of attorney must accompany every application if the applicant is not the registered owner of the concerned property.</li> <li>4. Council /Company resolution authorizing such an application</li> <li>5. Site Plan if there will be any development on the property.</li> </ol> <p>Please fill and return the attached forms together with all documents required as</p>	<p>Telephone record:</p> <p>A telecomm was made to Mr. Ngoasheng Sefako to seek clarity with regard to his e-mail received on the 19<sup>th</sup> October 2020, and to enquire about the attached documents that Shango was required to complete and send back to Mr. Ngoasheng Sefako, as (i) the documentation did not relate to the proposed project and (ii) the proposed well locations are 500 metres away from national roads.</p> <p>Mr. Ngoasheng Sefako indicated that we do not need to complete the attached forms if the proposed project is located 500 metres away from national roads. However, we need to respond to his e-mail and provide proof that the well locations are indeed located 500 metres away from national roads.</p> <p>Ms Zizo Siwendu let Mr Ngoasheng Sefako know that Shango will respond to his e-mail and provide a kmz file indicating the distance of the planned well locations to surrounding and/or</p>

I&AP	Method	Date	Issue	Response
			<p>listed on the application forms</p> <p>Thanks</p> <p>Ngoasheng Sefako</p>	<p>nearby national roads.</p> <p>Dear Ngoasheng,</p> <p>This e-mail serves as a follow-up to your telecomm with Ms. Zizo Siwendu, during which you indicated that we do not need to complete the attached forms if the proposed project is located 500 metres away from national roads.</p> <p>As per your request, please find the attached kmz file indicating that the planned well locations are <b>not</b> located within 500 metres of any national road (s).</p> <p>I have also included a Google Earth screenshot of the proposed application area and planned well locations for your convenience.</p>  <p>Should you have any questions in this regard, please do not hesitate to contact me.</p> <p>Best regards,</p> <p>Mmakoena Mmola</p>

I&AP	Method	Date	Issue	Response
Eskom			No comment received at this stage.	
Transnet			No comment received at this stage.	
<b>Other Affected Parties</b>				
BirdLife SA			No comment received at this stage.	
Federation for a Sustainable Development (Mariette Liefferink)			No comment received at this stage.	
Endangered Wildlife Trust - EWT			No comment received at this stage.	
Wildlife and Environment Society of South Africa -WESSA			No comment received at this stage.	
Free State Agriculture	E-mail	29 September 2020	<p>Dear All</p> <p>Please find attached our position RE prospecting for gas in agricultural areas which, if successful, could lead to potentially highly destructive mining /extraction and decimation of groundwater on which long term sustainable agriculture depends, while massive renewable energy potential exists in SA which is far less risky!</p> <p>We object in strongest terms and propose the no-go option from the outset.</p> <p>I will unfortunately not be able to attend the open day tomorrow, but have forwarded the notification on to our</p>	<p>Dear Jack,</p> <p>Thank you for your mail.</p> <p>Your objection to the proposed project and reasons thereof are noted. Responses to your comments provided on the Interested and Affected Party Registration Form are written in red font colour:</p> <ol style="list-style-type: none"> <li>1. Organization representing some of the affected farmers and agriculture in general. <b>Noted.</b></li> <li>2. Groundwater is critical for any farm to be able to farm sustainably, and groundwater (and affected surface water) flows form the point source of pollution to infect many others sharing groundwater source and downstream, hence our main point of concern for any gas</li> </ol>

I&AP	Method	Date	Issue	Response
			<p>representative farmers in the area.</p> <p>Please note that FSAgri does not represent all of the farmers in the affected area.</p> <p>Yours sincerely,</p> <p>Jack Armour</p> <p>Mr Jack Armour completed the Interested and Affected Party Registration form and provided the following comments:</p> <ol style="list-style-type: none"> <li>3. Organisation representing some of the affected farmers and agriculture in general.</li> <li>4. Groundwater is critical for any farm to be able to farm sustainably, and groundwater (and affected surface water) flows from the point source of pollution to infect many others sharing groundwater source and downstream, hence our main point of concern for any gas mining application.</li> <li>5. Greenpeace, WWF, Birdlife Africa and similar wildlife, water, cultural, heritage and environmental protection organizations need to be notified of the proposed project. Also renewable energy providers who can supply far safer energy more sustainably.</li> <li>6. Receiving environment is that of high arable crop and irrigation agricultural lands and permanent crops, natural</li> </ol>	<p>mining application.</p> <p>Your concerns are duly noted. Kindly note that the gas wells will be drilled in such a way that groundwater contamination will be minimised as far as is practically possible, and that the drilling process will follow the MPRDA Regulations (GNR 466 of 2015).</p> <p>In order to prevent groundwater contamination, the MPRDA GNR 466 Regulations regarding the casing of the wells will be adhered to. Section 98 of GNR 466 indicates the following:</p> <p>“Surface casing for exploration or production wells must be set to a depth of 60 m below the base of the deepest fresh water or at least 100 m above the top of expected petroleum bearing zones, whichever comes first, and cemented to a surface”. The appointed Geohydrology specialist for this project has made a recommendation that the Applicant cement the top 200 m of the gas well.</p> <p>Upon completion of drilling activities, The Regulatory Authority (Petroleum Agency South Africa) will assess that the well has indeed been cemented according to the required specifications and/or best practice, and sign off on the well. The groundwater quality will be monitored for 10 years or to the point where a Geohydrologist can indicate with confidence that leakages and contamination of groundwater is no longer a significant risk.</p> <p>In addition to cementing of the holes, mitigation measures such as placement of drip trays under</p>

I&AP	Method	Date	Issue	Response
			<p>and planted grazing camps, wildlige ranching, agri-tourism, etc. Homesteads and livelihoods.</p> <p>7. Land developments within the application area include large capital investments in game farming where the future value of peace and quiet and the pristine environment is capitalized. Capital and time investments in fixing rural roads together as a community, planting trees for future generations to enjoy and building community for unity and trust.</p> <p>8. Cultural and heritage features within the application area and surrounds include multigenerational farmhouses and outbuildings which hold huge sentimental value.</p> <p>9. A full socio-economic impact assessment needs to be conducted to weight the potential short term benefits and costs of gas mining against the long-term potential social and environmental impacts vs. the carry on as is scenario of conservation and regenerative agriculture game and wildlige ranching, agri-tourism, etc. The SERNICK group of companies doing excellent work in transformation and agri-processing and value addition near Edenville and Kroonstad could be affected.</p>	<p>vehicles to prevent spills, leaks and possible contamination of groundwater have been proposed. It is not foreseen that there will be any significant impact on surface water as the development will not take place within 100 m of any identified watercourses (rivers, streams or dams).</p> <p>3. Greenpeace, WWF, Birdlife Africa and similar wildlife, water, cultural, heritage and environmental protection organizations need to be notified of the proposed project. Also renewable energy providers who can supply far safer energy more sustainably.</p> <p>Noted.</p> <p>4. Receiving environment is that of high arable crop and irrigation agricultural lands and permanent crops, natural and planted grazing camps, wildlige ranching, agri-tourism, etc. Homesteads and livelihoods.</p> <p>Noted.</p> <p>5. Land developments within the application area include large capital investments in game farming where the future value of peace and quiet and the pristine environment is capitalized. Capital and time investments in fixing rural roads together as a community, planting trees for future generations to enjoy and building community for unity and trust.</p> <p>Noted.</p> <p>6. Cultural and heritage features within the application area and surrounds include multigenerational farmhouses and outbuildings which hold huge sentimental</p>



I&AP	Method	Date	Issue	Response
			<p>10. Thorough professional studies should be conducted and more as gathered from intensive consultation from all local stakeholders. The no-go option if proposed at this stage already to prevent any further water of funds pursuing prospecting as eventually mining WILL be strongly opposed as people's entire legacy and livelihoods stand to be destroyed by the eventually actions the successful prospecting could lead to.</p> <p>11. FSAgri strongly objects to any prospecting activity which then automatically if successful becomes a gas mining activity in a following phase of applications and if granted and proceeded with, especially if UCG or hydraulic fracturing, becomes a huge risk to the sustainability of productive agriculture in a very important area of the district / region affecting long term livelihoods and job creation potential where alternative energy is available with far less risk. FSAgri strongly objects to any further prospecting in the area which could potentially lead to hydraulic fracturing and has a mandate to do according to a congress decision which is also carried through to AgriSA at national level.</p>	<p>value. <b>Noted.</b></p> <p>7. A full socio-economic impact assessment needs to be conducted to weight the potential short term benefits and costs of gas mining against the long-term potential social and environmental impacts vs. the carry on as is scenario of conservation and regenerative agriculture game and wildlidge ranching, agri-tourism, etc. The SERNICK group of companies doing excellent work in transformation and agri-processing and value addition near Edenville and Kroonstad could be affected.</p> <p><b>Your suggestion that a socio-economic impact assessment be conducted and concerns regarding how the project could affect the SERNICK group of companies are duly noted. Kindly note that this application is for gas exploration and not production nor mining. During the 3-year exploration programme, it is anticipated that drilling of the 4 gas wells will be conducted for a duration of 16 months (8 months during Year 2 and 8 months during Year 3), and that each drill well site will disturb an area of 0.2 ha. As such, it is not foreseen that there will be any significant impact on current land uses. Therefore, given the nature (exploration) and short duration (3 years) of the proposed project, a socio-economic impact assessment is deemed not necessary at this stage.</b></p> <p>8. Thorough professional studies should be conducted and more as gathered from</p>

I&AP	Method	Date	Issue	Response
				<p>intensive consultation from all local stakeholders. The no-go option if proposed at this stage already to prevent any further water of funds pursuing prospecting as eventually mining WILL be strongly opposed as people's entire legacy and livelihoods stand to be destroyed by the eventually actions the successful prospecting could lead to.</p> <p>Noted.</p> <p>9. FSAgri strongly objects to any prospecting activity which then automatically if successful becomes a gas mining activity in a following phase of applications and if granted and proceeded with, especially if UCG or hydraulic fracturing, becomes a huge risk to the sustainability of productive agriculture in a very important area of the district / region affecting long term livelihoods and job creation potential where alternative energy is available with far less risk. FSAgri strongly objects to any further prospecting in the area which could potentially lead to hydraulic fracturing and has a mandate to do according to a congress decision which is also carried through to AgriSA at national level.</p> <p>Your objection and concerns are duly noted. Kindly note that hydraulic fracturing will not be undertaken as part of the exploration works programme. Since there are faults in the rock in the proposed application area, the rock is already fractured. Once a fault is intersected during drilling, the gas will come out automatically without the need for hydraulic</p>

I&AP	Method	Date	Issue	Response
				<p>fracturing.</p> <p>Should you have any questions in this regard, please do not hesitate to contact me.</p> <p>Regards,</p> <p>Mmakoen</p>
Registered Interested and Affected Parties				
White Rivers Exploration (Pty) Ltd/Scott Sullivan	E-mail	23 September 2020	<p>Hi Zizo</p> <p>Jochen asked me to give you a summary of a community contact.</p> <p>I was contacted by Eddy Crankshaw via WhatsApp. He got my phone number off the website.</p> <p>He is a farmer neighbouring Kroonstad and noted we were planning a project in this area and he was just offering assistance of any kind if we needed services.</p> <p>He wasn't specific, but being a farmer would have access to equipment, resources and expertise that may be of use for drilling programs.</p> <p>I simply replied that the projects are very early stage and we had no current needs. Our exploration team or community manager would liaise with the community at the appropriate time and to watch for news.</p>	<p>Good morning Scott,</p> <p>Thank you very much for the e-mail. We will make a follow up with Eddy Crankshaw.</p> <p>Keep well and may you enjoy the rest of your day.</p> <p>Best Regards,</p> <p>Zizo Siwendu</p>

I&AP	Method	Date	Issue	Response
			His number s +27 82 772 1952 Regards Scott	
Muelekanyi Resources (Pty) Ltd			No comment received at this stage.	
Paull Mosia	Scoping Phase Open Day and Comment Sheet	30 September 2020	<p>During the Scoping Phase Open Day, Paul Mosia raised the following issues with regard to the proposed exploration project:</p> <ol style="list-style-type: none"> <li>1. I am currently leasing Sterkwater farm (one of the properties under application) from the government and I came here today to obtain more information about the project.</li> <li>2. Will drilling be conducted on the farm Klipdraai?</li> <li>3. If a gas resource is found in the area, what steps will follow?</li> <li>4. What kind of gas will they be exploring for?</li> <li>5. Should it be found that a viable gas resource exists; will the Applicant get into an agreement with the government and Kopano Ke Matla?</li> <li>6. The representative of Kopano Ke Matla (George Mafokozi) says that the Applicant is welcome to conduct drilling activities on Klipdraai, should</li> </ol>	<p>Shango Solutions provided the following responses:</p> <ol style="list-style-type: none"> <li>1. This is a gas Exploration Right application by a company called Western Allen Ridge. The company would like to ascertain whether a viable gas resource exists in the area. The Applicant intends on drilling four gas wells as part of the exploration works programme: two during the second year of the exploration programme, followed by an additional two wells during the third year. The planned gas wells are located on Montreal West 64, the remaining portion of Evergreen 1236, Klipdraai 664 and Blaaugom 115. Klipdraai is owned by Kopano Ke Matla Agricultural Co-operative.</li> <li>2. Yes. Should the Exploration Right be granted and drilling activities be undertaken, a drill pad will be set up on the farm Klipdraai. The gas well will be drilled to a depth of 600 metres.</li> <li>3. If the geological model indicates that there is an economically viable gas resource in the area, the Applicant will apply for a Production Right, which will be a whole new application,</li> </ol>

I&AP	Method	Date	Issue	Response
			<p>the Exploration Right be granted.</p> <p>In addition, Mr. Mosia completed the Interested and Affected Party Comment Sheet and provided the following comment:</p> <p>Shango Solutions are welcome to drill on my farm Stekrwater and Klipdraai in their process of searching for gas, and if the results are positive, I think the project will create jobs in my area.</p>	<p>with its own studies. Communities residing within and around the application area will have to be notified of the Production Right application, and a process similar to the one currently being undertaken for the Exploration Right will be conducted. Another open day will be held where the public can ask questions with regard to the Production Right application. However, the Applicant will not be mining nor producing any gas for now. For the purpose of this application, the aim is to determine whether there is a viable gas resource.</p> <p>4. According to the exploration works programme, they will be exploring for helium and methane.</p> <p>5. Yes. Should the Exploration Right be granted, the Licence Holder will have to make arrangements with Kopano Ke Matla to enter the property where drilling will take place. The Licence Holder will not enter the premises without the landowner's permission. The Licence Holder has to reach an agreement with the landowner, and the landowner must provide consent before any drilling can take place.</p> <p>6. This comment is noted.</p>

## 14. ENVIRONMENTAL ATTRIBUTES AND ASSOCIATED ALTERNATIVES

### 14.1 Baseline Receiving Environment

This section describes the baseline receiving environment of the exploration area. Information in this section was sourced from the specialist scoping reports which are included as Appendix F to this Final Scoping Report.

#### 14.1.1 Social-economic

The application area is located in the Free State Province approximately 15 km east of the town of Kroonstad. It can be found in the Moqhaka Local Municipality (Wards 2 and 18) and Ngwathe Local Municipality (Ward 8), which form part of the Fezile Dabi District Municipality (Figure 6).

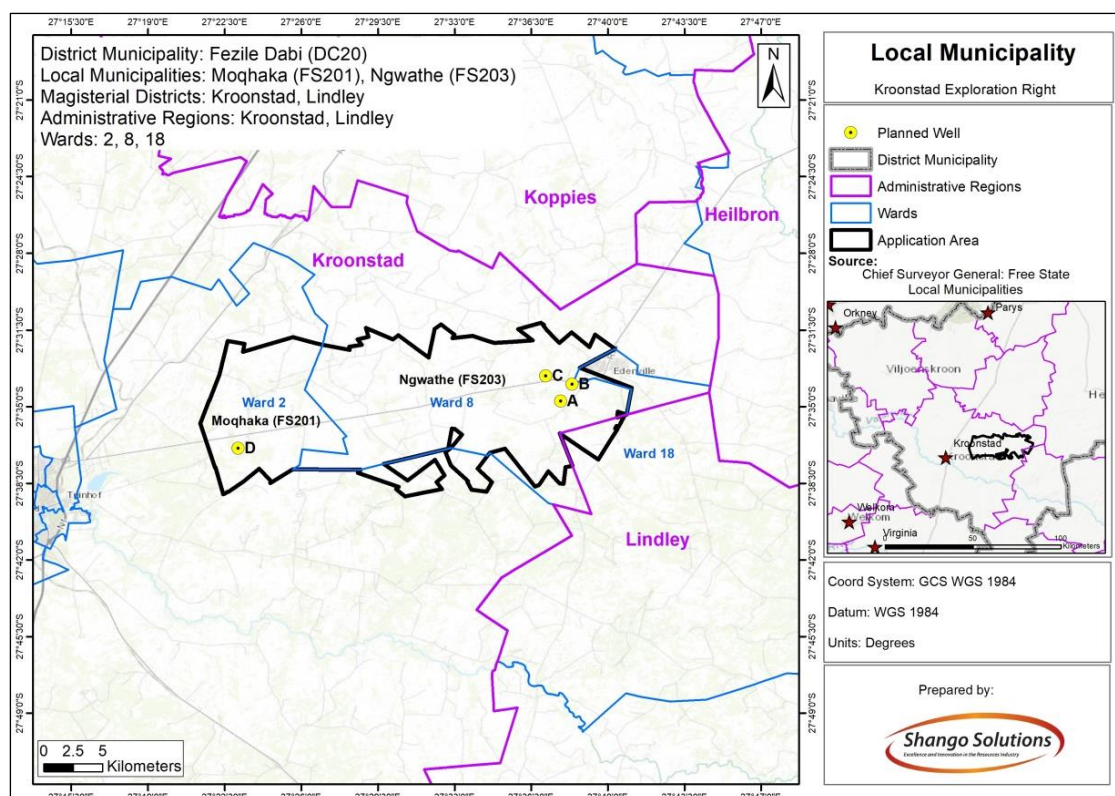


Figure 6: Affected municipalities on site (refer to Appendix D for enlarged map).

According to the 2011 census data, the Moqhaka Local Municipality has a population of 160 532. Approximately 87.2% of the population is African, 9.3 % is White and 3.5% Coloured, Indian, Asian or other. The Moqhaka unemployment rate (32.5%) is marginally smaller than the provincial rate of 33% and the district rate of 34 %. The Moqhaka Local Municipality Integrated Development Plan (IDP) 2020/2021 states that the region is located within a significant agricultural region. Kroonstad is the centre of a large agricultural community that plays a crucial role in the economy of the region. In addition to agriculture, mining remains one of the primary economic sectors within the Moqhaka Local Municipality through the De Beers and Lace diamond mines situated approximately 15 km from Kroonstad CBD. The AngloGold Ashanti Kopanong Mine and the possible re-opening of Vierfontein Collieries in the area of Viljoenskroon also play the same important economic role.

The Ngwathe Local Municipality is 7 055 km<sup>2</sup> in aerial extent and has a population of 120 520. Approximately 86.5% of the population is African, 10.3 % is White and 3.2% Coloured, Indian, Asian or other. The Ngwathe unemployment rate (35.2%) is marginally larger than the provincial rate of 33% and the district rate of 34%. The

region predominantly accommodates agricultural related activities (Ngwathe Local Municipality IDP, 2020/2021). The rural area within Ngwathe Local Municipality comprises 2 332 farms. Substantial migration has occurred over the past few years from rural to urban areas with most rural families migrating to urban areas.

According to the Fezile Dabi District Municipality Integrated Development Plan (IDP, 2020/2021), mining and manufacturing are the dominant sectors within the municipality due to the strong petrochemical industry provided by Sasol and other activities in the area. The expansion of these sectors, as well as agriculture and tourism within the Mqohaka and Ngwathe Local Municipalities have been identified as future leading sectors to support economic and socio-economic development in the area.

The proposed development supports the social and economic development through enabling skills development and training in order to empower individuals and promote employment creation within the local area. The development would mainly focus on economic benefits to the area and boost the petrochemical industry in the region.

#### 14.1.2 Climate

The climate of the area is characterised by mild to hot summer temperatures in excess of 30°C and extremely cold temperatures with severe frost during winter months. Summer rains occur with a mean annual precipitation of 500 millimetres between November and March. The months with the highest average temperatures are November, December, January and February. The months with the lowest average temperatures are June and August. The mean annual temperature is approximately 15.2°C with an average frost incidence of 37 days a year (Figure 7).

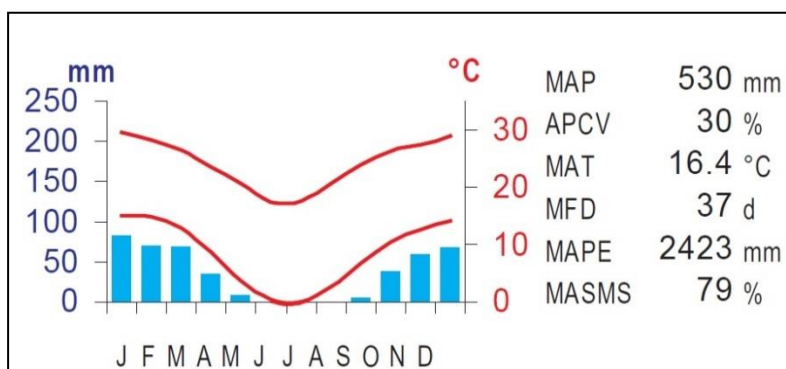


Figure 7: Climate diagram for the project area (Mucina and Rutherford (2006)).

#### 14.1.3 Land Uses and Land Cover

The dominant land uses surrounding the project area include watercourses, agriculture and informal residential areas.

The land in the application area is predominantly utilised for commercial dryland agriculture. Other land uses surrounding the application area include livestock and game farming. Infrastructure such as secondary tar roads, gravel roads and homesteads occur within proximity of the application area. In terms of land cover, the application area is covered by cultivated fields (medium and high), grassland, wetlands, permanent water and woodland/open bush (Figure 8).



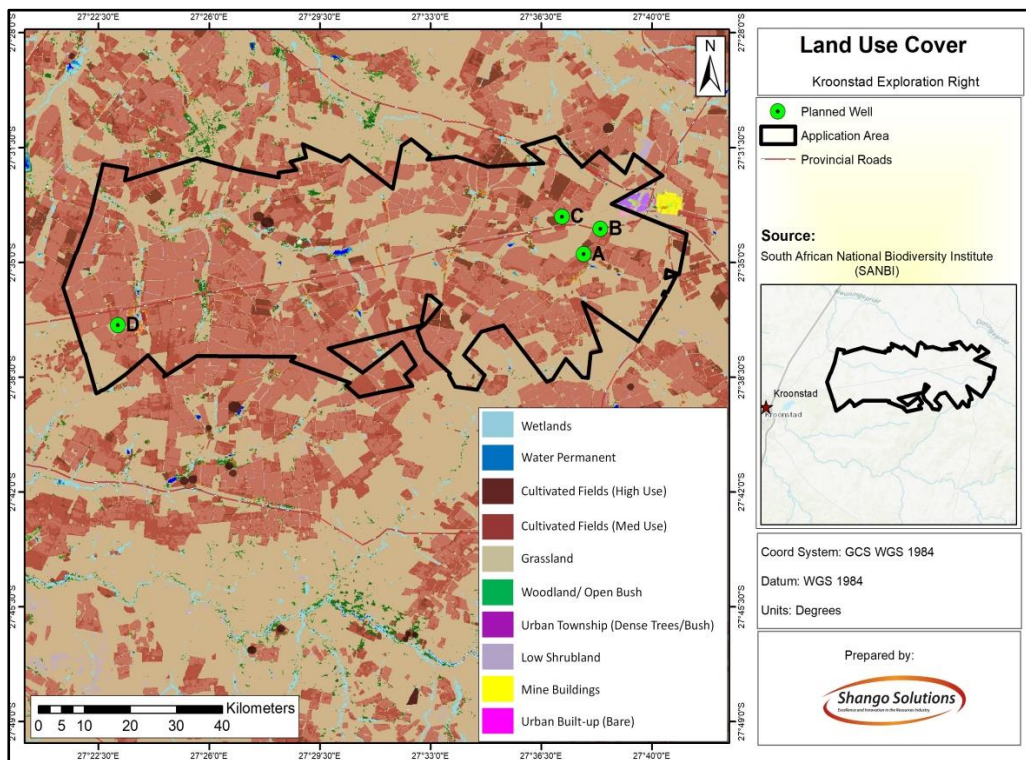


Figure 8: Current land uses (refer to Appendix D for an enlarged map).

With specific reference to the planned well areas, Well A and Well C consist of crop fields. Well B consists of 5% crop fields with the remainder characterised by grazing. Well D consists of 10% grazing and 90% crop fields. These statistics indicate the dominance of agriculture and grazing throughout (Figure 9).

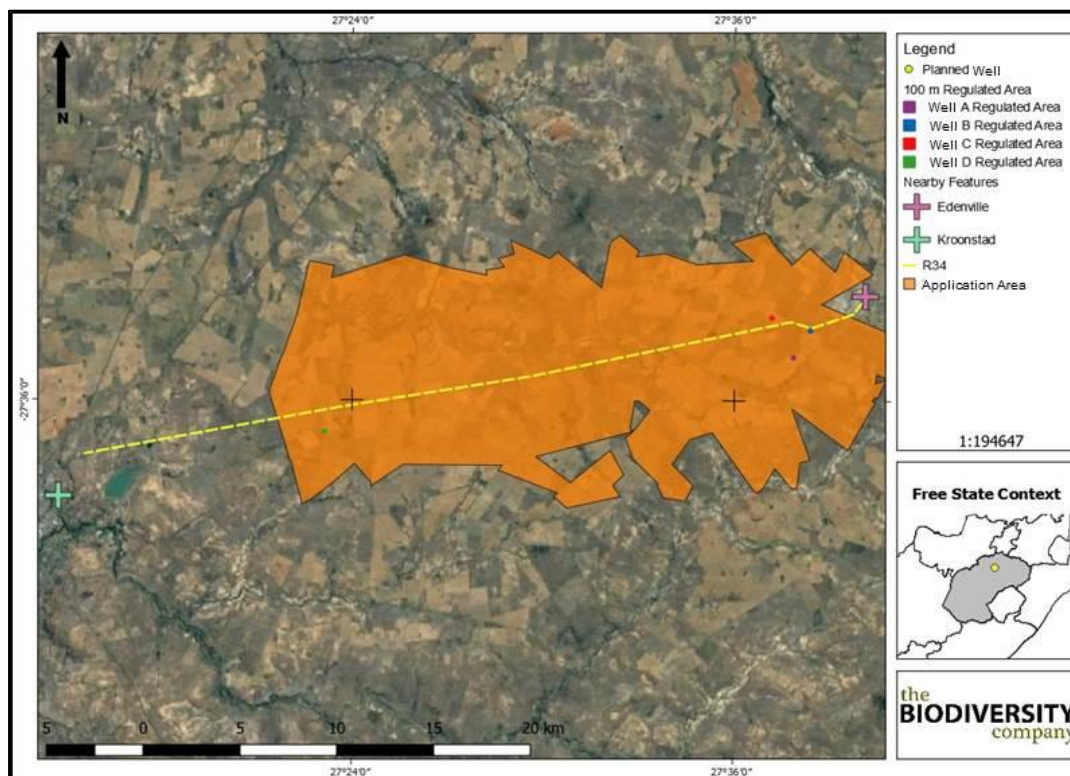


Figure 9: Current land uses for the exploration drilling target areas (refer to Appendix D for an enlarged map).



#### 14.1.4 Soils

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Bd 21 and the Dc 11 land types. Figure 10 and Figure 11 illustrate the respective terrain units with the expected soils illustrated in Table 6 and Table 7. The Dc land type completely covers Well C, partially covers Well A and Well B with only the Bd land type covering Well D.

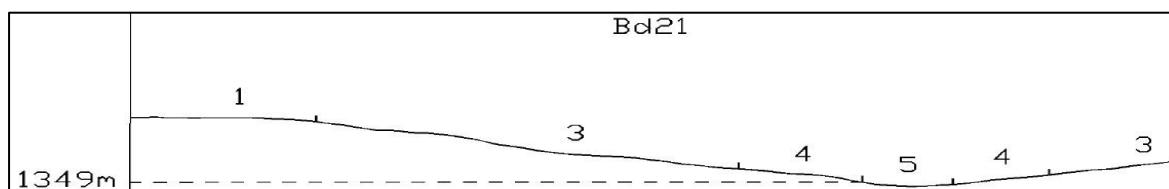


Figure 10: Illustration of land type Bd 21 terrain units (Land Type Survey Staff, 1972 – 2006).

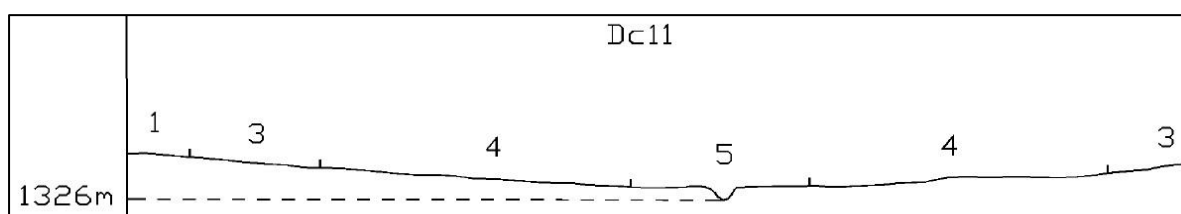


Figure 11: Illustration of land type Dc 11 terrain units (Land Type Survey Staff, 1972 – 2006).

Table 6: Soils expected at the respective terrain units within the Bd 21 land type.

Terrain units							
1 (33%)		3 (50%)		4 (11%)		5 (6%)	
<b>Avalon</b>	67%	Avalon	38%	Valsrivier	50%	Dundee	62%
<b>Westleigh</b>	18%	Westleigh	38%	Sterkspruit	27%	Bonheim	18%
<b>Bainsvlei/Hutton</b>	12%	Valsrivier	12%	Bonheim	9%	Valsrivier	17%
<b>Glenrosa</b>	3%	Bainsvlei/Hutton	8%	Kroonstad	9%	Sterkspruit	3%
		Sterkspruit	1%	Swartland	5%		
		Kroonstad	1%				
		Glenrosa	1%				
		Swartland	1%				

Table 7: Soils expected at the respective terrain units within the Dc 11 land type.

Terrain units							
1 (7%)		3 (18%)		4 (60%)		5 (15%)	
<b>Mayo/Milkwood</b>	40%	Mayo/Milkwood	19%	Valsrivier	49%	Willowbrook/Rensburg	70%
<b>Glenrosa</b>	31%	Swartland	19%	Bonheim	37%	Bonheim	9%
<b>Rock</b>	29%	Bainsvlei/Hutton	17%	Westleigh	5%	Arcadia	7%
		Rock	12%	Arcadia	4%	Oaklands	7%
		Glenrosa	11%	Sterkspruit	3%	Stream Beds	7%
		Bonheim	11%				
		Valsrivier	6%				
		Westleigh	5%				

### 14.1.5 Digital Elevation Model

The elevation of the application area (in Meters Above Sea Level (MASL)) is illustrated in Figure 12 and Figure 13. The elevation for Well D regulated area ranges from 1 449 – 1 480 MASL, while that of Well A, B and C regulated areas ranges from 1 480 – 1 562 MASL.

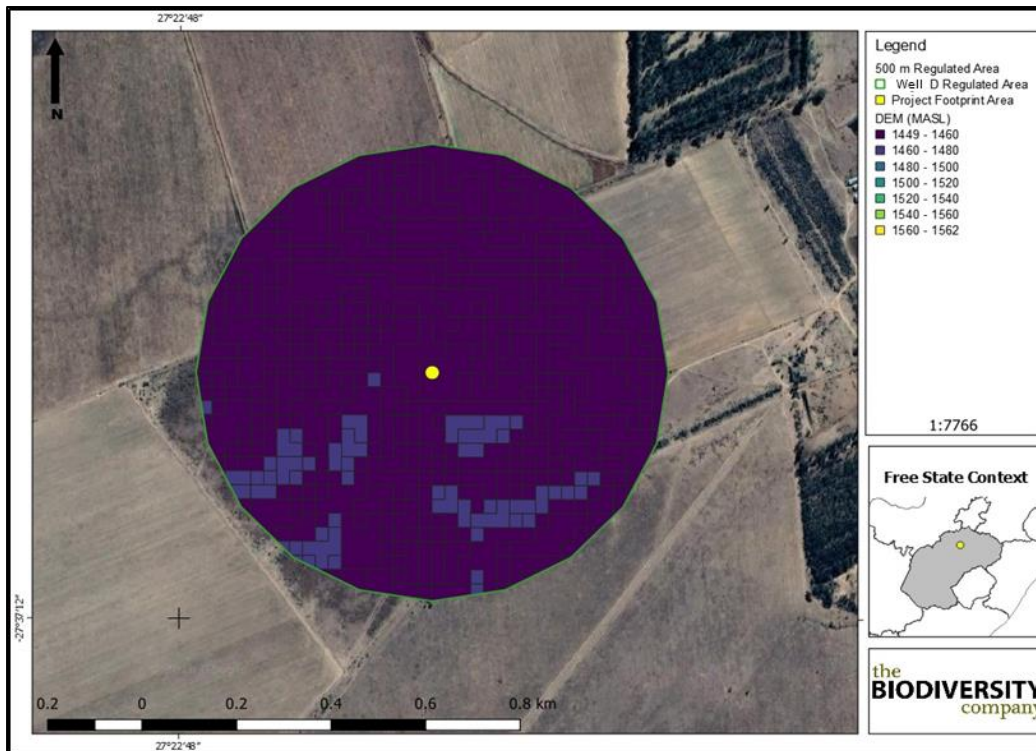


Figure 12: Digital Elevation Model for Well D regulated area.

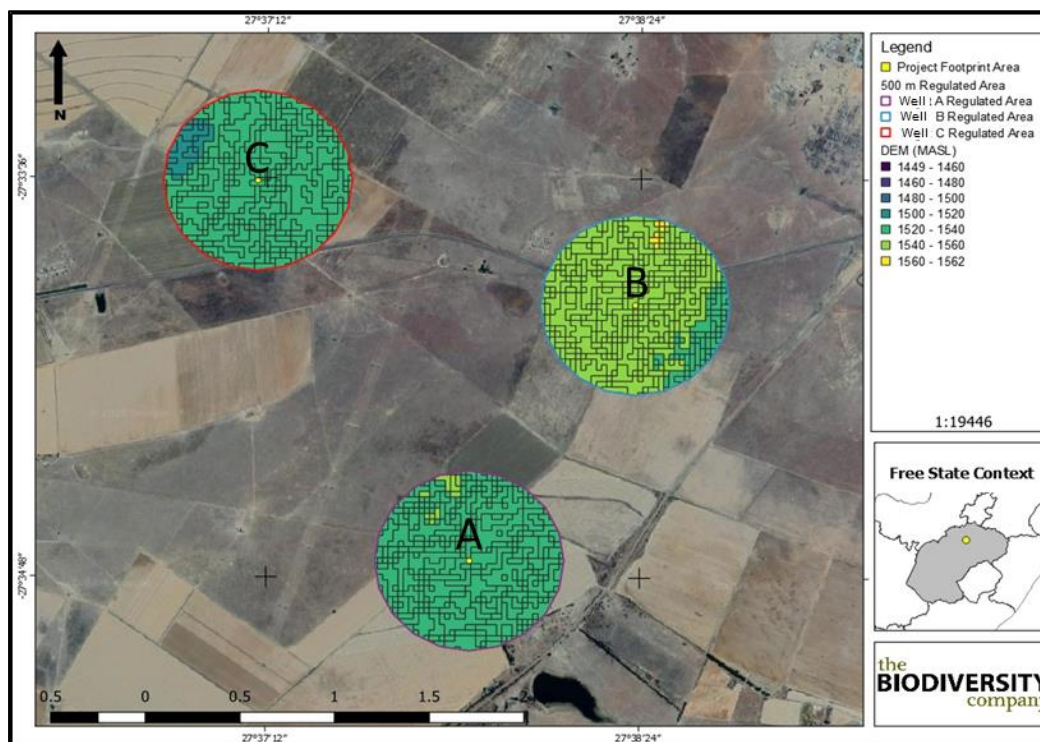


Figure 13: Digital Elevation Model for Well A, B and C regulated areas.

### 14.1.6 Slope Percentage

The slope percentage of the project area is illustrated in Figure 14 and Figure 15. The slope percentage ranges between 0 and 1,5% with the majority of the project area characterised by a slope percentage between 0 and 0.5%, which indicates a gentle slope.

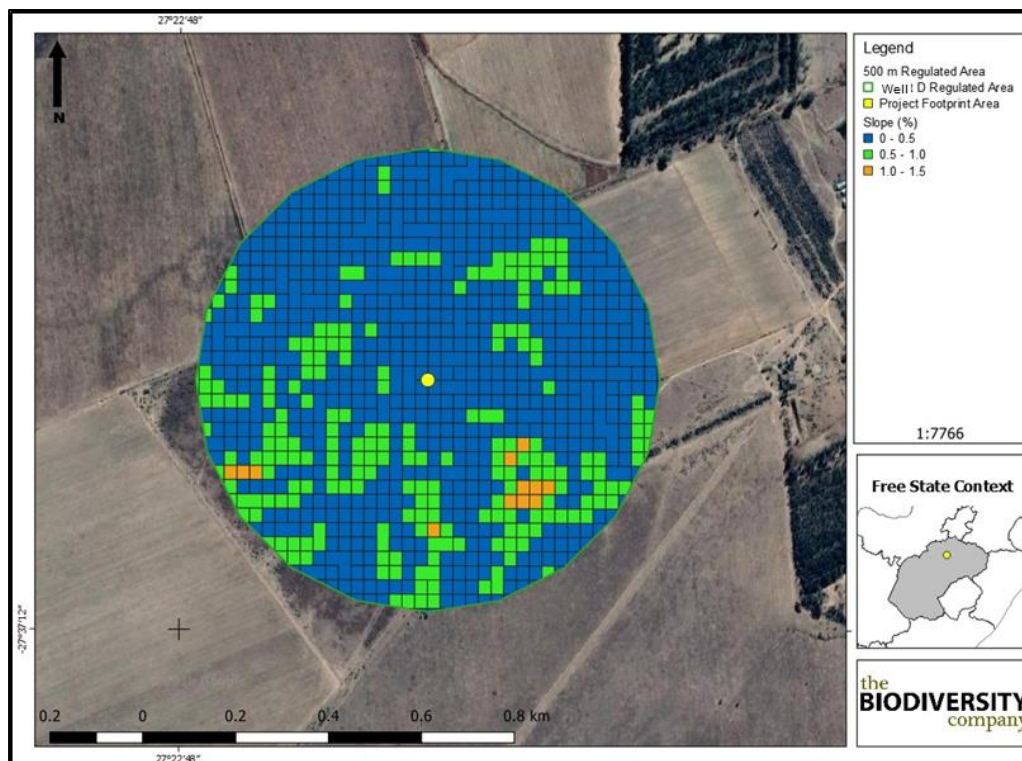


Figure 14: Slope percentage for Well D regulated area.

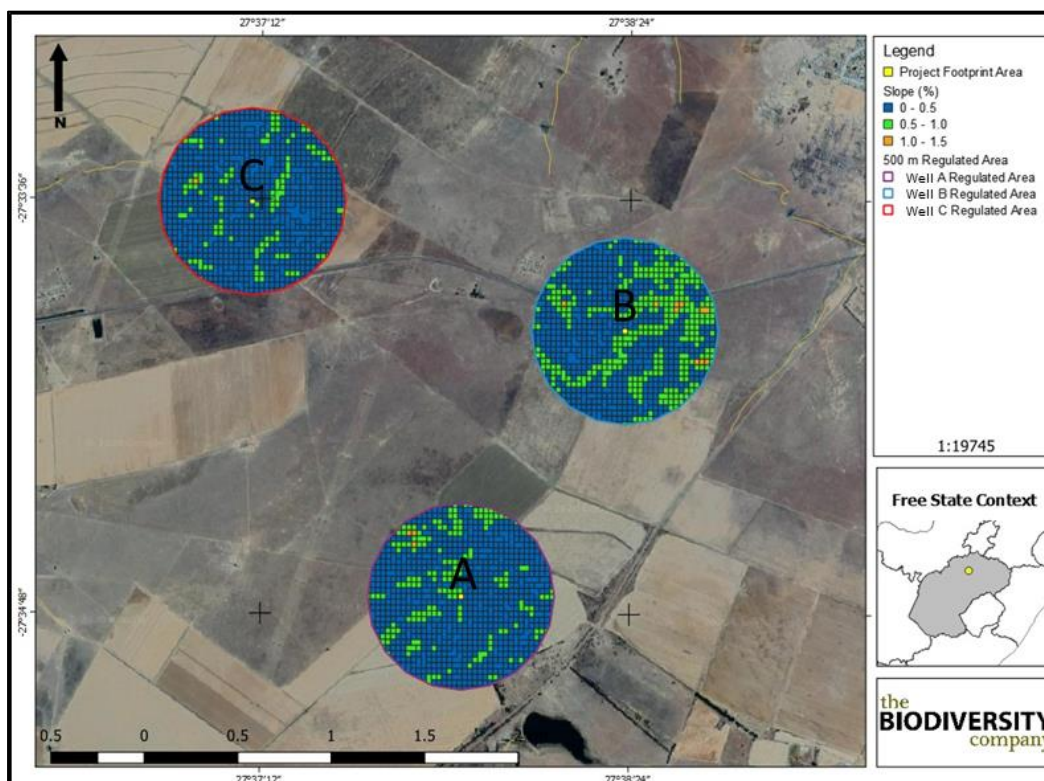


Figure 15: Slope percentage for the proposed Well A, B and C regulated areas.



### 14.1.7 Terrestrial Biodiversity

#### 14.1.7.1 Desktop Spatial Assessment

The desktop analysis that was conducted over the application area is summarised in Table 8.

Table 8: Desktop spatial features over the application area.

Desktop Information Considered	Relevant/Not relevant
<b>Conservation Plan</b>	Three (A, C and D) of the planned wells are situated in areas which are classified as 'ESA2'. The remaining Well B) is situated in an area which is classified as 'ESA1'.
<b>Rocky Ridges</b>	Irrelevant: Free State does not have regulations for ridges.
<b>Ecosystem Threat Status</b>	Three of the boreholes are situated within an ecosystem that is listed as EN, while the fourth is situated in a LC ecosystem.
<b>Ecosystem Protection Level</b>	Three of the sites are rated as <i>not protected</i> while the fourth falls in an ecosystem classified as <i>poorly protected</i> .
<b>Protected Areas</b>	Irrelevant: 20km from Seekoeivlei Nature Reserve.
<b>SAIIAE</b>	Various wetlands and rivers can be found close to the drill sites. Refer to wetland report for details.
<b>Important Bird and Biodiversity Areas</b>	Irrelevant: The project area is 74km from the Willem Pretorius IBA.

#### Free State Biodiversity Plan

A Critical Biodiversity Area (CBA) is considered a significant and ecologically sensitive area and needs to be kept in a pristine or near-natural state to ensure the continued functioning of ecosystems (DESTEA, 2015). A CBA represents the best choice for achieving biodiversity targets. Ecological Support Areas (ESAs) are not essential for achieving targets, but they play a vital role in the continued functioning of ecosystems and often are essential for proper functioning of adjacent CBAs.

According to the Free State Terrestrial CBA Plan, three (A, C and D) of the planned wells are situated in areas which are classified as 'ESA2'. The remaining Well (B) is situated in an area which is classified as 'ESA1'. It should be noted that site A is 400 m from a CBA1 and site D is 75 m from a CBA 1 area (Figure 16).

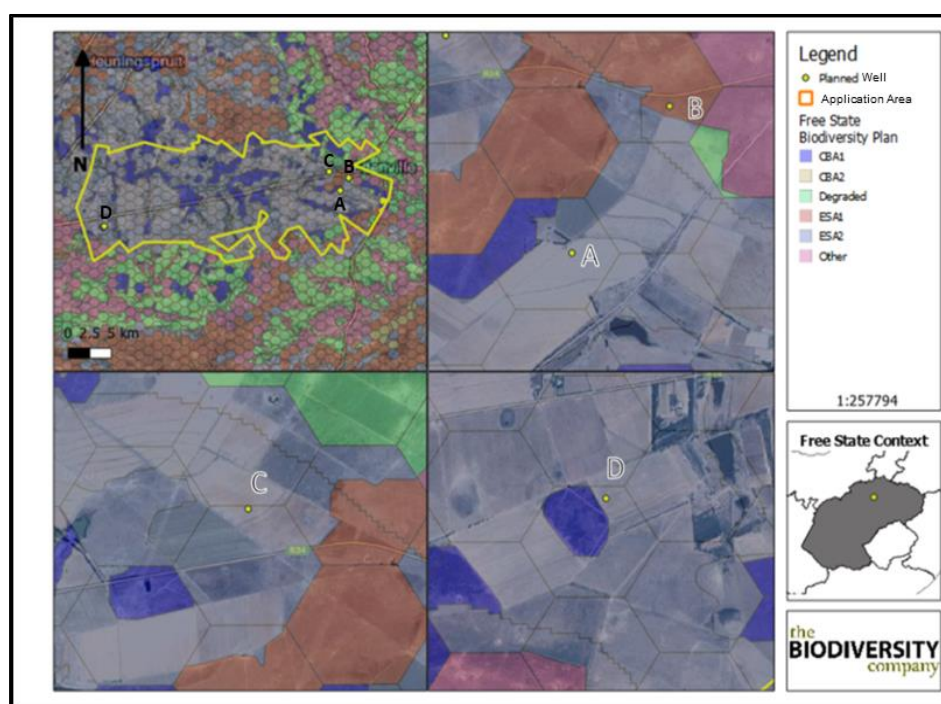


Figure 16: The project area superimposed on the Free State Biodiversity Plan.

### Ecosystem Threat Status

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno et al., 2019).

The application area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the exploration. Based on Figure 17, the terrestrial ecosystems associated with three of the sites are rated as not protected, while the fourth falls in an ecosystem classified as poorly protected. This means that these ecosystems are considered not to be adequately protected in areas such as National Parks or other formally protected areas.

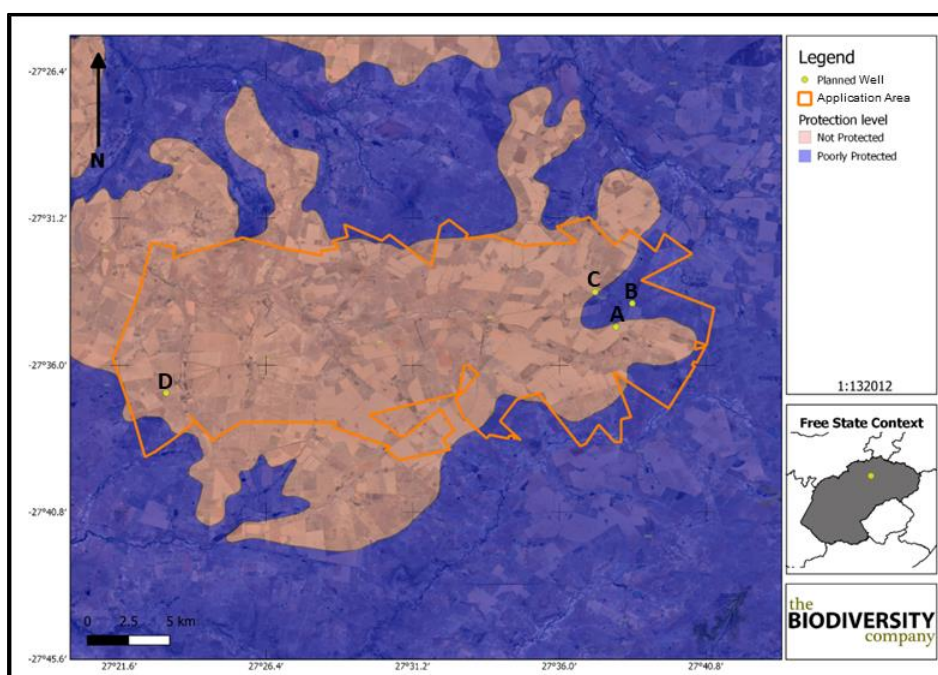


Figure 17: The project area showing the regional level of protection of terrestrial ecosystems (NBA, 2018).

#### 14.1.7.2 Mining and Biodiversity Guidelines

The Mining and Biodiversity Guidelines (2013) was developed by the Department of Mineral Resources, the Chamber of Mines, the South African National Biodiversity Institute and the South African Mining and Biodiversity Forum, with the intention to find a balance between economic growth and environmental sustainability. The Guideline is envisioned as a tool to “foster a strong relationship between biodiversity and mining which will eventually translate into best practice within the mining sector. In identifying biodiversity priority areas which have different levels of risk against mining, the Guideline categorises biodiversity priority areas into four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view as well as the implications for mining in these areas:

- A) Legally protected areas, where mining is prohibited;
- B) Areas of highest biodiversity importance, which are at the highest risk for mining;
- C) Areas of high biodiversity importance, which are at a high risk for mining; and
- D) Areas of moderate biodiversity importance, which are at a moderate risk for mining.

Table 9 shows the four different categories and the implications for mining within each of these categories.

Table 9: The mining and biodiversity guidelines categories.

Category	Biodiversity priority areas	Risk for mining	Implications for mining
<b>A. Legally protected</b>	Protected areas (including National Parks, Nature Reserves, World Heritage Sites, Protected Environments, Nature Reserves) Areas declared under Section 49 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002)	<b>Mining prohibited</b>	Mining projects cannot commence as mining is legally prohibited. Although mining is prohibited in Protected Areas, it may be allowed in Protected Environments if both the Minister of Mineral Resources and Minister of Environmental Affairs approve it. In cases where mining activities were conducted lawfully in protected areas before Section 48 of the Protected Areas Act (No. 57 of 2003) came into effect, the Minister of Environmental Affairs may, after consulting with the Minister of Mineral Resources, allow such mining activities to continue, subject to prescribed conditions that reduce environmental impacts.
<b>B. Highest biodiversity importance</b>	Critically endangered and endangered ecosystems Critical Biodiversity Areas (or equivalent areas) from provincial spatial biodiversity plans River and wetland Freshwater Ecosystem Priority Areas (FEPAs) and a 1km buffer around these FEPAs Ramsar Sites	<b>Highest risk for mining</b>	Environmental screening, environmental impact assessment (EIA) and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licenses, and environmental authorisations. If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these areas and the associated ecosystem services. These areas are viewed as necessary to ensure protection of biodiversity, environmental sustainability, and human well-being. An EIA should include the strategic assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. This assessment should fully take into account the environmental sensitivity of the area, the overall environmental and socio-economic costs and benefits of mining, as well as the potential strategic importance of the minerals to the country. Authorisations may well not be granted. If

Category	Biodiversity priority areas	Risk for mining	Implications for mining
			granted, the authorisation may set limits on allowed activities and impacts and may specify biodiversity offsets that would be written into license agreements and/or authorisations.
<b>C. High biodiversity importance</b>	Protected area buffers (including buffers around National Parks, World Heritage Sites* and Nature Reserves) Transfrontier Conservation Areas (remaining areas outside of formally proclaimed protected areas) Other identified priorities from provincial spatial biodiversity plans High water yield areas Coastal Protection Zone Estuarine functional zone	<b>High risk for mining</b>	These areas are important for conserving biodiversity, for supporting or buffering other biodiversity priority areas, and for maintaining important ecosystem services for particular communities or the country as a whole. An EIA should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. Mining options may be limited in these areas, and limitations for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisations.
<b>D. Moderate biodiversity importance</b>	Ecological support areas Vulnerable ecosystems Focus areas for protected area expansion (land-based and offshore protection)	<b>Moderate risk for mining</b>	These areas are of moderate biodiversity value. EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, identifying features (e.g. threatened species) not included in the existing datasets, and on providing site-specific information to guide the application of the mitigation hierarchy. Authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisations.

The Guideline provides a tool to facilitate the sustainable development of South Africa's mineral resources in a way that enables regulators, industry and practitioners to minimise the impact of mining on the country's biodiversity and ecosystem services. It provides the mining sector with a practical, user- friendly manual for integrating biodiversity considerations into the planning processes and managing biodiversity during the operational phases of a mine, from exploration through to closure. The Guideline provides explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects, and where biodiversity may limit the potential for mining.

Overall, proponents of a mining activity in biodiversity priority areas should demonstrate that:

1. There is significant cause to undertake mining – by commenting on whether the biodiversity priority area coincides with mineral or petroleum reserves that are strategically in the national interest to exploit. Reference should also be made to whether alternative deposits or reserves exist that could be exploited in areas that are not biodiversity priority areas or are less environmentally sensitive areas.



- Through the process of a rigorous EIA and associated specialist biodiversity studies the impacts of the proposed mining are properly assessed following good practice. It is critical that sufficient time and resources are budgeted to do so early in the planning and impact assessment process, including appointing appropriate team of people with the relevant skills and knowledge as required by legislation.

Cumulative impacts have been taken into account:

- The mitigation hierarchy has been systematically applied and alternatives have been rigorously considered.
- The issues related to biodiversity priority areas have been incorporated into a robust EMP as the main tool for describing how the mining or prospecting operation's environmental impacts are to be mitigated and managed.
- Good practice environmental management is followed, and monitoring and compliance enforcement is ensured.

None of the planned wells overlap with areas classified by the Mining and Biodiversity Guidelines and does not represent a risk to mining (Figure 18).

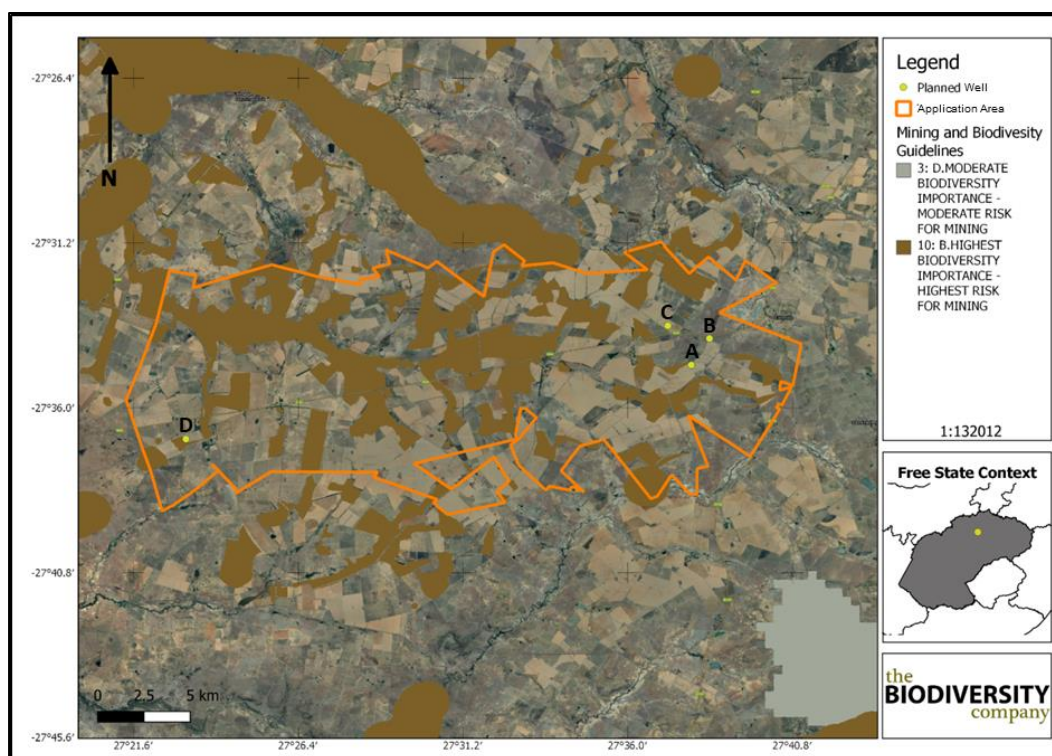


Figure 18: The project area superimposed on the Mining and Biodiversity Guidelines spatial dataset (BGIS, 2018).

#### 14.1.7.3 Desktop Vegetation Assessment

The application area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

- Seasonal precipitation.
- The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.



Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

### Vegetation Types

The grassland biome comprises many different vegetation types. Three of the planned wells (wells A, C and D) are situated within the Vaal-Vet Sandy Grassland and the fourth Well (WellB) is situated in the Central Free State Grassland (Mucina & Rutherford, 2006) (Figure 19).

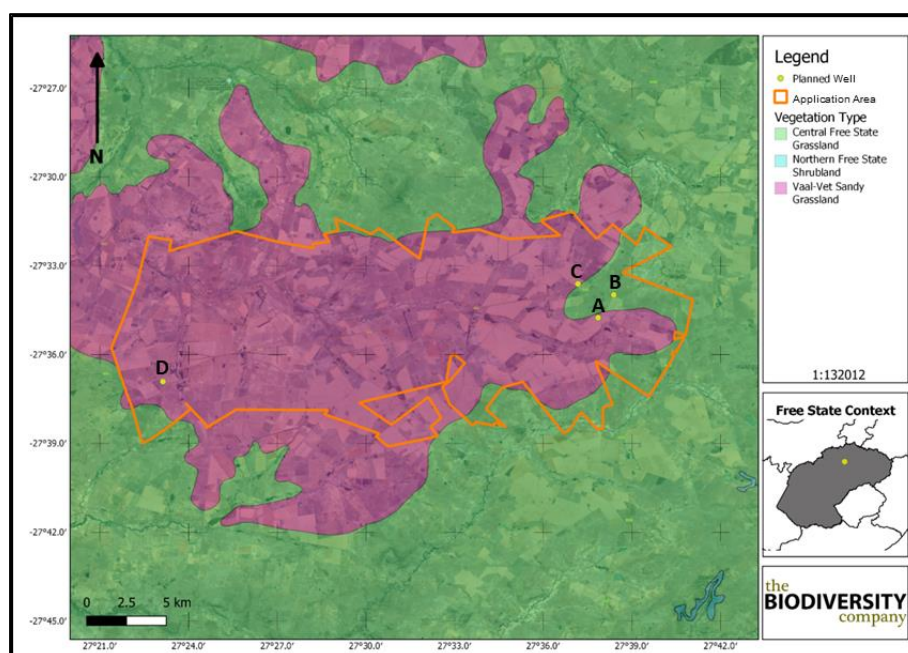


Figure 19: The project area showing the vegetation type of the application area.

#### 1. Vaal Vet Sandy Grassland (Gh 10)

Vaal-Vet Sandy Grassland is found in the North West and Free State Provinces at an altitude of 1 260 – 1 360 m above mean sea level. It occurs south of Litchenburg and Ventersdorp and stretches southwards towards Klerksdorp, Leeudoringstad, Bothaville and to the north towards Brandfort.

The landscape is plains-dominated with irregular, undulating plains with mainly low-tussock grasslands with an abundant karroid element. A characteristic feature of this vegetation unit is the dominance of *Themeda triandra*.

Important taxa include:

- Graminoids: *Antheophora pubescens* (d), *Aristida congesta*, *Chloris virgata* (d), *Cymbopogon caesius* (d), *Cynodon dactylon* (d), *Digitaria argyrograpta*, *Elionurus muticus*, *Eragrostis chloromelas* (d), *E. lehmanniana* (d), *E. plana* (d), *E. tichophora* (d), *Heteropogon contortus* (d), *Panicum gilvum* (d), *Setaria Sphacelata* (d), *Themeda triandra* (d), *Targus berteronianus* (d), *Brachiaria serrata*, *Cymbopogon pospischilii*, *Digitaria eriantha*, *Eragrostis curvula*, *E. obtusa*, *E. superba*, *Panicum coloratum*, *Pogonarthria squarrosa*, *Trichoneura grandiglumis*, *Triraphis andropogonoides*.
- Herbs: *Stachys spathulata* (d), *Barleria macrostegia*, *Berkheya onopordifolia* var. *onopordifolia*, *Chamaesyce inaequilatera*, *Geigeria aspera* var. *aspera*, *Helichrysum caespitium*, *Hermannia depressa*, *Hibiscus pusillus*, *Monsonia burkeana*, *Rhynchosia adenodes*, *Selago densiflora*, *Vernonia oligocephala*.

- Geophytic Herbs: *Bulbine narcissifolia*, *Ledebouria marginata*.
- Succulent Herbs: *Tripteris aghillana* var. *integrifolia*

## 2. Central Free State Grassland (Gh 6)

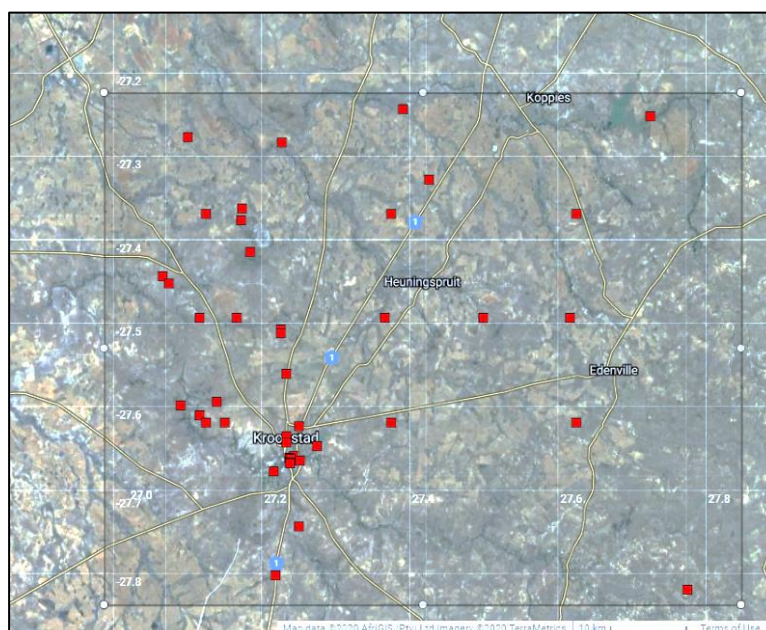
According to Mucina and Rutherford (2006), the Central Free State Grassland is found in the Free State Province and marginally in the Gauteng Province at an altitude of 1 300-1 640 m above mean sea level. It occurs in a broad zone from around Sasolburg to Dewetsdorp and other large settlements, namely Kroonstad, Ventersburg, Steynsrus, Winburg, Lindley and Edenville, are also found within this vegetation unit.

The landscape is undulating plains with short grasslands which are dominated by *Themeda triandra* if it is in its natural condition and conversely *Eragrostis curvula* and *E. chloromelas* when it is degraded. Important Taxa include:

- Graminoids: *Aristida adscensionis* (d), *A. congesta* (d), *Cynodon dactylon* (d), *Eragrostis chloromelas* (d), *E. curvula* (d), *E. plana* (d), *Panicum coloratum* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Tragus koeleriodes* (d), *Agrostis lachnantha*, *Andropogon appendiculatus*, *Aristida biparita*, *A. canescens*, *Cymbopogon pospischilii*, *Cynodon transvaalensis*, *Digitaria argyrograptia*, *Elionurus muticus*, *Eragrostis lehmanniana*, *E. micrantha*, *E. obtusa*, *E. racemosa*, *E. trichophora*, *Heteropogon contortus*, *Microchloa caffra*, *Setaria incrassata*, *Sporobolus discoloratus*.
- Herbs: *Berkheya onopordifolia* var. *onopordifolia*, *Chamaesyce inaequilatera*, *Conyza pinnata*, *Crabbea acaulis*, *Geigeria aspera* var. *aspera*, *Hermannia depressa*, *Hibiscus pusillus*, *Pseudognaphalium luteoalbum*, *Salvia stenophylla*, *Selago densiflora*, *Sonchus dregeanus*.
- Geophytic herbs: *Oxalis depressa*, *Raphionacme dyeri*.
- Succulent herb: *Tripteris aghillana* var. *integrifolia*.
- Low shrubs: *Felicia muricata* (d), *Anthospermum rigidum* subsp. *pumilum*, *Helichrysum dregeanum*, *Melolobium candicans*, *Pentzia globosa*.

### Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2019) database, 515 plant species have the potential to occur in the project area and its surroundings (Figure 20). Of these 515 plant species, none of the species are classified as Species of Conservation Concern (SCC).



#### 14.1.7.4 Desktop Faunal Assessment

##### Avifauna

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 209 bird species have the potential to occur in the vicinity of the project area. The full list of potential bird species is provided in Appendix B of the specialist report. Of the potential bird species, nine (9) species are listed as SCC either on a regional or global scale (Table 10).

The SCC includes the following:

- One (1) species that are listed as EN on a regional basis.
- Two (2) species that are listed as VU on a regional basis.
- Six (6) species that are listed as NT on a regional basis.

On a global scale, one (1) species are listed as EN, two (2) species are listed as VU and six (6) species as NT (Table 10).

Table 10: List of bird species of regional or global conservation importance that are expected to occur in close vicinity to the project area.

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
<i>Afrotis afra</i>	Korhaan, Southern Black	VU	VU	High
<i>Anthropoides paradiseus</i>	Crane, Blue	NT	NT	Moderate
<i>Circus macrourus</i>	Harrier, Pallid	NT	NT	High
<i>Circus maurus</i>	Harrier, Black	EN	EN	Moderate
<i>Falco vespertinus</i>	Falcon, Red-footed	NT	NT	High
<i>Oxyura maccoa</i>	Duck, Maccoa	NT	NT	Moderate
<i>Phoenicopus minor</i>	Flamingo, Lesser	NT	NT	Low
<i>Phoenicopus ruber</i>	Flamingo, Greater	NT	NT	Low
<i>Sagittarius serpentarius</i>	Secretarybird	VU	VU	High

*Afrotis afra* (Southern Black Korhaan) is listed as VU on a regional and global scale (IUCN, 2017). They are endemic to the South-Western side of South Africa. Their habitat varies from non-grassy areas to the Fynbos biome, Karoo biome and the western coastline of South Africa. The main threat to them is habitat loss, in an eight year span they lost 80% of their range due to agricultural developments. Their diet consists of insects, small reptiles and plant material, including seeds and green shoots (Hockey et al., 2005). Suitable habitat can be found in the project area as such the likelihood of occurrence is rated as high.

*Anthropoides paradiseus* (Blue Crane) is listed as NT on a regional scale and as VU on a global scale. This species has declined, largely owing to direct poisoning, power-line collisions and loss of its grassland breeding habitat owing to afforestation, mining, agriculture and development (IUCN, 2017). This species breeds in natural grass- and sedge-dominated habitats, preferring secluded grasslands at high elevations where the vegetation is thick and short. Some areas of grassland still exist in the project area, however large areas has also been altered with agriculture as such the likelihood of occurrence is rated moderate.

*Circus macrourus* (Pallid Harrier) is listed as NT on a regional and global scale, and overwinters in semi-desert, scrub, savanna and wetlands. The species is migratory, with most birds wintering in sub-Saharan Africa or south-

east Asia (IUCN, 2017). Suitable habitat can be found in the project area therefore the likelihood of occurrence is rated as high.

*Circus maurus* (Black Harrier) is listed as EN on a local basis and is restricted to southern Africa, where it is mainly found in the fynbos and Karoo of the Western and Eastern Cape. It is also found in the grasslands of Free State, Lesotho and KwaZulu-Natal. Harriers breed close to coastal and upland marshes, damp sites, near vleis or streams with tall shrubs or reeds. South-facing slopes are preferred in mountain areas where temperatures are cooler, and vegetation is taller (IUCN, 2017). During the non-breeding season, they will also be found in dry grassland areas further north and they also visit coastal river floodplains in Namibia. The likelihood of occurrence is rated as moderate.

*Falco vespertinus* (Red-footed Falcon) is known to breed from eastern Europe and northern Asia to north-western China, heading south in the non-breeding season to southern Angola and southern Africa. Within southern Africa it is locally uncommon to common in Botswana, northern Namibia, central Zimbabwe and the area in and around Gauteng, South Africa (Hockey et al., 2005). The habitat it generally prefers is open habitats with scattered trees, such as open grassy woodland, wetlands, forest fringes and croplands. Many of these habitats are present in the project area and thus the likelihood of occurrence is rated as high.

*Oxyura maccoa* (Maccoa Duck) has a large northern and southern range, South Africa is part of its southern distribution. During the species' breeding season, it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with extensive emergent vegetation such as reeds (*Phragmites* spp.) and cattails (*Typha* spp.) on which it relies for nesting (IUCN, 2017). The likelihood of occurrence of this species in the project area was rated as moderate as the wetland does provide suitable habitat.

*Phoenicopterus minor* (Lesser Flamingo) is listed as NT on a global and regional scale whereas *Phoenicopterus roseus* (Greater Flamingo) is listed as NT on a regional scale only. Both species have similar habitat requirements and the species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). Due to the absence of its preferred habitat within the project area, the likelihood of occurrence is low.

*Sagittarius serpentarius* (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The likelihood of occurrence is rated as high as suitable grasslands with some wetlands is seen as ideal habitat for this species.

## Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 74 mammal species that could be expected to occur within the project area. Of these species, 8 are medium to large conservation dependant species, such as *Ceratotherium simum* (Southern White Rhinoceros) and *Tragelaphus oryx* (Common Eland) that, in South Africa, are generally restricted to protected areas such as game reserves. These species are not expected to occur in the project area and are removed from the expected SCC list. They are however still included in the expected species list.

Of the remaining 66 small to medium sized mammal species, ten (10) (15%) are listed as being of conservation concern on a regional or global basis (Table 11).

The list of potential species includes:

1. Four (4) that are listed as VU on a regional basis.
2. Five (5) that are listed as NT on a regional scale.

On a global scale, 1 is listed as EN, 2 are listed as VU and 4 as NT (Table 11).

Table 11: List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses.

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
<i>Aonyx capensis</i>	Cape Clawless Otter	NT	NT	High
<i>Atelerix frontalis</i>	South Africa Hedgehog	NT	LC	High
<i>Eidolon helvum</i>	African Straw-colored Fruit Bat	LC	NT	Low
<i>Felis nigripes</i>	Black-footed Cat	VU	VU	High
<i>Hydricotis maculicollis</i>	Spotted-necked Otter	VU	NT	High
<i>Leptailurus serval</i>	Serval	NT	LC	High
<i>Mystromys albicaudatus</i>	White-tailed Rat	VU	EN	High
<i>Panthera pardus</i>	Leopard	VU	VU	Low
<i>Parahyaena brunnea</i>	Brown Hyaena	NT	NT	Moderate
<i>Poecilogale albinucha</i>	African Striped Weasel	NT	LC	High

*Aonyx capensis* (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water. The wetlands and rivers provide suitable habitat for this species thus the likelihood rated as high.

*Atelerix frontalis* (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), *A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Based on the grassland habitat that can be found in the project area there is a high likelihood of this species occurring.

*Eidolon helvum* (African Straw-coloured Fruit Bat) is listed as LC on a regional scale and NT on a global scale. This species has been recorded from a very wide range of habitats across the lowland rainforest and savanna zones of Africa (IUCN, 2017). Although considered to be widespread and abundant across its range, certain populations are decreasing due to severe deforestation, hunting for food and medicinal use (IUCN, 2017). This species is known to form large roosts and colonies numbering in the thousands to even millions of individuals (IUCN, 2017). No colonies of this species are known to occur in the project area or in the immediate vicinity and, although individuals may occasionally be recorded, it is not expected to be resident within the project area and therefore its likelihood of occurrence is rated as low.

*Felis nigripes* (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. Given that the highest densities of this species have been recorded in the more arid Karoo region of South Africa, the habitat in the project area can be considered ideal for the species and the likelihood of occurrence is rated as high.

*Hydricotis maculicollis* (Spotted-necked Otter) inhabits freshwater habitats where water is un-silted, unpolluted, and rich in small to medium sized fishes (IUCN, 2017). Suitable habitat can be found in the project area and the likelihood is rated as high.



*Leptailurus serval* (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. Due to the mostly natural state of the project area combined with some wetlands the likelihood of occurrence is rated as high.

*Mystromys albicaudatus* (White-tailed Rat) is listed as VU on a regional basis and EN on a global scale. It is relatively widespread across South Africa and Lesotho; the species is known to occur in shrubland and grassland areas. A major requirement of the species is black loam soils with good vegetation cover. Suitable habitat can be found in the project area and as such the likelihood of occurrence is rated as high.

*Panthera pardus* (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (IUCN, 2017). Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (IUCN, 2017). Although known to occur and persist outside of formally protected areas, the densities in these areas are considered to be low. The likelihood of occurrence in the application area, which does not have high numbers of suitable prey species, is rated as low.

*Parahyaena brunnea* (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. There is a moderate likelihood of occurrence.

*Poecilogale albinucha* (African Striped Weasel) is usually associated with savanna habitats, although it probably has a wider habitat tolerance (IUCN, 2017). Due to its secretive nature, it is often overlooked in many areas where it does occur. There is sufficient habitat for this species in the project area and the likelihood of occurrence of this species is therefore considered to be high.

### Herpetofauna (Reptiles and Amphibians)

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2019) 28 reptile species have the potential to occur in the project area. One of the expected species is a SCC (IUCN, 2017) (Table 12).

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2019) 18 amphibian species have the potential to occur in the project area. No amphibian SCCs is expected to be present in the project area.

Table 12: Reptile specie of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016).

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
<i>Smaug giganteus</i>	Giant Dragon Lizard	VU	VU	High

*Smaug giganteus* (Giant Dragon Lizard) is categorised as VU on both a regional and an international scale. It is endemic to South Africa, where it is found only in the grasslands of the northern Free State and the southwestern parts of Mpumalanga (IUCN, 2017). Habitat loss due to agriculture is a continuing threat. Large portions of the

grassland habitat are underlain by coal beds of varying quality and extent, and exploitation of coal for fuel has and will result in further habitat loss. The Kroonstad area is renowned for high numbers of this species therefore the likelihood of occurrence is rated as high.

#### 14.1.8 Surface Hydrology

The application area is predominantly in the Renoster River catchment (C70), which forms part of the Vaal Water Management Area (WMA:5) (Figure 21). The exploration area falls largely in the C70G quaternary catchment. The C70G quaternary catchment is associated with the Heuningspruit, with its origin to the north of the application area and directly north of the top cadastral farms Onrustig 234 and Devilliershof 1618. The Rietspruit, a tributary of the Heuningspruit, has its origin to the south of Edenville and it flows in a westerly direction, through the centre of the project area, before it joins the Heuningspruit in the vicinity of the N1 national road. The project area was historically associated with the Middle Vaal WMA. Other rivers and streams in the area include are provided in Table 13 and the Quaternary catchment information is detailed in Table 14.

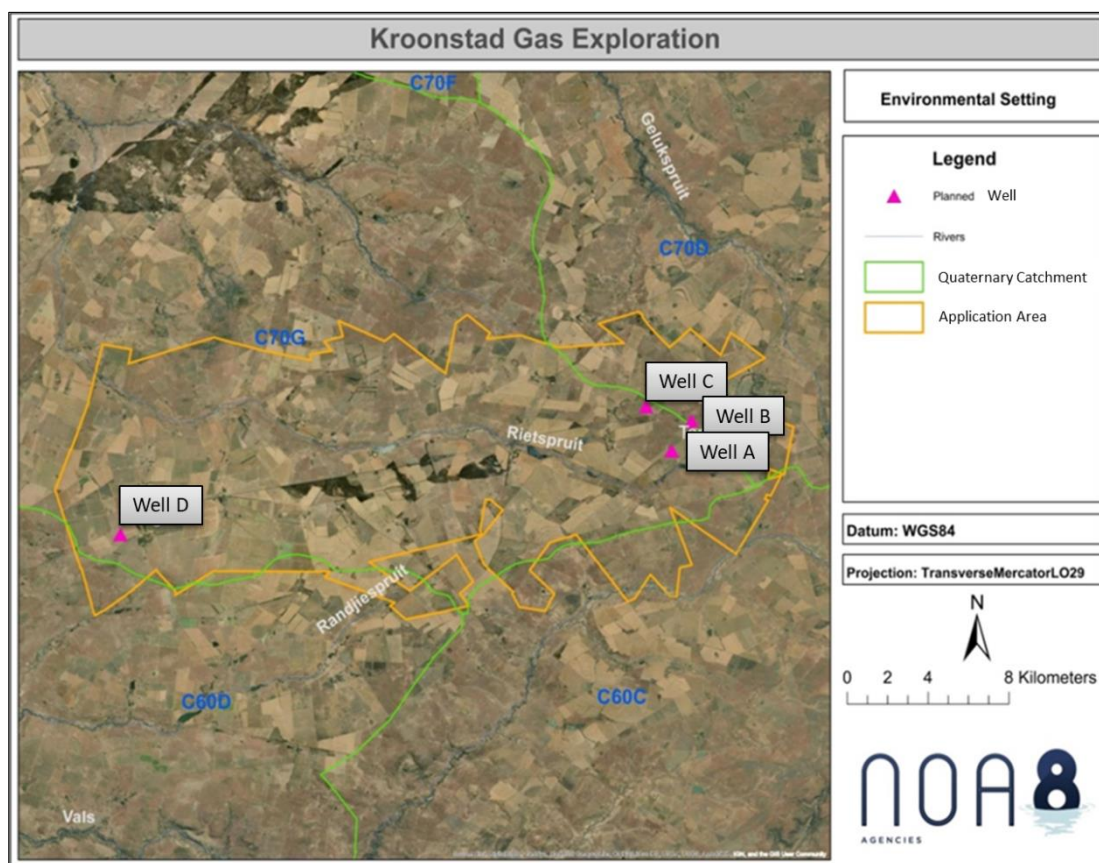


Figure 21: Surface hydrology of the application area.

Table 13: Local rivers and streams.

Local Stream	Quaternary Catchment	Notes
Liebenbergsspruit	C60C	Along the south-eastern boundary of the project area, near Edenville. Discharges in the Vals River that flows to the Vaal River.
Randjespruit	C60D	Located to the south of the project area. Discharges in the Vals River that flows to the Vaal River.
Doringspruit	C70D	Located northeast of the project area, to the north of Edenville. Discharges in the Renoster River that flows to the Vaal River.
Rietspruit and Heuningspruit	C70G	The Rietspruit is the main drainage in the project area and is a tributary to the Heuningspruit.

Table 14: Quaternary catchment information (WR2012 dataset).

Quaternary Catchment	C60C	C60D	C70D	C70G
Rainfall (mm/a)	571	550	586	577
Evaporation (mm/a)	1550	1600	1600	1600
Runoff (mcm)	27.68	15.87	14.44	18.16

On a local scale the surface flow is in a north-westerly direction (Vals and Renoster Rivers). The Integrated Units of Analysis (IUA) (DHSWS classification, Government Gazette, April 2016) are classified in terms of their extent of permissible utilisation and protection, as either Class I, Class II or Class III. The Vals and Renoster Rivers have been assigned a classification of Class II, indicating moderate protection and moderate utilisation.

The ecological category or Recommended Ecological Category (REC) means the assigned ecological condition, by the Minister, to a water resource that reflects the ecological condition of that water resource in terms of the deviation of its biophysical components from a predevelopment condition; both river systems have been assigned a classification of Class C – moderately modified; a loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.

#### 14.1.8.1 Freshwater Ecosystem Priority Area (NFEPA) Status

According to Nel et al. (2011), the catchment of the watercourses in the study area is not classified as a National Freshwater Priority Area (NFEPA).

#### 14.1.8.2 Wetlands

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer et al., 2018) was used to identify potential wetland areas within the 500 m regulated area. One depression has been identified within the 500 m regulated area of Well C and D regulated areas (Figure 22 and Figure 23).

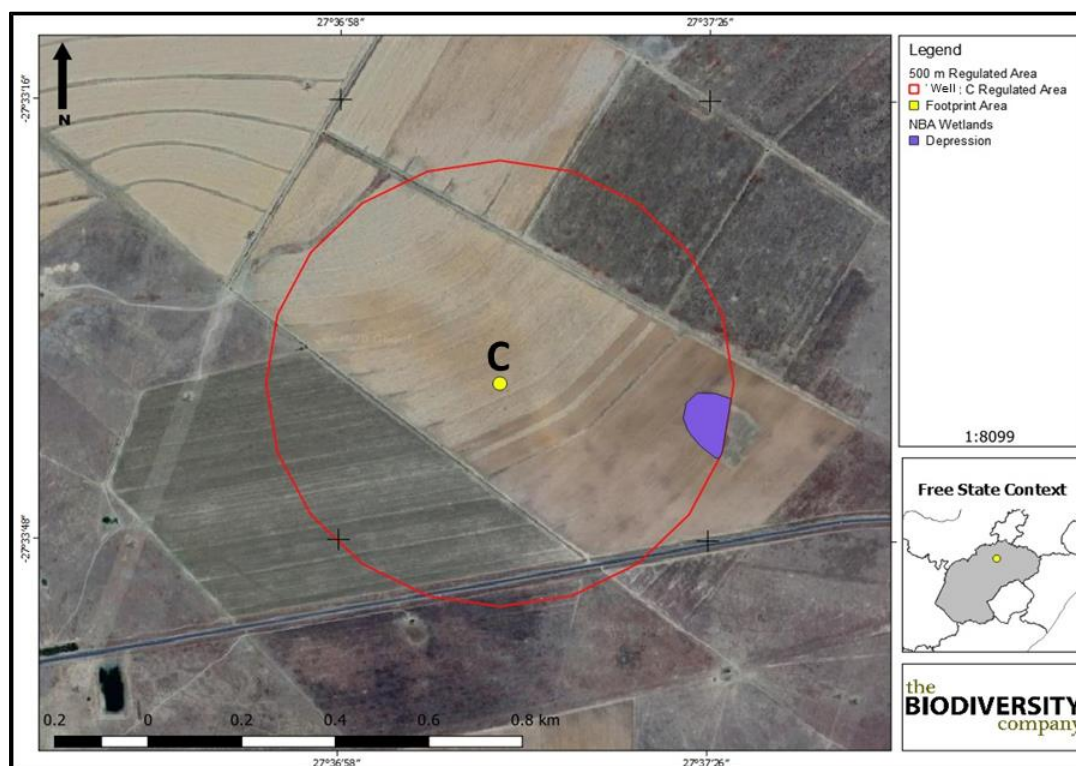


Figure 22: NBA wetlands identified within the 500 m regulated area of Well C.



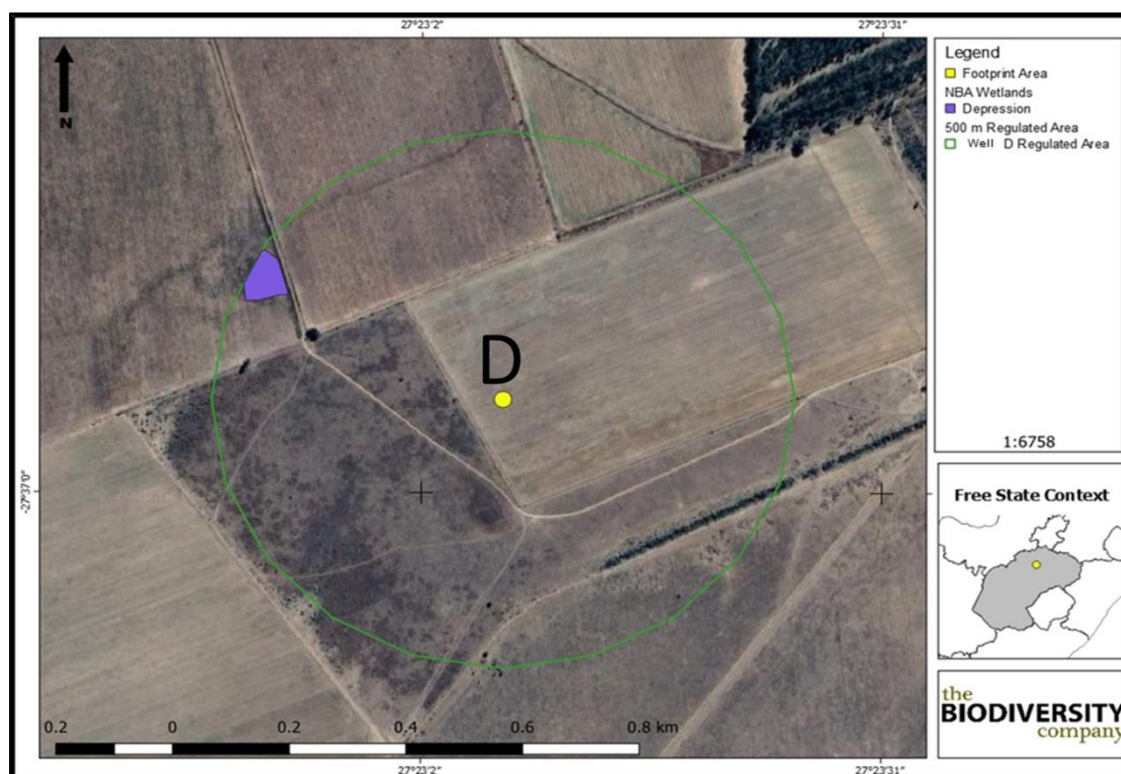


Figure 23: NBA wetlands identified within the 500 m regulated area of Well D.

#### 14.1.9 Cultural Heritage Baseline Description

The cultural heritage baseline description considered the predominant landscape based on the identified heritage resources within the regional and local study area. Table 15 presents the broad timeframes for the major periods of the past in South Africa.

Table 15: Periods in the South African past.

<b>The Stone Age</b>	Early Stone Age (ESA)	2 million years ago (mya) to 250 thousand years ago (kya)
	Middle Stone Age (MSA)	250 kya to 20 kya
	Later Stone Age (LSA)	20 kya to 500 CE (Common Era <sup>1</sup> )
<b>Farming Communities</b>	Early Farming communities (EFC)	500 to 1400 CE
	Late Farming Communities (LFC)	1100 to 1800 CE
<b>Historical Period</b>	-	1500 CE to 1994 (Behrens & Swanepoel, 2008)

Adapted from Esterhuysen & Smith (2007).

Figure 24 presents the results of the review of previously-completed heritage assessments. In total, 176 heritage resources were identified within the regional, local and site-specific study areas. Figure 25 illustrates where such heritage resources have been recorded.

<sup>1</sup> Common Era (CE) refers to the same period as *Anno Domini* ("In the year of our Lord", referred to as AD): i.e. the time after the accepted year of the birth of Jesus Christ and which forms the basis of the Julian and Gregorian calendars. Years before this time are referred to as 'Before Christ' (BC) or, here, BCE (Before Common Era).

The predominant tangible heritage resources recorded in the area under consideration demonstrate affiliations with the historical period, dominated by the historical built environment, and the archaeological MSA period. Archaeological resources representing the LSA and LFC as well as burial grounds and graves have been recorded in the greater study area.

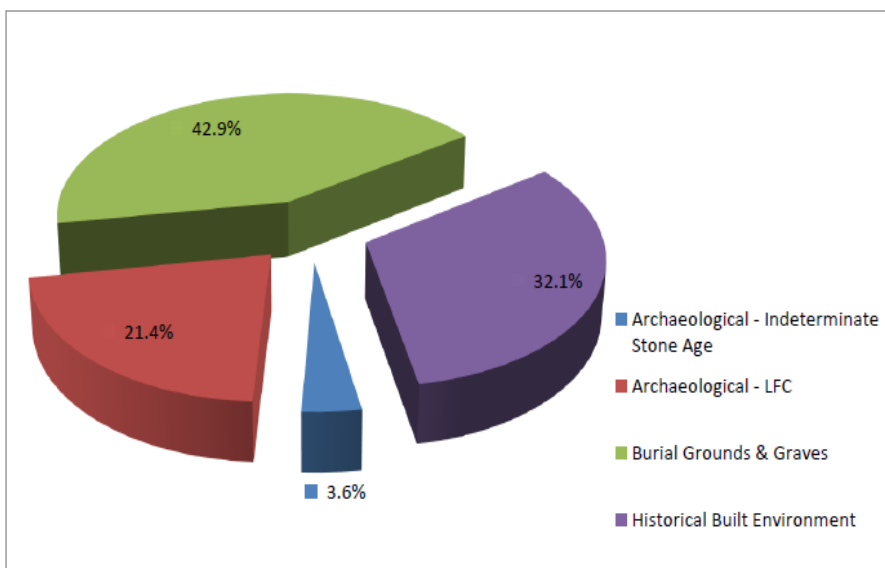


Figure 24: Heritage resources identified within the regional study area.

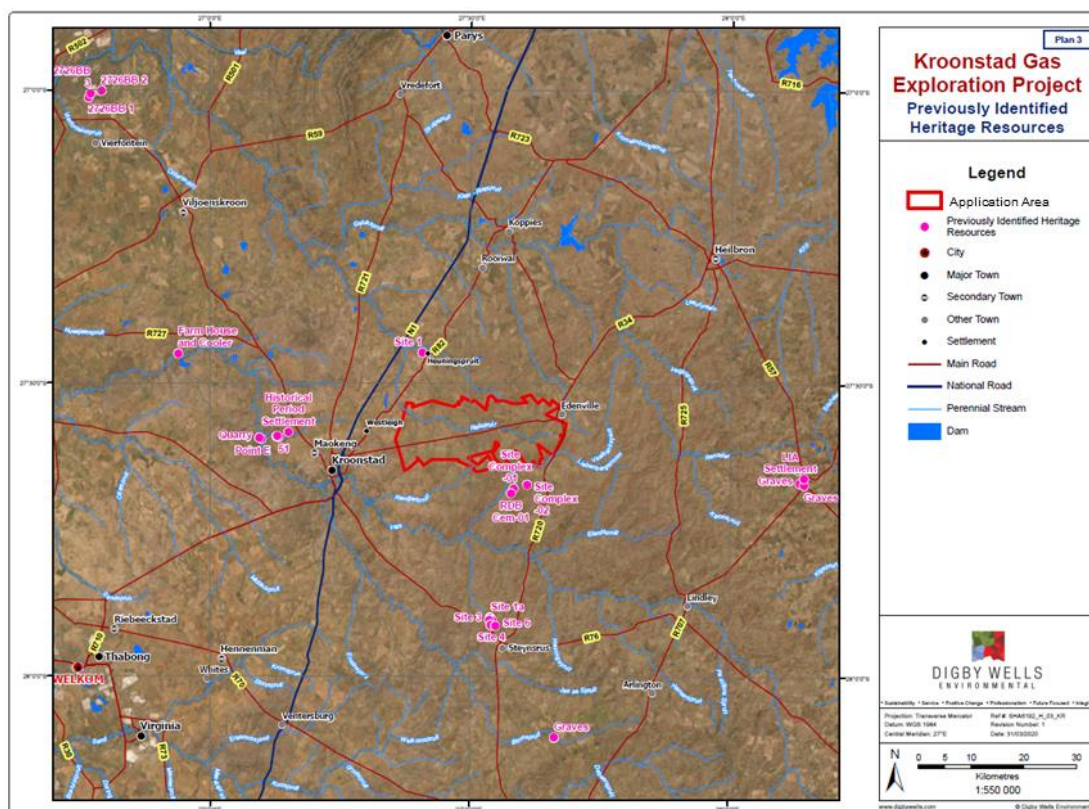


Figure 25: Heritage Resources Identified within the regional study area.

#### 14.1.9.1 Archeo-historical Context

The Stone Age in southern Africa comprises three broad phases, which are described according to the lithic tools and material culture produced by the various hominid species through time. These phases are:

1. The ESA.
2. The MSA.
3. The LSA.

The survey of the heritage assessments previously completed within the regional study area yielded one expressions of the Stone Age (accounting for 3.6% of the identified records). The resource comprised of a low-density scatter of stone tools (Pistorius, 2004). Material associated with the MSA and LSA has been recorded within the province and may potentially be uncovered during Project activities. As such, a brief description of the periods within the Stone Age follows.

The ESA is comprised predominantly of large handaxes and cleavers made of coarse-grained materials (Esterhuysen & Smith, 2007). This period occurred between 2 mya and 250 kya and is associated with *Australopithecus* and early *Homo hominid* species.

The MSA dates from approximately 300 kya to 20 kya. High proportions of minimally modified blades, created using the Levallois technique, characterise the early MSA lithic industries (Clark, 1982; Deacon & Deacon, 1999). The MSA can be more broadly defined through the presence of blades and points produced on good-quality raw material. The presence of bone tools, ochre, beads and pendants also define this period.

The LSA dates between 40 kya to the historical period. LSA lithics are specialised where specific tools have been created for specific tasks (Mitchell, 2002). LSA assemblages can also include bone points and commonly include diagnostic tools such as microlithic scrapers and segments. In southern Africa, the LSA is closely associated with hunter-gatherer groups, such as the San. Regional hunter-gatherer occupation is well documented, although open sites are usually poorly preserved and difficult to identify because of the nomadic nature of these peoples.

The LSA is further defined by evidence of ritual practise and complex societies (Deacon & Deacon, 1999). This is often expressed through rock art. The literature survey did not yield any records of rock art within the regional study area.

The San were later followed by the various peoples of the Farming Community. The farming community period correlates to the movements of Bantu-speaking agro-pastoralists moving into southern Africa and is divided into two stages to distinguish between widespread events: the EFC and the LFC.

No EFC material was recorded in the reviewed literature.

LFC sites can be identified through secondary tangible surface indicators, such as ceramics and evidence for domesticated animals, i.e. dung deposits or faunal remains. These resources provide motivation for settlement and possible trade networks and are distributed across the region (Huffman, 2007; Delius, et al., 2014). The *Makgwareng facies* of ceramics occurs within the regional study area. These ceramics are characterised by decorations including appliqué, finely-stamped triangles and rim notching (Huffman, 2007). These ceramics date from 1700 to 1820 CE.

Stonewalling is the most visible indicator of LFC settlements. Table 16 presents a summary of the stonewalled settlement types within the province. Within the regional study area, Type V is the dominant stonewalling type. First described by Maggs (1976), these settlements consist of a ring around which primary enclosures are grouped. The closures are either contiguous or linked by secondary walling to form a secondary enclosure. There may be additional free-standing structures around the periphery of the settlement unit, but there is no surrounding wall. *Makgwareng ceramics* are typically associated with Type V walling.

Within the regional study area, the LFC accounts for nine records or 21.4% of the identified heritage resources included in the literature survey. These resources include stonewalling, low density artefact scatters and sites which

include stonewalling and material culture including potsherds and metal fragments (Dreyer, 2005; 2006a; 2006b; WITS, 2010).

Table 16: Stonewalled settlement types. Adapted from Huffman (2007).

Central Cattle Pattern			
Moor Park Cluster		Ntsuanatsatsi Cluster	
Moor Park	14 <sup>th</sup> -16 <sup>th</sup> Century	Type N	15 <sup>th</sup> -17 <sup>th</sup> Century
		Badfontein	16 <sup>th</sup> Century
		Doornspruit	19 <sup>th</sup> Century
Melora	16 <sup>th</sup> Century - ?	Klipriviersberg	19 <sup>th</sup> Century
		Type V	19 <sup>th</sup> Century
		Molokwane	19 <sup>th</sup> Century
Kwamaza	18 <sup>th</sup> Century – Historic	Type Z	19 <sup>th</sup> Century
		Type B	19 <sup>th</sup> Century
		Tukela	19 <sup>th</sup> Century

The historical period<sup>2</sup> is commonly regarded as the period characterised by contact between Europeans and Bantu-speaking African groups and the written records associated with this interaction. However, the division between the LFC and historical period is artificial, as there is a large amount of overlap between the two.

An example of the overlap between the LFC and the historical period is the Mfecane or, north of the Orange River, the Difaqane. These terms refer to a period of violence and unrest between approximately 1817 to 1826 AD (Landau, 2010). The understanding of the period is that Mzilikazi and his Ndebele group were pushed out of their territory by the Zulu group led by Shaka. This displacement had a knock-on effect, as multiple groups were subsequently displaced to the north and the west. A drought during this time exacerbated the instability and increased the pressure on food supplies, which were already running low. European settlers, traders, missionaries and travellers moving into the interior further added to instability and resulting power struggles. The Mfecane/Difaqane was characterised by unprecedented (at least within the records of the Europeans travelling within southern Africa) social and political mobilisation and violence across the Highveld as individuals sought personal and food security.

As a result of social and political upheaval, the Highveld was vulnerable to intrusive groups including the Swazi and the Voortrekkers. Groups of Afrikaners initiated a move from the Cape to the interior to establish an independent state in approximately 1835, in reaction to increased British liberalism and the abolishment of slavery and pass laws. The migration of these Voortrekkers is commonly referred to as the Great Trek (or *Groot Trek*) and it started with the Robert Schoon Party in 1836. By 1838, the Voortrekkers had settled on both sides of the Vaal River and declared the area Boer lands (Delius & Cope, 2007).

<sup>2</sup> In southern Africa, especially in Mpumalanga, the last 500 years represents a formative period that is marked by enormous internal economic invention and political experimentation that shaped the cultural contours and categories of modern identities outside of European contact. This period is currently not well documented but is being explored through the '500 Year Initiative' (Swanepoel et al., 2008).

Chief Moshoeshoe resisted the influx of the Voortrekkers and sought the assistance of the British Kingdom, sanctioned through the signing of a treaty in 1843. In response, the British, under the Governor of the Cape, issued a proclamation declaring British sovereignty over all the lands between the Orange and Vaal Rivers (Fairbridge, 1918). This proclamation was superseded by the signing of the Sand River Convention in 1852. The Sand River Convention was an agreement between the British and the Voortrekkers to the north of the Vaal acknowledging their independence and the establishment of the Zuid-Afrikaansche Republiek (ZAR). ZAR independence allowed for land to be distributed to its citizens, though the demarcation of farms and the issuing of title deeds. It was not until 17 February 1854 that the independence of the Orange River Sovereignty was recognised, and officially became the Orange Free State with the signing of the Orange River Convention.

Subsequent to this, a breach of the agreements by the British resulted in the relationships with the Boers to break down and the start of the Anglo Boer Wars. The South African War of 1899-1902 (previously referred to as the Second Anglo-Boer War) officially started on October 9<sup>th</sup>, 1899. The war was the result of building tensions and conflicting political agendas between the Trekboers and the British.

The concentration camps associated with the South African War within the Free State Province include:

1. Kroonstad (approximately 17 km west of the application area).
2. Heilbron (40 km northeast).
3. Vredefortweg (the concentration camp cemetery is located approximately 40 km north of the application area, as the crow flies).
4. Reitz (80 km east).
5. Winburg (100 km south).
6. Brandfort (150 km southwest).
7. Harrismith (160 km southeast).
8. Ladybrand (170 km south).
9. Bloemfontein (200 km southwest).
10. Edenburg (280 km southwest).
11. Springfontein (330 km southwest).
12. Bethulie (350 km southwest).

Within the regional study area, historical resources are represented as:

1. Built environment resources, including buildings, structural remains and industrial and functional structures (Pistorius, 2004; WITS, 2010; Daniels, 2013; Van Der Walt, 2013b; Daniels & Tomsana, 2014; De Bruyn & Tomose, 2018).
2. A low-density scatter of historical artefacts including pottery and a smoking pipe (WITS, 2010).
3. Burial grounds and graves, ranging from burial grounds of less than ten graves to burial grounds of less than 50 graves and including burial grounds of indeterminate size (Pistorius, 2004; Dreyer, 2006c; 2007; 2008; WITS, 2010; Daniels, 2013; Van Der Walt, 2013a; 2013b; Sebogodi, 2014; De Bruyn & Tomose, 2018).

#### 14.1.10 Palaeontology

The regional study area is underlain predominately by lithologies associated with the Karoo Supergroup and forms part of the Main Karoo Basin. The Main Karoo Basin dates from the Late Carboniferous to the Middle Jurassic periods, which is approximately 320 to 145 mya (Johnson et al., 2006). The Main Karoo Basin constitutes a retro-arc foreland basin. As described by Johnson et al., (2006), this is because of:

1. The thick flysch-molasse succession which wedges out northwards over the adjacent craton.
2. Its position behind an inferred magmatic arc.



3. The associated fold thrust belt produced by northward subduction of oceanic lithosphere located south of the arc.

These processes allowed for sedimentation of the basin, forming what is collectively known as the Karoo Supergroup (Johnson, et al., 2006). These sediments cover approximately 700 000 km<sup>2</sup>, including the site-specific study area. Figure 26 illustrates the extent of the Main Karoo Basin and the envisaged plate tectonic setting of the basin in the Late Triassic. Within the Karoo Basin, two geological features are relevant to the Project: the Volksrust Formation of the Ecca Group and the Adelaide Sub-group. Table 17 presents the geological sequence of these features.

The Ecca Group is the most palaeontologically sensitive of the layers within the Karoo Supergroup and the group is considered of very high palaeosensitivity, although the sensitivity of various layers may differ (Groenwald and Groenewald, 2014). Ecca Group sediments are well-known for their wealth of plant fossils, characterised by assemblages of *Glossopteris* (plant species defined by through their fossil leaves). These layers also include significant coal reserves.

In the north-eastern parts of the Free State Province, the Ecca Group consists of the lower Pietermaritzburg Formation, the Vryheid Formation and the upper Volksrust Formation (Groenwald and Groenewald, 2014). The Project area is underlain by the Volksrust Formation. This consists of monotonous sequences of grey shale. Fossils are significant but are rarely recorded. Table 17 includes the types of fossils found within the Formation.

Overlying the Ecca group is the late Permian to early Triassic Beaufort Group of sediments (Groenwald and Groenewald, 2014). These sediments are divided into two sub-groups – a lower Adelaide Sub-group and an upper Tarkastad Sub-group. The Adelaide Sub-group is comprised of sediments deposited in a range of environments, from deltaic environments in the lower part of the sub-group to lacustrine and playa lake environments in the upper part of the sub-group. Table 17 presents the types of fossils expected within the sub-group.

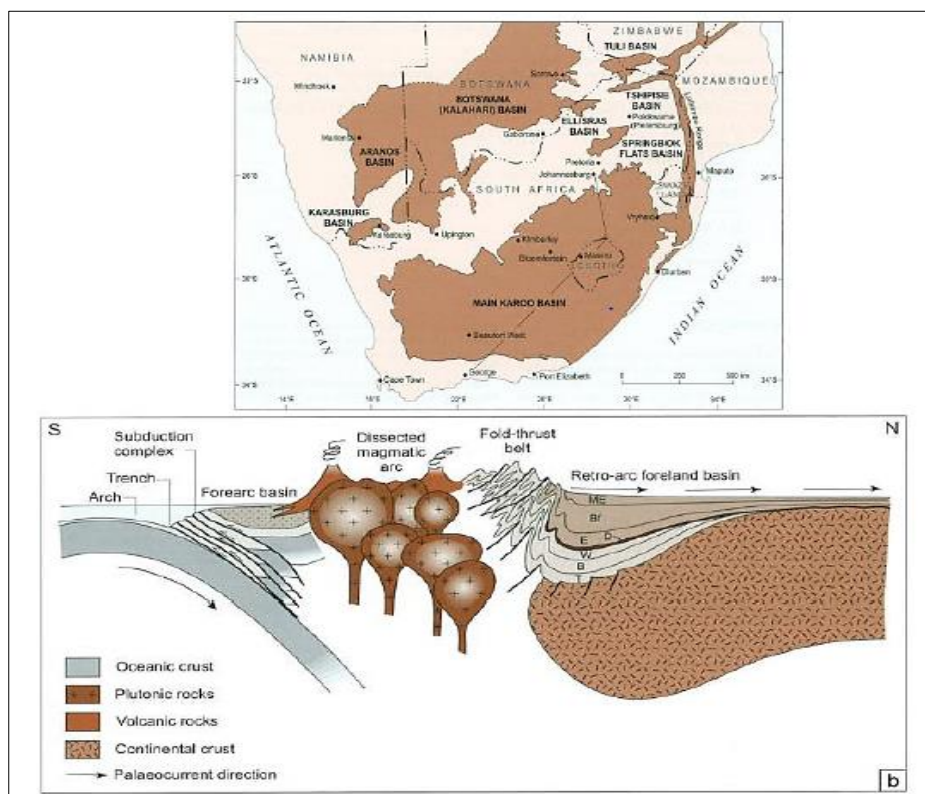


Figure 26: Location and envisaged plate tectonic setting of the Main Karoo Basin during the Late Triassic.

Table 17: Lithostratigraphic units underlying the regional study area and associated palaeosensitivity. Adapted from Groenwald and Groenwald (2014).

Eo n	Era	Period	Ma	Lithographic Units				Significance	Fossils
				Supergroup	Group	Sub-group	Formation		
Phanerozoic	Mesozoic	Triassic	145	Karoo Supergroup	Beaufort Group	Adelaide Sub-group	Koonop Formation	Very High	Diverse terrestrial and freshwater tetrapods from the <i>Pristeognathus</i> to <i>Dicynodon</i> Assemblage Zones (amphibians, true reptiles and synapsids) and <i>Lystrosaurus</i> Assemblage Zone (dicynodonts, cynodonts, therocephalians, proclophonids and archosaurs), palaeoniscoid fish, freshwater bi valves, trace fossils (including tetrapod trackways, vertebrate burrows and coprolites), and insects. These formations may also include vascular plants ( <i>Glossopteris</i> flora) and petrified wood.
	Palaeozoic	Permian	Middelton Formation						
			Balfour Formation						
			Ecce Group			Volksrust Formation	Moderate	Trace fossils, rare temnospondyl amphibian remains, invertebrates (bivalves, insects), minor coals with plant remains, petrified wood, organic microfossils (acritarchs), low-diversity marine to non-marine trace fossil assemblages.	
			300						

#### 14.1.10.1 Paleosensitivity

According to the South African Heritage Resources Agency (SAHRA) website and the South African Heritage Information System (SAHRIS) Fossil Sensitivity Map (Figure 27), the application area is depicted as having very high (red), high (orange/yellow) and moderate (green) fossil sensitivity.

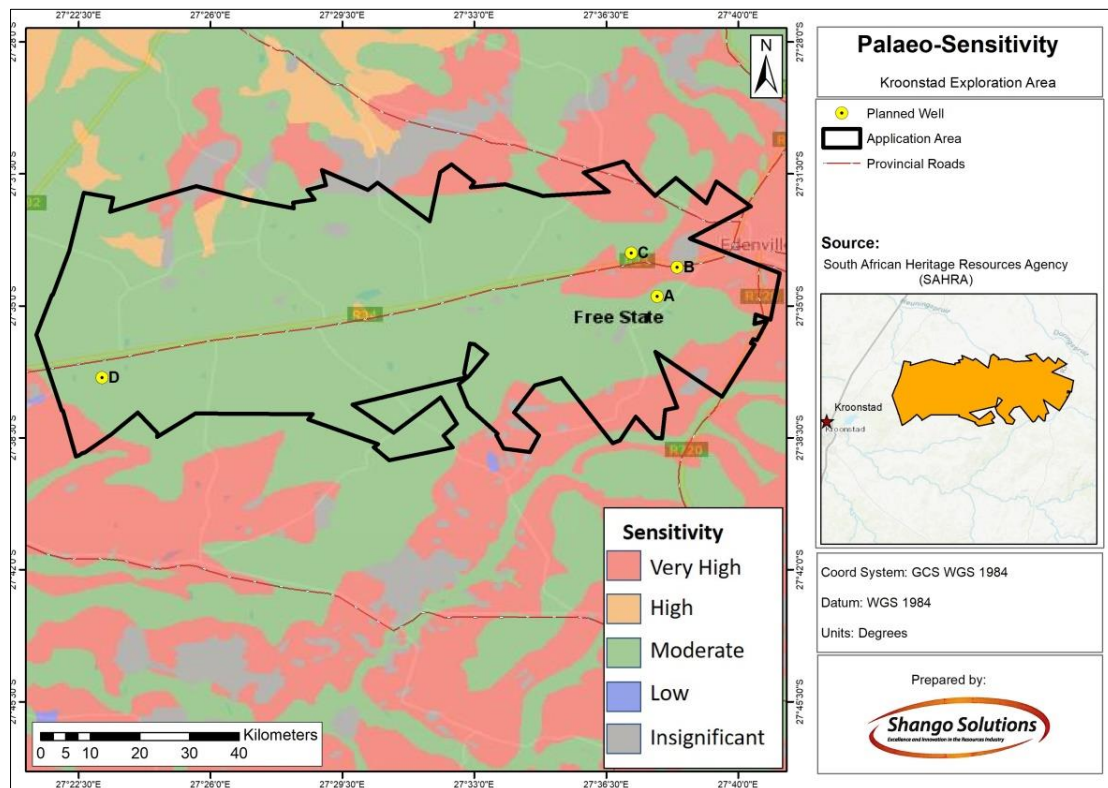


Figure 27: Palaeontological sensitivity (refer to Appendix D for enlarged map).

#### 14.1.11 Geohydrology

##### 14.1.11.1 Hydrocensus

A hydrocensus was completed from 25 August to 2 September 2020 across the proposed Kroonstad Gas Exploration area. The survey focussed on properties inside the application area and concentrated on identifying existing boreholes to enhance the knowledge of the groundwater systems and current groundwater use. A total of 42 farm portions were surveyed.

During the 2020 hydrocensus 120 groundwater sites (boreholes) were identified (Figure 28). From the 120 boreholes that were surveyed:

7. 84 boreholes are currently in use:
  - 47 boreholes fitted with submersible pumps.
  - 28 boreholes fitted with wind pumps.
  - 5 boreholes fitted with solar pumps.
  - 3 boreholes fitted with mono pumps.
  - 1 borehole has a hand pump.
8. An additional 8 boreholes are equipped, but not in use.
9. 28 open / unequipped boreholes:
  - 15 accessible, open holes.
  - 13 collapsed / blocked boreholes.



Groundwater level measurements were possible from 45 boreholes; pumping equipment or systems that protect the boreholes from vandalism and theft blocked the rest, and 21 groundwater samples were collected for water quality analysis.

During the hydrocensus the following information was collected for each site:

1. Borehole position (X, Y, Z-coordinates).
2. Information relating to equipment installed.
3. Borehole construction details.
4. Borehole yield – if known by the land owner.
5. Groundwater level, if possible.

The general observations and conclusions from the hydrocensus are as follows:

1. Groundwater is one of the main sources of water in the study area. In most cases it was the only source of water. It was only the properties that have access to the local surface water systems, like the Rietspruit, where surface water is another source of water. Several pools of water could still be seen during the hydrocensus, in the Rietspruit. Earth dams are also present in the local streams and rivers to help secure a source of water for the local farming activities. Edenville town is dependent on several boreholes to supplement the town water supply from Heilbron.
2. Most of the landowners in the western section of the study area refused access to their properties. The landowners were concerned about the negative impact that prospecting and mining activities have on the environment and were concerned about the negative impact on their already limited water resources.
3. The highest water elevations can be found in the vicinity of the Farm Mooihoek (eastern boundary of the application area) and the lowest water table elevations to the west, on the Farms Fermanagh, Zoar and Klipfontein 2140 Portion1. The regional groundwater flow is in a westerly to north-westerly direction.
4. From the 45 measured water levels only two were deeper than 20 m below surface. The rest were on average between 3 and 18 metres below surface. The average depth for the study area is 9.1 m.
5. The depth of the water strikes, and the depth of the boreholes are unfortunately not known for many of the sites. Most of the private boreholes are 30 to 50 metres deep, with pumps often installed between 20 and 45 m below surface. The Edenville town boreholes seem to be the deepest, with an average pump depth of 60 m. The deepest pump is at 70 m below surface.
6. This indicates that most of the boreholes potentially only penetrate the weathered, and the shallow weathered and fractured aquifers.
7. Borehole yields are predominantly in the 800 to 3000 Litres per Hour (L/hr) range, with isolated high yields of 7000 to 15000 L/hr range. Many of the higher yielding boreholes are close to a surface water feature – earth dam or stream.
8. Based on the SANS241 drinking water guideline and on the sampled borehole water results, 7 of the 21 sampled boreholes are not fit for human consumption (unless treated). This is mainly the result of elevated nitrate concentrations. Fluoride is the only other parameter with a DWS classification of Class 2. This is only applicable for borehole NOA46 on Farm Langland 517 (RE). The rest of the tested parameters are within the Class 0 and Class 1 limits.

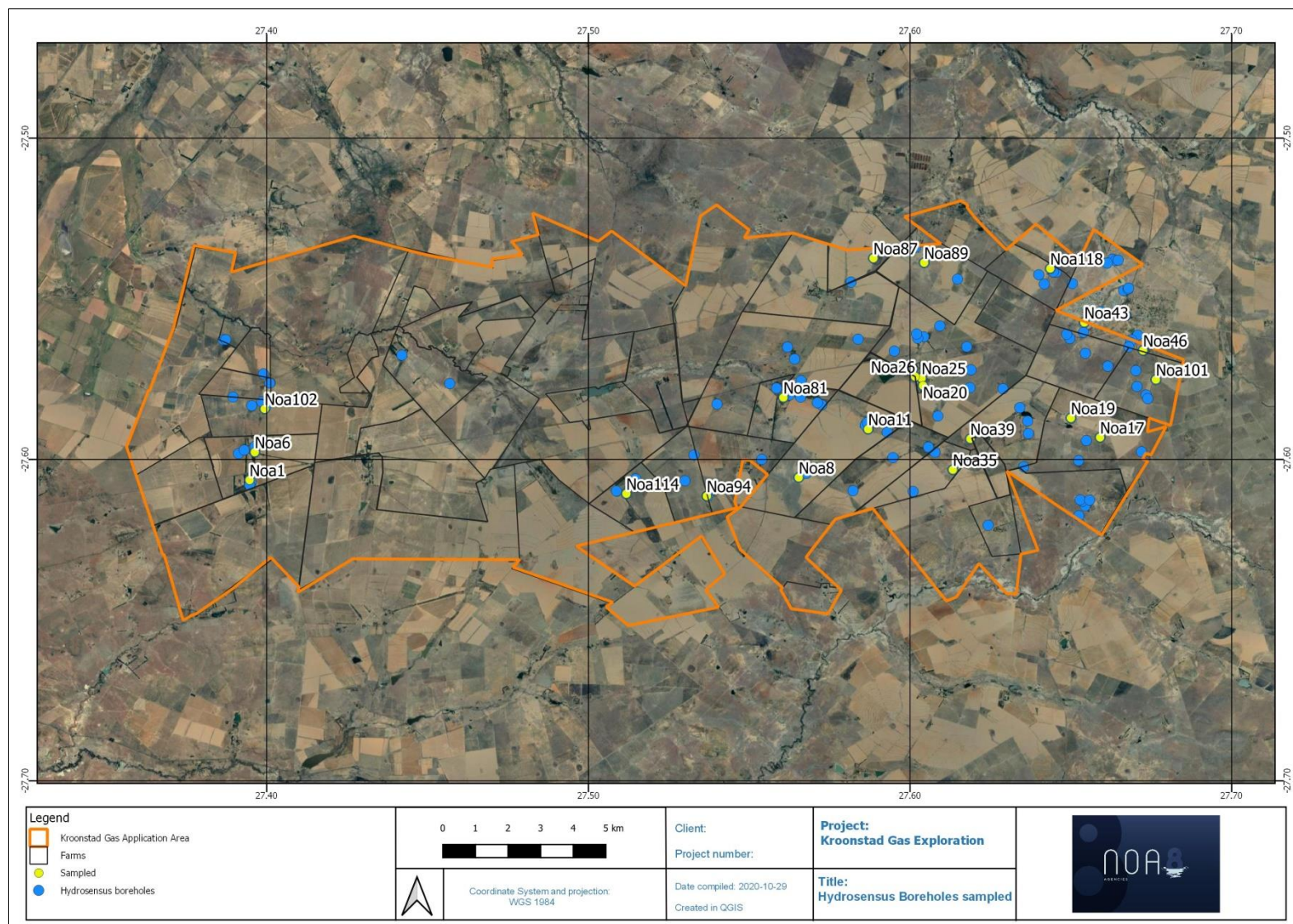


Figure 28: Hydrocensus boreholes sampled.

#### 14.1.11.2 Groundwater Quality

Twenty-one (21) groundwater samples were collected during the hydrocensus. The water samples were analysed for basic inorganic parameters and the results were compared against the SANS 241:2015 Drinking Water Standards, as well as the DWS South African Water Quality Guidelines, Domestic Use.

The water quality results are presented in Table 18. Based on the SANS 241 Drinking Water Guideline, the following conclusions were drawn:

##### 1. Health effects:

- i. Nitrate – The groundwater samples from boreholes NOA8 (15 mg/L), NOA11 (15 mg/L), NOA19 (20 mg/L), NOA25 (11 mg/L), NOA39 (13 mg/L) and NOA81 (13 mg/L) yielded high nitrate concentrations. The elevated nitrate concentration might be related to the underlying geology, soils or vegetation (i.e. natural) or to human settlements or livestock watering (i.e. anthropogenic). All listed boreholes are in agricultural areas and is possibly the reason for the elevated nitrate concentrations.

Fluoride – borehole NOA46 has a high fluoride concentration (21 mg/L), compared to 1.5 mg/L allowed. Fluoride is the most electronegative member of the halogens. It has a strong affinity for positive ions and readily forms complexes with many metals. Apart from the alkali metal fluorides, most fluorides are insoluble in water. Fluoride reacts readily with calcium to form calcium fluoride, which is reasonably insoluble and can be found in sediments. Where phosphate is present, an even more insoluble apatite or hydroxy apatite may form.

The presence of fluoride in drinking water reduces the occurrence of dental caries in adults and children. A small amount of fluoride is necessary for proper hardening of dental enamel and to increase resistance to attack on tooth enamel by bacterial acids. In humans and animals, fluoride accumulates in the skeleton.

This borehole is to the south of the Edenville refuse dump and there are also 2 old holding dams upstream from this borehole. They are dry now, but the original use of the dams is not known.

##### 2. Operational effects:

- i. Turbidity – The turbidity values for boreholes NOA8, NOA43, NOA46, NOA87 and NOA89 were elevated. All of these boreholes are in regular use. It has been assumed that the pumping disturbs the silt inside the borehole cavity.

Most of the salts and metals were present in concentrations below the SANS241 guideline limits. Based on the SANS241 drinking water guideline and on the sampled borehole water results, borehole water from NOA8, NOA11, NOA19, NOA25, NOA39, NOA46 and NOA81 is not fit for human consumption (unless treated). This is mainly the result of elevated nitrate and fluoride concentrations.

Based on the DWS classification system the borehole water is categorized as follows:

1. Class 0 – borehole NOA26.
2. Class 1 –
  - a. Boreholes 1, 6, 20, 35, 43, 87, 89, 94, 101, 102, 114 and 118.
  - b. Mainly due to the EC, TDS, Ca, Na, NO<sub>3</sub> and Turbidity concentration.
3. Class 2 –
  - a. Boreholes 8, 11, 17, 19, 25, 39 and 81.
  - b. Mainly due to the NO<sub>3</sub> and Fluoride concentration.
4. Class 4 – borehole NOA46 due to the Fluoride concentration

Table 18: Groundwater quality results (2020).

	DWS Drinking Water Guideline Limits					SANS241:2015 Drinking Water Standard Limits		NOA 1	NOA 6	NOA 8	NOA 11	NOA 17
	Class 0	Class 1	Class 2	Class 3	Class 4	Aesthetic effects	Chronic health effects					
pH	5-9,5	4,5-5 or 9,5-10	4-4,5 or 10-10,5	3-4 or 10,5-11	<3 or >11	≥5 to ≤9,7		7,5	7,3	7,4	7,7	7,4
Electrical Conductivity	<70	70-150	150-370	370-520	>520	Aesthetic ≤170		83,8	95,9	83,4	86,2	96,1
TDS	<450	450-1000	1000-2400	2400-3400	>3400	Aesthetic ≤1200		536	614	542	546	600
Turbidity	0 - 1	1 - 5	5 - 10	>10		Operational ≤ 1 Aesthetic ≤ 5		0,1	0,4	1,6	0,1	0,1
Aluminium		0 - 0,15	0,15 - 0,5	>0,5		Operational ≤ 0,30		<0,1	<0,1	<0,1	<0,1	<0,1
Arsenic	<0,01	0,01-0,05	0,05-0,2	0,2-2	>2		Chronic health ≤0,01	<0,001	<0,001	<0,001	<0,001	<0,001
Calcium	<80	80-150	150-300	>300				62	91	56	64	61
Copper	<1	1-1,3	1,3-2	2-15	>15		Chronic health ≤2	0,02	0,021	0,018	0,022	0,019
Total Iron	<0,5	0,5-1	1-5	5-10	>10	Aesthetic ≤0,3	Chronic health ≤2	<0,025	<0,025	0,086	<0,025	<0,025
Magnesium	<70	70-100	100-200	200-400	>400			20	24	30	28	25
Manganese	<0,1	0,1-0,4	0,4-4	4-10	>10	Aesthetic ≤0,1	Chronic health ≤0,4	<0,025	<0,025	<0,025	<0,025	<0,025
Potassium	<25	25-50	50-100	100-500	>500			7,3	9,2	9	9,1	29
Sodium	<100	100-200	200-400	400-1000	>1000	Aesthetic ≤200		96	96	74	75	102
Chloride	<100	100-200	200-600	600-1200	>1200	Aesthetic ≤300		37	34	43	61	63
Fluoride	<0,7	0,7-1	1-1,5	1,5-3,5	>3,5		Chronic health ≤1,5	0,5	0,3	0,2	0,3	1,2
Free & Saline Ammonia	0 - 1	1 - 2	2 - 10	>10		Aesthetic ≤1,5		<0,1	0,1	<0,1	<0,1	0,1
Nitrate	<6	6 - 10	10 - 20	20-40	>40		Acute health ≤11	4,6	4,8	15	15	2,4
Nitrite							Acute health ≤0,9	<0,05	<0,05	<0,05	<0,05	<0,05
Sulphate	<200	200-400	400-600	600-1000	>1000	Aesthetic ≤250	Acute health ≤500	62	83	59	57	68
Silica								27	34	46	38	21
DWS Classification								1	1	2	2	2

Table 18 continued

	DWS Drinking Water Guideline Limits					SANS241:2015 Drinking Water Standard Limits		NOA 19	NOA 20	NOA 25	NOA 26	NOA 35
	Class 0	Class 1	Class 2	Class 3	Class 4	Aesthetic effects	Chronic health effects					
pH	5-9.5	4.5-5 or 9.5-10	4-4.5 or 10-10.5	3-4 or 10.5-11	<3 or >11	≥5 to ≤9.7		7.6	7.3	7.4	7.6	7.7
Electrical Conductivity	<70	70-150	150-370	370-520	>520	Aesthetic ≤170		103	77.4	58.7	63.7	79.2
TDS	<450	450-1000	1000-2400	2400-3400	>3400	Aesthetic ≤1200		634	490	388	414	498
Turbidity	0 - 1	1 - 5	5 - 10	>10		Operational ≤ 1 Aesthetic ≤ 5		0.2	0.4	0.1	0.2	0.2
Aluminium		0 - 0,15	0,15 - 0,5	>0,5		Operational ≤ 0,30		<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	<0,01	0,01-0,05	0,05-0,2	0,2-2	>2		Chronic health ≤0,01	<0.001	<0.001	<0.001	0.001	<0.001
Calcium	<80	80-150	150-300	>300				74	56	46	42	51
Copper	<1	1-1,3	1,3-2	2-15	>15		Chronic health ≤2	0.019	0.017	0.022	0.021	0.026
Total Iron	<0,5	0,5-1	1-5	5-10	>10	Aesthetic ≤0,3	Chronic health ≤2	<0.025	<0.025	0.031	<0.025	<0.025
Magnesium	<70	70-100	100-200	200-400	>400			25	21	15	11	20
Manganese	<0,1	0,1-0,4	0,4-4	4-10	>10	Aesthetic ≤0,1	Chronic health ≤0,4	<0.025	<0.025	<0.025	<0.025	<0.025
Potassium	<25	25-50	50-100	100-500	>500			5.4	4.8	3.3	2	14.1
Sodium	<100	100-200	200-400	400-1000	>1000	Aesthetic ≤200		101	80	55	81	87
Chloride	<100	100-200	200-600	600-1200	>1200	Aesthetic ≤300		116	54	19	29	40
Fluoride	<0,7	0,7-1	1-1,5	1,5-3,5	>3,5		Chronic health ≤1,5	0.9	0.4	0.2	0.4	0.4
Free & Saline Ammonia	0 - 1	1 - 2	2 - 10	>10		Aesthetic ≤1,5		0.1	0.1	0.1	0.1	0.1
Nitrate	<6	6 - 10	10 - 20	20-40	>40		Acute health ≤11	20	7.9	11	2	5.1
Nitrite							Acute health ≤0,9	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	<200	200-400	400-600	600-1000	>1000	Aesthetic ≤250	Acute health ≤500	71	44	25	30	39
Silica								25	33	45	35	26
DWS Classification								2	1	2	0	1

Table 18 continued

	DWS Drinking Water Guideline Limits					SANS241:2015 Drinking Water Standard Limits		NOA 39	NOA 43	NOA 46	NOA 81	NOA 87
	Class 0	Class 1	Class 2	Class 3	Class 4	Aesthetic effects	Chronic health effects					
pH	5-9,5	4.5-5 or 9.5-10	4-4.5 or 10-10.5	3-4 or 10.5-11	<3 or >11	≥5 to ≤9.7		7.6	7.5	9.4	7.2	7.5
Electrical Conductivity	<70	70-150	150-370	370-520	>520	Aesthetic ≤170		56.7	58.6	70.8	114	88.4
TDS	<450	450-1000	1000-2400	2400-3400	>3400	Aesthetic ≤1200		376	370	402	698	552
Turbidity	0 - 1	1 - 5	5 - 10	>10		Operational ≤ 1 Aesthetic ≤ 5		0.4	1.7	1.5	0.1	1.6
Aluminium		0 - 0,15	0,15 - 0,5	>0,5		Operational ≤ 0,30		<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	<0,01	0,01-0,05	0,05-0,2	0,2-2	>2		Chronic health ≤0,01	<0.001	<0.001	0.001	<0.001	<0.001
Calcium	<80	80-150	150-300	>300				41	60	5	127	60
Copper	<1	1-1,3	1,3-2	2-15	>15		Chronic health ≤2	0.021	0.015	<0.01	0.02	0.021
Total Iron	<0,5	0,5-1	1-5	5-10	>10	Aesthetic ≤0,3	Chronic health ≤2	<0.025	0.248	0.052	<0.025	0.143
Magnesium	<70	70-100	100-200	200-400	>400			21	27	2	22	22
Manganese	<0,1	0,1-0,4	0,4-4	4-10	>10	Aesthetic ≤0,1	Chronic health ≤0,4	<0.025	<0.025	<0.025	<0.025	<0.025
Potassium	<25	25-50	50-100	100-500	>500			6.1	2.3	0.5	5.9	11.4
Sodium	<100	100-200	200-400	400-1000	>1000	Aesthetic ≤200		46	26	142	84	97
Chloride	<100	100-200	200-600	600-1200	>1200	Aesthetic ≤300		19	26	109	135	75
Fluoride	<0,7	0,7-1	1-1,5	1,5-3,5	>3,5		Chronic health ≤1,5	0.2	0.4	21	0.2	0.6
Free & Saline Ammonia	0 - 1	1 - 2	2 - 10	>10		Aesthetic ≤1,5		0.1	0.1	0.2	0.1	0.1
Nitrate	<6	6 - 10	10 - 20	20-40	>40		Acute health ≤11	13	<0.1	<0.1	13	8.8
Nitrite							Acute health ≤0,9	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	<200	200-400	400-600	600-1000	>1000	Aesthetic ≤250	Acute health ≤500	27	39	9	69	44
Silica								48	40	17.8	41	23
DWS Classification								2	1	4	2	1



Table 18 continued

	DWS Drinking Water Guideline Limits					SANS241:2015 Drinking Water Standard Limits		NOA 89	NOA 94	NOA 101	NOA 102	NOA 114	NOA 118
	Class 0	Class 1	Class 2	Class 3	Class 4	Aesthetic effects	Chronic health effects						
pH	5-9.5	4.5-5 or 9.5-10	4-4.5 or 10-10.5	3-4 or 10.5-11	<3 or >11	≥5 to ≤9.7		7.3	7.4	7.5	7.4	7.1	6.9
Electrical Conductivity	<70	70-150	150-370	370-520	>520	Aesthetic ≤170		116	94.3	83.8	86.6	95	88.2
TDS	<450	450-1000	1000-2400	2400-3400	>3400	Aesthetic ≤1200		718	578	518	538	546	588
Turbidity	0 - 1	1 - 5	5 - 10	>10		Operational ≤ 1 Aesthetic ≤ 5		1.3	0.8	0.2	0.2	0.3	0.1
Aluminium		0 - 0,15	0,15 - 0,5	>0,5		Operational ≤ 0,30		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	<0,01	0,01-0,05	0,05-0,2	0,2-2	>2		Chronic health ≤0,01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	<80	80-150	150-300	>300				75	67	62	51	58	83
Copper	<1	1-1,3	1,3-2	2-15	>15		Chronic health ≤2	0.019	0.021	0.021	0.01	<0.01	0.018
Total Iron	<0,5	0,5-1	1-5	5-10	>10	Aesthetic ≤0,3	Chronic health ≤2	0.055	<0.025	<0.025	<0.025	0.025	<0.025
Magnesium	<70	70-100	100-200	200-400	>400			30	24	23	27	19	44
Manganese	<0,1	0,1-0,4	0,4-4	4-10	>10	Aesthetic ≤0,1	Chronic health ≤0,4	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Potassium	<25	25-50	50-100	100-500	>500			12.5	13.4	10	6.1	14.6	1.1
Sodium	<100	100-200	200-400	400-1000	>1000	Aesthetic ≤200		136	91	79	95	108	60
Chloride	<100	100-200	200-600	600-1200	>1200	Aesthetic ≤300		101	80	51	36	35	56
Fluoride	<0,7	0,7-1	1-1,5	1,5-3,5	>3,5		Chronic health ≤1,5	0.5	0.5	0.5	0.4	0.4	0.3
Free & Saline Ammonia	0 - 1	1 - 2	2 - 10	>10		Aesthetic ≤1,5		0.1	0.1	0.1	0.1	0.1	<0.1
Nitrate	<6	6 - 10	10 - 20	20-40	>40		Acute health ≤11	5.3	7.4	3	6.8	2.3	5.8
Nitrite							Acute health ≤0,9	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	<200	200-400	400-600	600-1000	>1000	Aesthetic ≤250	Acute health ≤500	98	57	63	65	52	45
Silica								24	27	27	44	24	50
DWS Classification								1	1	1	1	1	1

#### 14.1.11.3 Aquifer Description

The aquifers in the study area are classified as minor aquifer systems, meaning that groundwater is of limited quantity, but potentially important for local water supply and base flow for rivers. Two main aquifers are typically formed in the Karoo sediments, namely:

1. The shallow aquifer forms within the weathered zone with the following characteristics:
  - The weathered zone is around 10 m - 40 m deep across the area.
  - The depth to groundwater in the weathered aquifer varies between 1 m – 20 m (average depth of 10 m).
  - The aquifer is unconfined and is replenished through the infiltration of rainwater (recharge) from the soil horizon.
  - The rate of recharge to this aquifer is typically assumed to be around 3% of the Mean Annual Precipitation (MAP).
  - Groundwater occurrence is most often associated with the transition between weathered and fresh rock.
  - Dolerite sill(s) often form a barrier between the upper weathered and deeper fractured rock aquifers.
  - Fresh and unfractured dolerite (low permeability) acts as an aquitard or even an aquiclude, forming a barrier to the vertical flow of groundwater from the weathered to fractured rock aquifers.
2. Deeper intergranular, fractured rock aquifers are characterised by:
  - Formation in faults, fractures, joints and bedding planes of the sediments and rock formations.
  - Most of the groundwater is stored in the matrix (or unfractured) part of these rock formations and is associated with the contact zones of the dolerite sills.
  - Typically, narrow and linear aquifers along the strike of the intrusion, where zones of increased permeability allow groundwater flow through otherwise tight rock matrices.
  - Highly variable permeability dependant on the nature and extent of the secondary features mentioned, although decreased with depth.
  - The depth to groundwater in the deeper fractured rock aquifer varies between 5 m and 30 m.

#### 14.1.11.4 Aquifer Description

Aquifer characterisation is done based on the information presented thus far, and guidelines and maps provided by the Department of Human Settlement, Water and Sanitation (DHSWS). This system was created as it allows the grouping of aquifer areas into types according to their associated supply potential, water quality and local importance as a resource.

The aquifers in the study area are classified as minor aquifer systems according to the South African aquifer system management classification. The groundwater is therefore of limited quantity, but potentially important for local water supply and base flow for rivers (Parsons, 1998).

#### 14.1.11.5 Groundwater Vulnerability

Groundwater vulnerability indicates the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer. Based on the aquifer vulnerability map published by the DHSWS, in July 2013 the local formations are classified as moderately vulnerable aquifer systems (DHSWS, July 2013).

#### 14.1.11.6 Aquifer Susceptibility

Aquifer susceptibility is a qualitative measure of the relative ease with which a groundwater body can potentially be contaminated by anthropogenic activities and includes both aquifer vulnerability and the relative importance of the aquifer in terms of its classification. Based on the classification above the local Karoo formations have a medium susceptibility to contamination.



## 15. IDENTIFIED POSITIVE AND NEGATIVE IMPACTS OF THE PROPOSED ACTIVITY

The potential biophysical and socio-economic impacts of the proposed project that were identified during the Scoping process, with inputs from specialist studies, are discussed under each of the identified issues in this section. These discussions should be read with the corresponding descriptions of the baseline environment in Section 14 and the scoping specialist studies in Appendix F.

The potential impacts associated with the project phases (construction, operations, decommissioning and closure) have been identified and described and reference has been made to the studies/investigations that are required to inform the impact assessment. The specialist studies undertaken in support of this application were conducted on a Scoping level. As such, the assessment conclusions are conservative. It follows that the assessment provided below is a preliminary assessment which will, after having obtained detailed specialist input, be refined/changed as necessary in the EIA phase, as appropriate with due consideration of the direct and indirect impacts.

### 15.1 Potential Impacts Associated with the Planning Phase

The impacts in the planning phase are minimal as they would be mainly initial site surveys.

#### 15.1.1 Socio-Economic

1. The notification of the proposed Exploration Right is likely to create great interest, particularly in the potential for employment, perceived safety and security risks, and the exact nature of the proposed project.
2. Required access to the property for exploration activities may result in a risk to the safety and security of landowners, lawful occupiers, and community members due to the increase in number of unfamiliar people in the area.

#### 15.1.2 Terrestrial Biodiversity (Fauna, Avifauna and Flora)

The impacts on the four well sites were assessed collectively. Only one possible impact was considered:

1. Site temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles.

#### 15.1.3 Wetlands

1. During the planning phase, landowners will be visited as part of the public participation process and areas will be traversed by ecologists as part of the EIA.

#### 15.1.4 Pedology (Soils)

1. During the planning phase, landowners will be visited as part of the public participation process and areas will be traversed by ecologists as part of the EIA.

#### 15.1.5 Heritage

Surface or vegetation clearing ahead of construction could lead to the following heritage impacts:

### 15.2 Impact to in situ historical built environment sites.

1. Impact to fossil-bearing material.
2. Impact to in situ archaeological material.
3. Impact to in situ burial grounds or graves.

### 15.3 Potential Impacts Associated with the Construction Phase

This phase refers to the period when the drill and associated infrastructure will be established.

#### 15.3.1 Socio-Economic

1. The proposed exploration project will impact on the established sense of place of the property. The character of the area will change with the addition of invasive exploration activities. Additional vehicles, increased noise and dust, the removal of vegetation for borehole well sites, and potential influx of workers will all contribute to the alteration of the sense of place.

2. The potential positive impacts which could arise as a result of the construction activities include limited and short-term job opportunities both for skilled and unskilled labourers. The limited Jobs for the unskilled labourers are likely to be filled by the local community and the skilled personnel likely to be drawn around South Africa. The project would also bring with it an opportunity for training and capacity building of personnel that will be recruited.
3. During the construction phase, adjacent landowners could be negatively affected by the dust, noise and negative aesthetics created as a result of the construction activities.
4. Heavy vehicles and construction activities could result in damage to roads and present safety risks in the local area.

#### 15.3.2 Terrestrial Biodiversity (Fauna, Avifauna and Flora)

The following potential impacts on the terrestrial biodiversity were considered for the construction phase of the proposed exploration. This phase is considered to have the largest direct impact on biodiversity. The following potential impacts to terrestrial biodiversity were considered:

1. Destruction of, and fragmentation of, portions of the vegetation communities classified as EN and VU;
2. Loss of ESA1 and ESA 2 habitat, poorly- and not protected as well as EN ecosystems.
3. Displacement of faunal community due to habitat loss, disturbance (noise, dust and vibration) and/or direct mortalities.
4. Erosion.
5. Encroachment by alien invasive species.

#### 15.3.3 Wetlands

1. During the construction phase, the footprint area will be cleared, sumps will be installed, and laydown yards assigned for the proposed drilling activities.

#### 15.3.4 Pedology (Soils)

1. During the construction phase, the footprint area will be cleared, sumps will be installed, and laydown yards assigned for the proposed drilling activities. Potential disturbances include compaction, physical removal and potential soil pollution.

#### 15.3.5 Heritage/Cultural Resources

During construction (including construction of access roads), the following impact may occur:

1. Impact to in situ historical built environment sites.
2. Impact to fossil-bearing material.
3. Impact to in situ archaeological material.
4. Impact to in situ burial grounds or graves.

#### 15.3.6 Groundwater

1. Negative impacts are not expected on the groundwater environment, if the proposed drill wells are located remote from private production boreholes or wells and the construction vehicles and drill areas are well maintained and kept free from hydrocarbon contamination.

### 15.4 Potential Impacts Associated with the Operational Phase

This phase refers to the period when the drilling of wells will occur.

#### 15.4.1 Socio-Economic

1. Drilling operations have the potential to disrupt or damage services such as water supply or sewage collection pipes if not situated correctly within the study area.
2. Activities associated with exploration will result in increased traffic on the adjacent road network which can result in damage to the local road infrastructure.

3. Employment opportunities, although limited and short-term, would be created which could result in benefits to unemployed individuals within the local communities. Furthermore, capacity building and skills development could be to the benefit of the employees and could assist them in obtaining transferable skills.
4. Should exploration prove successful and a resource quantified, it would indicate a potential viable economic activity in the form of production that is likely to contribute greatly to the socio-economic status quo in the form of increased income, employment and other benefits that would cascade through the local, regional and national levels.

#### 15.4.2 Terrestrial Biodiversity (Fauna, Avifauna and Flora)

The following potential impacts were considered on biodiversity (fauna and flora) during operational phase.

1. Continued encroachment and displacement of the vegetation communities (EN and VU) due to alien invasive plant species.
2. Further loss of ESA1 and ESA 2 habitat, poorly- and not protected as well as EN ecosystems.
3. Continued displacement and fragmentation of the faunal community due to on-going anthropogenic disturbances (noise, traffic and dust).
4. Soil erosion due to stormwater runoff.
5. Potential leaks from the water collections and portable toilets into the surrounding environment.

#### 15.4.3 Wetlands

1. During the operational phase, drilling will take place, which includes extracting cores and laying cores down within the proposed footprint area.

#### 15.4.4 Pedology (Soils)

1. During the operational phase, the footprint area will be cleared, sumps will be installed, and laydown yards assigned for the proposed drilling activities. Potential disturbances include compaction, physical removal and potential soil pollution.

#### 15.4.5 Visual

1. The establishment of the drilling equipment during operations, albeit short-term, will visually intrude on the surrounding landscape.

#### 15.4.6 Heritage/Cultural Resources

The establishment of exploration wells could result in the following:

1. Impact to in situ historical built environment sites.
2. Impact to fossil-bearing material.
3. Impact to in situ archaeological material.
4. Impact to in situ burial grounds or graves.

#### 15.4.7 Groundwater

1. A low to moderate risk is associated with the abstraction of groundwater from local boreholes during the drilling activities for water supply.
2. Diesel, petrol and grease could potentially spill on the ground surface, or leak from surface storage tanks at the drill site. This could have a potential negative impact on groundwater quality. It is possible that the spilled compounds can reach the groundwater environment considering the shallow water table.

#### 15.4.8 Groundwater Abstraction

1. Over-utilization of production boreholes can lead to the failure of the production borehole or other production boreholes in the area

#### 15.4.9 Waste Generation and Disposal (Including sewage)

1. Contamination of the aquifer via seepage from solid waste, waste water and leaking sewage systems.

**15.4.10 Air Quality**

1. Negligent dust would be generated during the exploration activities.

**15.4.11 Noise**

1. The operation and movement of machinery and equipment (including reverse beepers), crushing, Potential Impacts

**15.5 Potential Impacts Associated with the Decommissioning, Rehabilitation and Closure Phase****15.5.1 Terrestrial Biodiversity (Fauna, Avifauna and Flora)**

1. Continued encroachment and displacement of EN and VU vegetation communities by alien invasive plant species and erosion.
2. Continued displacement of the faunal community (including threatened or protected species) due to on-going anthropogenic disturbances and habitat degradation (litter, road mortalities and/or poaching).

The impacts were envisioned to be similar for the drill sites and as such they were assessed collectively.

**15.5.2 Wetlands**

1. During the decommissioning phase, all components used during the operational phase will be removed. It has been assumed that access roads will be removed/rehabilitated and that no blasting will take place.

**15.5.3 Pedology (Soils)**

1. During the decommissioning phase, all components used during the operational phase will be removed. It has been assumed that access roads will be removed/rehabilitated and that no blasting will take place.

**15.5.4 Socio-Economic**

1. Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income.

**15.6 Potential Impacts Associated with the Post Closure Phase****15.6.1 Groundwater**

1. No impact is expected on the water quantity during the post exploration phase.

**16. IMPACT RATINGS AND POSSIBLE MITIGATION MEASURES**

Table 19 provides preliminary rating scores (pre- and post- mitigation) for each impact identified, and it suggests possible management and mitigation measures.

Table 19: Impact ratings and possible mitigation measures.

Impact Description		Pre-Mitigation ER	Mitigation Measures	Post-Mitigation ER	Confidence	Impact Prioritisation			Priority Factor	Final Score
Impact	Phase					Public Response	Cumulative Impact	Irreplaceable Loss		
Interference with existing land use	Planning Constriction Operation Rehab and closure Post closure	-7,5	<ol style="list-style-type: none"> <li>1. Prior to accessing any portion of land, the Applicant must enter into formal written agreements with the affected landowners. This formal agreement should additionally stipulate the landowner's special conditions which would form a legally binding agreement.</li> <li>2. All homestead gates must be closed immediately upon entry/exit.</li> <li>3. Vehicles used must be in a roadworthy condition. Speed limits must be adhered to and all local, provincial and national regulations with regards to road safety and transport</li> </ol>	-6	Medium	3	1	1	2.00	-8
Sense of place	Planning Constriction Operation Rehab and closure Post closure	-4,5	<ol style="list-style-type: none"> <li>1. Limit the extent of disturbed areas.</li> <li>2. Suppress dust to prevent a visual dust cloud.</li> <li>3. Effective waste management.</li> <li>4. Effective rehabilitation to achieve post closure land use.</li> <li>5. The use of berms where appropriate.</li> <li>6. The height of stockpiles should be limited as far as possible.</li> </ol>	-3	Medium	2	1	1	2.00	3.5
Safety and security	Planning Constriction Operation Rehab and closure Post closure	-6	<ol style="list-style-type: none"> <li>1. Ensure construction activities are consistent with occupational and health safety requirements</li> <li>2. Prior to accessing any portion of land, the Applicant must enter into formal written agreements with the affected</li> </ol>	-3.5	Medium	3	2	2	2.00	-4.67

Impact Description		Pre-Mitigation ER	Mitigation Measures	Post-Mitigation ER	Confidence	Impact Prioritisation			Priority Factor	Final Score
Impact	Phase					Public Response	Cumulative Impact	Irreplaceable Loss		
			landowners. This formal agreement should additionally stipulate the landowner's special conditions which would form a legally binding agreement 3. All homestead gates must be closed immediately upon entry/exit 4. Vehicles used must be in a roadworthy condition and their loads secured. Speed limits must be adhered to and all local, provincial and national regulations with regards to road safety and transport							
Perceptions and expectations	Planning Construction Operation	-8,25	1. Adhere to an open and transparent communication procedure with stakeholders at all times. 2. Ensure that accurate and regular information is communicated to I&APs. 3. Enhance project benefits and minimise negative impacts through intensive consultation with stakeholders.	-6.75	Medium	3	2	1		-9
Disturbance/ damage of and paleontological resources	Construction Operation	-20,25	1. Exploration activities and machinery should completely avoid the historical farm house. 2. Plan project to avoid heritage resources of significant importance. 3. Training of workers regarding the heritage and cultural sites that may be encountered and about the need to conserve these.	-10.75	Medium	2	2	1	2.00	-7.25

Impact Description		Pre-Mitigation ER	Mitigation Measures	Post-Mitigation ER	Confidence	Impact Prioritisation			Priority Factor	Final Score
Impact	Phase					Public Response	Cumulative Impact	Irreplaceable Loss		
			4. Fence off and limit access to the heritage and cultural sites that could be indirectly disturbed by exploration activities. 5. In the event that resources are identified, a chance find emergency procedure should be implemented.							
Possible boost in short-term small business opportunities and creation of employment opportunities	Construction Operation	+13	1. Maximise positive impacts through optimisation of economic growth opportunities. 2. Develop and implement procedures for recruiting, training and procurement that align with good industry practise. 3. Employ local people and procure goods and services locally as far as practically possible. 4. Effective communication to manage expectations with regard to employment and other opportunities.	+21.25	Medium	3	3	3	2.00	+25.00
Impact on surface water	Construction Operation	-7	1. No development should take place within 100 m of the rivers and streams.	-2.50	Medium	2	2	1	2.00	-3.75
Impact on groundwater	Planning Construction Operation Closure and Rehab Post Rehab	11,25	1. Ensure that detailed baseline water quality and quantity samples are obtained and analysed for reference purposes. 2. Drip trays must be placed under vehicles. 3. During refuelling of vehicles or equipment, drip trays must be utilised to prevent spills or	-4.50	Medium	2	2	1	2.00	-6.25

Impact Description		Pre-Mitigation ER	Mitigation Measures	Post-Mitigation ER	Confidence	Impact Prioritisation			Priority Factor	Final Score
Impact	Phase					Public Response	Cumulative Impact	Irreplaceable Loss		
			leaks. 4. Ensure that the land owner's borehole yields are monitored during the drilling operation. 5. Should it be proven that the operation is indeed affecting the quantity and quality of groundwater available to users and surrounding water resources, the affected parties must be compensated.							
Impact on ground water quality - vertical migration of gas	Construction Operation Rehab and closure	-20	1. Continue engaging with PASA and technical specialists on appropriate technical approaches. 2. Well development must be to pre-determined and agreed to standards and specifications to ensure casing and grouting integrity. A well engineer should oversee and sign-off key aspects of well development. 3. Down well surveys should be conducted as per the QA/QC methodology. A life of well database should be kept for each well to inform a risk based well specific approach at closure 4. Well decommissioning and closure measures must align to Regulation 132 of the MPRDA.	-1	Medium	3	3	3	2.00	-2.00
Socio-economic impact - devalued licence to operate in subsequent exploration/mining	Rehab and closure	-17,5	1. Implement Public Participation according to prescribed legislation. 2. Continually engage stakeholders and relevant authorities to ensure alignment.	1.5	Medium	3	3	3	2.00	3.00



Impact Description		Pre-Mitigation ER	Mitigation Measures	Post-Mitigation ER	Confidence	Impact Prioritisation			Priority Factor	Final Score
Impact	Phase					Public Response	Cumulative Impact	Irreplaceable Loss		
			Update and submit the GN R.1147 suite of closure planning and costing documents annually as required to the PASA. 3. Actively participate in local security and social forums. 4. Ensure that nuisance factors like dust and noise generation and surface disturbances are limited as far as possible. 5. Engage surrounding land users and potential end land users regarding end land use planning , rehabilitation methodologies and planned outcomes.							
Loss of biodiversity - alien invasive species infestation	Construction Operation Rehab and closure Post rehab	-13	1. Limit the extent of the disturbed area. 2. Develop and implement protocols for identifying and eradicating alien invasive species (AIPs) throughout the operations. 3. Provide training and promote continual awareness amongst operational personnel.	1	Medium	2	1	1	1.17	1.17
Altered land use - cumulative impact of poor rehabilitation practice	Construction Operation Rehab and closure Post rehab	-12	1. Limit extent of disturbances. 2. Develop rehabilitation methodology based on site specific conditions. Involve relevant specialists as required. 3. Provide for management and accurate implementation through an onsite Environmental Control Officer (ECO). 4. Ensure effective contracting and materials sourcing.	1	Medium	1	1	1	1.00	1.00

Impact Description		Pre-Mitigation ER	Mitigation Measures	Post-Mitigation ER	Confidence	Impact Prioritisation			Priority Factor	Final Score
Impact	Phase					Public Response	Cumulative Impact	Irreplaceable Loss		
Reduced land capability - soil compaction	Construction Operation Rehab and closure Post rehab	-11	<ol style="list-style-type: none"> <li>1. Limit the extent of disturbed area. Limit vehicle traffic to disturbed areas only.</li> <li>2. Rip all disturbed areas to alleviate compaction prior to vegetation establishment.</li> </ol>	-1	Medium	2	1	1	1.17	-1.17
Reduced land capability - failed rehabilitation	Construction Operation Rehab and closure Post rehab	-9	<ol style="list-style-type: none"> <li>1. Shape and level areas to ensure a free draining landform.</li> <li>2. Rip all disturbed areas to alleviate compaction.</li> <li>3. Ameliorate soil chemistry based on dedicated fertility sampling and analysis.</li> <li>4. Seed areas with a suitable species mix sources from reputable suppliers to ensure quality.</li> <li>5. Conduct rehabilitation sampling and performance assessments to highlight deficiencies and determine when closure objectives (abandonment criteria) have been met.</li> <li>6. Conduct post rehabilitation care and maintenance to address deficiencies highlighted through the monitoring period.</li> </ol>	-1	Medium	2	1	1	1.17	-1.17
Reduced land capability - soil loss to erosion	Construction Operation Rehab and closure Post rehab	-9	<ol style="list-style-type: none"> <li>1. Limit the extent of the disturbed area.</li> <li>2. Rehabilitate disturbed areas as soon as possible.</li> <li>3. Shape areas to align with the surrounding surface water drainage framework.</li> <li>4. Rip disturbed areas to alleviate compaction prior to vegetation establishment</li> </ol>	-1	Medium	2	1	1	1,17	-1,17

Impact Description		Pre-Mitigation ER	Mitigation Measures	Post-Mitigation ER	Confidence	Impact Prioritisation			Priority Factor	Final Score
Impact	Phase					Public Response	Cumulative Impact	Irreplaceable Loss		
			<p>meliorate soil chemistry based on dedicated fertility sampling and analysis.</p> <p>5. Seed areas with a suitable species mix sources from reputable suppliers to ensure quality.</p>							
Socio-economic and regulatory impact - misaligned expectations	Construction Operation Rehab and closure Post rehab	-9	<p>1. Continually engage stakeholders and relevant authorities to ensure alignment.</p> <p>2. Update and submit the GN R.1147 suite of closure planning and costing documents annually as required.</p>	1.5	Medium	2	1	1	1.17	1.75
Financial - insufficient closure provision	Rehab and closure	-8,25		1	Medium	2	1	1	1.17	1.17
Noise - increased noise pollution	Construction Operation Rehab and closure Post rehab Decommissioning	-5,25	<p>1. Continue noise monitoring and reporting during the rehabilitation implementation Limit rehabilitation activities to daylight hours.</p> <p>2. Actively manage an easily accessible complaints register on-site.</p>	-1	Medium	2	1	1	1.17	-1.17
Impacted surface water and groundwater quality - Hydrocarbon contamination	Construction Operation Decommissioning Rehab and closure Post rehab	-5	<p>3. Continue operational controls into the decommissioning phase.</p> <p>4. Ensure preventative measures and protocols are adhered to for breakdowns, parking and servicing equipment.</p> <p>5. Provide training on protocols and emergency procedures Keep emergency equipment and spill kits onsite.</p> <p>6. Deal with all spillages (major and minor) immediately.</p>	-1	Medium	2	1	1	1.17	-1.17

Impact Description		Pre-Mitigation ER	Mitigation Measures	Post-Mitigation ER	Confidence	Impact Prioritisation			Priority Factor	Final Score
Impact	Phase					Public Response	Cumulative Impact	Irreplaceable Loss		
Impacted surface water quality - failed rehabilitation and increased sediment load	Construction Operation Rehab and closure Post rehab and closure	-5	<ol style="list-style-type: none"> <li>1. Limit the extent of surface disturbances.</li> <li>2. Construct storm water control measures, if required, based on storm water modelling.</li> <li>3. Implement vegetation establishment on disturbed areas as soon as possible.</li> </ol>	-1	Medium	2	1	1	1.17	-1.17
Air quality - increased dust generation	Construction Operation Decommissioning Rehab and closure Post rehab	-3	<ol style="list-style-type: none"> <li>1. Continue dust monitoring and reporting during the rehabilitation implementation.</li> <li>2. Apply dust suppression / watering as required.</li> <li>3. Actively manage an easily accessible complaints register on-site.</li> </ol>	-1	Medium	2	1	1	1.17	-1.17

## 17. COMBINED SENSITIVITY MAP

An environmental sensitivity map was created based on the outcome of each specialist study and it combines all the studies into a consolidated sensitivity map (Figure 29). This map will aid in determining the avoidance of sensitive features and the placement of invasive exploration activities to minimise the impact of the proposed project on the environment. The exact placement of these gas wells will be refined based on the sensitivity of the receiving environment and the results of public consultation.

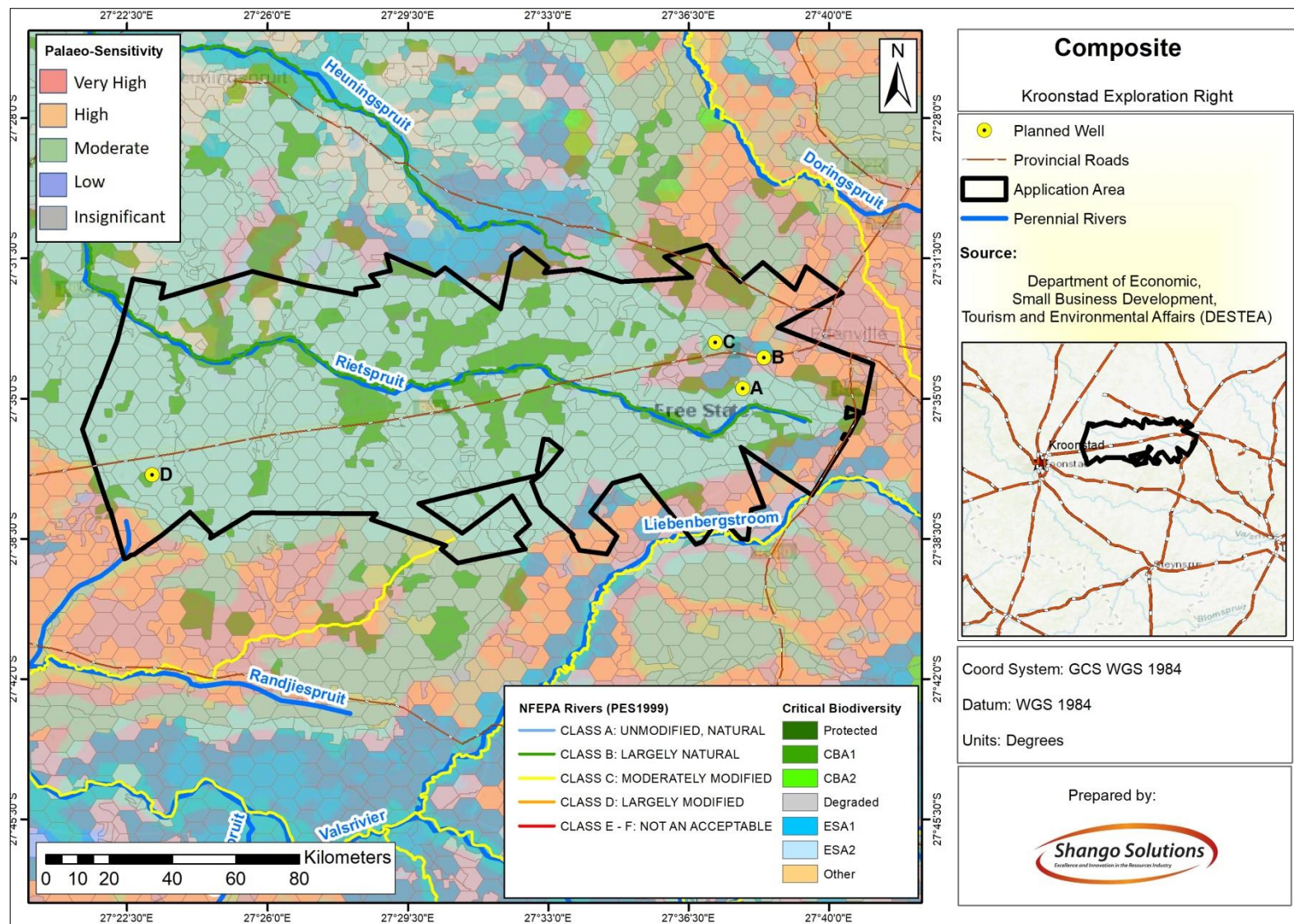


Figure 29: Combined sensitivity map.

## 18. MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

The proposed application area has been selected based predominantly on historical data available for the region, which indicates the potential for an economically viable gas resource to occur. The surface geology of the application area is dominated by Karoo Supergroup sediments of the Volksrust Formation, Ecca Group. Beaufort Group sediments and Karoo age dolerite intrusions also occur on and in close proximity to the licence area (Figure 2). Quaternary sand and gravel is limited to the surface drainage patterns. Karoo Supergroup sediments and later age intrusives are underlain by rocks of the Witwatersrand, Ventersdorp and Transvaal supergroups.

Exploration targets include gas-bearing coal seams of the Karoo Supergroup and pre-Karoo gas-bearing structures. Shales of the Volksrust Formation and younger dolerite sills may act as suitable cap rocks that trap gas, especially where pre-Karoo palaeo-highs occur. Gas rich in helium and methane associated with pre-Karoo structures is the primary target.

The exploration well sites are located in areas that are currently utilised for agriculture (cropfields and grazing). According to the Free State Terrestrial CBA Plan, three (A, C and D) of the planned wells are situated in areas which are classified as 'ESA2'. The remaining well (B) is situated in an area which is classified as 'ESA1'. The Scoping Heritage Study indicates that no heritage or built environment features occur within 100 m of the proposed well sites. In terms of palaeosensitivity, the planned wells are situated in areas classified as having high (Well B) to moderate (wells A, C and D) fossil sensitivity.

## 19. STATEMENT MOTIVATING THE ALTERNATIVE DEVELOPMENT LOCATION WITHIN THE OVERALL SITE

Historically, the Kroonstad project area was explored for gold by Anglo American Prospecting Services between 1950 and 1990. White Rivers Exploration (Pty) Ltd (WRE) holds prospecting rights over the application area and previously held a TCP over the same area. The desktop activities that were carried out in the Kroonstad area indicated promising gold intersections in the Kimberley Group of reefs. A few of the boreholes intersected gas as well and it was believed that gas could form a useful co-product along with gold as it could provide a source of energy for the future mining operations in the area. WRE collected summary borehole logs for many of the boreholes drilled in the area from the Council for Geoscience (CGS) and used these boreholes to build a low resolution 3D geological model of the project area.

Based on the outcomes of the geological model WRE were of the opinion that the Kroonstad TCP area held considerable promise as a gasfield because the geological formations that are present are very similar to those in the Evander Goldfield which has yielded large quantities of gas since its discovery in 1955. In addition, the TCP area is located in close proximity to the helium-rich Smaldeel Gasfield.

In addition, the project area has been selected based on a number of criteria, which include the environmental considerations (how sensitive the area is in terms of flora, fauna, wetlands, etc.) as well as historical and current data available for the region, which indicates the potential for economically viable gas deposits to occur.

Due to the geological features (in terms of gas deposition) present within the application area and the low sensitivity of the receiving socio-economic and biophysical environment, alternative development locations within the overall site are not suggested.



## 20. REHABILITATION PLAN

The rehabilitation and closure actions required to address the identified risks are summarised in Table 20.

Table 20: Summary of Rehabilitation and Closure Actions per area.

Areas	Concurrent Rehabilitation	Closure Measures
Drill sites	<p>The following measures should be implemented for the first 2 drill sites developed on year 2:</p> <ul style="list-style-type: none"> <li>• Shape and level areas to ensure a free draining landform aligned with the surrounding surface water drainage framework</li> <li>• Rip all disturbed areas to alleviate compaction</li> <li>• Ameliorate soil chemistry based on dedicated fertility sampling and analysis</li> <li>• Seed areas with a suitable species mix sourced from reputable suppliers to ensure quality</li> <li>• Conduct rehabilitation sampling and performance assessments to highlight deficiencies and determine when closure objectives (abandonment criteria) have been met</li> <li>• Conduct post rehabilitation care and maintenance to address deficiencies highlighted through the monitoring period</li> </ul>	<p>The following measures should be implemented at closure (end year 3) for the drill sites developed in year 3:</p> <ul style="list-style-type: none"> <li>• Shape and level areas to ensure a free draining landform aligned with the surrounding surface water drainage framework</li> <li>• Rip all disturbed areas to alleviate compaction</li> <li>• Ameliorate soil chemistry based on dedicated fertility sampling and analysis</li> <li>• Seed areas with a suitable species mix sourced from reputable suppliers to ensure quality</li> <li>• Conduct rehabilitation sampling and performance assessments to highlight deficiencies and determine when closure objectives (abandonment criteria) have been met</li> <li>• Conduct post rehabilitation care and maintenance to address deficiencies highlighted through the monitoring period</li> </ul>
Jeep tracks developed for access to gas wells	<p>None, jeep track to remain to access wells and rehabilitated drill sites as required.</p>	<p>The following measures should be implemented at closure:</p> <ul style="list-style-type: none"> <li>• Shape and level areas to ensure a free draining landform aligned with the surrounding surface water drainage framework</li> <li>• Rip all disturbed areas to alleviate compaction</li> <li>• Ameliorate soil chemistry based on dedicated fertility sampling and analysis</li> <li>• Seed areas with a suitable species mix sourced from reputable suppliers to ensure quality</li> <li>• Conduct rehabilitation sampling and performance assessments to highlight deficiencies and determine when closure objectives (abandonment criteria) have been met</li> <li>• Conduct post rehabilitation care and maintenance to address deficiencies</li> </ul>



Areas	Concurrent Rehabilitation	Closure Measures
		highlighted through the monitoring period
Gas wells	<p>The following operational actions are key to the successful closure of each well:</p> <ul style="list-style-type: none"> <li>Ensure that the well construction was implemented to design specifications / industry standards and signed off by a competent well engineer (QA/QC management plan).</li> <li>Apply a risk-based approach to the closure of each well based on the initial logging and sampling and monitoring conducted throughout the operational phase. Logging includes (but is not limited to) downhole surveys, geophysical logs (density, calliper, gamma ray, packer tests, neutron porosity, optic and acoustic tele viewer) and dip meter data.</li> <li>Develop and refine a decommissioning plan for each well informed by the previous steps, during the operational phase and the runup to closure.</li> <li>Incorporate into the Closure Plan as required during the pre-requisite annual updates. The well decommissioning plan should align with the requirements of MPRDA Regulation 132 (1 and 2).</li> </ul>	<p>Assuming that the concurrent rehabilitation actions were implemented, the following actions (aligned with MPRDA Regulation 132 (3) should be implemented at closure:</p> <ul style="list-style-type: none"> <li>Conduct a final well inspection to ensure the integrity of the casing and grouting prior to plugging.</li> <li>Pressure grout and seal the full length and diameter of the well bore.</li> <li>Cut the casing 1 meter below ground level, backfill and establish vegetation.</li> </ul> <p><u>Note:</u> It is assumed that the four gas wells will be decommissioned and plugged at the end of the exploration period (end year 3). Should exploration outcomes lead to further development, the exploration wells could become future production wells.</p>

## 20.1 Proposed End Land Use

A post exploration/mining land use plan should be developed during the next phase of development and incorporated into the subsequent annual updates of this closure plan as information becomes available. Initial indications are that the post mining land use should align with the existing mix of (mostly) agricultural land uses.

## 20.2 Alternative Closure Strategies

The proposed initial approach is to rehabilitate the surface disturbances of the drill sites and associated jeep tracks to a predetermined land use (e.g. grazing) through implementing accepted and appropriate rehabilitation measures. The following alternatives could be explored:

1. Engage with current landowners and land users in terms of leaving the disturbed areas un-rehabilitated for alternative use that may include developing farm infrastructure (e.g. sheds, workshops, lay down areas etc), planting crops or alternate vegetation to the proposed grassland seed mix.
2. Leaving the jeep tracks developed to access the drill sites for use by the current / future land users to supplement the existing farm road network.

The approach to gas well decommissioning and plugging is aligned with Regulation 132 of the MPRDA, particularly regulation 132 (3) *The surface area of a decommissioned well must be clear of obstructions and equipment and the well bore must be cemented for the full length and diameter of the wellbore to surface.*

It is noted that exploration wells may become future production wells based on the testing during the exploration phase. The decommissioning and closure of such wells could then only take place at some point in the future. Alternate closure approaches should be investigated and discussed with PASA at the Bi-annual technical meetings.

## 20.3 Preliminary Mine Closure Schedule

The mine closure schedule addresses the timing of rehabilitation and closure activities performed during the decommissioning and post-closure phases. A preliminary mine closure schedule has been developed in line with the closure objectives defined in the exploration schedule (Table 21). Closure of the exploration activities is currently indicated at the end of Year 3. The pre-site relinquishment period covers the monitoring and maintenance activities in years 4 – 6.

Table 21: Preliminary Rehabilitation and Mine Closure Schedule.

Activity	Year 1	Year 2	Year 3	Year 4-6
Further technical investigation, geological model update and refined exploitation strategy				
Annual; CP and ERR update and develop ARP aligned with GN R.1147				
Landowner engagement, develop first two well sites and gas wells				
Measure gas emissions, downhole surveys and logs				

Activity	Year 1	Year 2	Year 3	Year 4-6
Rehabilitate drill sites		2	2	
Laboratory analysis, interpretation and geological model update				
Develop life of well database and develop closure strategy with PASA				
Gas well decommissioning and closure				
Post closure rehabilitation monitoring, surface water, groundwater and gas monitoring				

Initial timeframes indicate that the last two well sites can be rehabilitated, and the four gas wells can be decommissioned and plugged during the last quarter of Year 3. The rehabilitation monitoring and maintenance will be conducted for three years (Year 4 – 6) and surface water, groundwater and gas monitoring will continue for 10 years (or to the point where a geohydrologist can indicate with confidence that gas leakages and contamination of groundwater is no longer a significant risk).

Although Western Allen Ridge will aim to reduce the rehabilitation period through concurrent rehabilitation of the first two well sites, monitoring and maintenance would have to continue until the site relinquishment criteria are met and a closure certificate issued by the PASA. The duration of the Exploration Right is three years.

#### 20.4 Audits, Reporting Requirements and Monitoring Plan

Initial monitoring, auditing and reporting requirements which relate to the risk assessment, legal requirements and knowledge gaps are shown in Table 22. The audit schedule differentiates between internal and external audits, defines the frequency and the responsible person.

All audit findings should be captured in the Environmental Management System (EMS). Resources and timeframes must be assigned to all audit findings, and progress tracked on an EMS platform.

Table 22: Internal, External and Legislated Audits.

Internal/External	Type	Frequency	Responsible Person
Internal	Water Use License audit	Annual	Environmental Manager
	Environmental Legal Compliance audits	Annual	Environmental Manager
	Addressing knowledge gaps for the closure plan	Annual	Environmental Manager
External	Site EMS audit	Annual	EMS specialist
	Water Use License audit	Annual	Water specialist
	GN704 audit	Annual	Water specialist

	Environmental audit (EA/EMP)	Annual	Environmental specialist
	Closure cost audit	Annual	Closure specialist

## 20.5 Monitoring Plan and Site Relinquishment Criteria

The management measures for the pre-site relinquishment period at specific areas are provided in Table 23 and primarily consist of monitoring and maintenance. Monitoring provides information on whether rehabilitation methods employed are functioning correctly or not. Monitoring should provide an early indication of problems arising so that corrective management actions can be taken.

The duration of post closure monitoring will be determined based on environmental performance and until it can be demonstrated that the rehabilitation work has achieved the agreed endpoints. It is assumed that post closure monitoring will continue for 6 years for surface water, groundwater and gas emissions. It is important that the data obtained during monitoring is used to gauge the success of rehabilitation. Negative monitoring findings should be clearly linked to specific corrective actions.

The following aspects should be monitored during the post-closure phase:

1. Soil fertility.
2. Erosion control.
3. Dust control.
4. Vegetation establishment on rehabilitated areas.
5. Alien invasive plant species.
6. Gas emissions.
7. Surface water and groundwater quality.

Table 23: Post closure monitoring programme.

Component/ Aspect	Monitoring		Performance/Success Criteria	Corrective Action
	Methodology	Frequency/Duration		
Soil Management				
Erosion	Conduct a visual assessment to determine areas of potential erosion  Undertake field investigations, fixed point photography to document the significance of the erosion occurring on site	Bi-annually for at least 3 years after decommissioning or as deemed necessary	No evidence of significant erosion  Erosion control measures (if any) are in place and effective	As required: <ul style="list-style-type: none"><li>▪ Re-shape areas to ensure that they are free-draining</li><li>▪ Ameliorate soils and reseed bare patches based on soil fertility analysis</li><li>▪ Repair and stabilisation of erosion gullies and sheet erosion</li></ul>
Soil fertility	Undertake a visual assessment and delineate areas where poor vegetation growth has occurred  Submit soil samples to an accredited soil laboratory to conduct soil fertility analysis	Annually until soil fertility supports the final land use or for at least 3 years after decommissioning or as deemed necessary	Self-sustaining vegetation establishment	As required: <ul style="list-style-type: none"><li>▪ Apply follow-up amelioration as informed by soil fertility analysis</li></ul>

Component/ Aspect	Monitoring		Performance/Success Criteria	Corrective Action
	Methodology	Frequency/Duration		
General site status	Conduct a visual assessment with respect to compliance of the aforementioned closure measures and to ensure that the site is aesthetically neat and tidy, and that no health or safety risks exist on site	Once-off following implementation of rehabilitation measures	Waste/rubble free sites	As required: <ul style="list-style-type: none"> <li>Clear remnant rubble and dispose of accordingly</li> </ul>
Topography	Conduct a visual assessment to determine areas of potential erosion  Undertake regular digital surveys of rehabilitated areas to confirm that final topography is aligned with landform designs	During decommissioning period	No evidence of significant erosion  No evidence of water ponding on rehabilitated areas  The final profile achieved must be acceptable in terms of surface water drainage requirements and the end land use objectives	As required: <ul style="list-style-type: none"> <li>Re-shape areas to ensure that they are free-draining</li> <li>Refer to end land use approach and refine measures to be implemented in achieving the desired final land use</li> </ul>
Terrestrial Ecosystem Health Management				
Vegetation re-growth	Determine whether re-growth of vegetation communities is on a trajectory of achieving a stable self-sustaining community dominated by species typical of the climax-	Yearly for at least 3 years after decommissioning or as deemed necessary	Limited to no erosion  Self-sustaining vegetation ecosystem	As required: <ul style="list-style-type: none"> <li>Reshape areas to ensure free drainage</li> <li>Ameliorate soils and</li> </ul>

Component/ Aspect	Monitoring		Performance/Success Criteria	Corrective Action
	Methodology	Frequency/Duration		
	<p>species present in the adjacent areas</p> <p>Inspect rehabilitated areas to assess vegetation re-growth and provide for early detection of erosion</p> <p>Undertake fixed point photography at specific points at the rehabilitated sites to obtain a long term directly comparable method of determining changes in the landscape</p> <p>Conduct evaluation of rehabilitated areas by means of field inspections. During these assessments measurement of growth performance and species abundance will be carried out to determine:</p> <p>Plant basal cover and species abundance in the grassed areas.</p> <p>Estimates of vegetation canopy and ground cover as well as height</p> <p>Distribution, growth and survival of</p>			<p>reseed bare patches based on soil fertility analysis</p> <ul style="list-style-type: none"> <li>▪ Rip hard stand areas as required to alleviate compaction and promote regrowth</li> </ul>

Component/ Aspect	Monitoring		Performance/Success Criteria	Corrective Action
	Methodology	Frequency/Duration		
	woody species (if any)  Dominant plant species (woody and herbaceous)  Presence of exotic invasive species, and degree of encroachment  Browsing or grazing intensity  Notes regarding erosion, such as, type, severity, degree of sediment build-up  Species composition and richness			
Invasive alien species	Visually inspect areas where invasive species have been previously eradicated and areas prone to invasive species (e.g. eroded/degraded areas, along drainage lines, etc.)  Undertake surveys on relevant sites where bush encroachment has previously been identified to determine the status quo of invasive vegetation	Yearly for at least 3 years after decommissioning or as deemed necessary	Limit and/or prevent declared Category 1, 2 and 3 invader species establishing  Minimise extended threat to ecosystems, habitats or other species  Increase the potential for natural systems to deliver goods and services  Minimise economic or environmental harm or harm to human health	As required: <ul style="list-style-type: none"> <li>▪ Foliar application technique</li> <li>▪ Cut-stump technique</li> <li>▪ Revisit mitigation measures</li> <li>▪ Continue control and management</li> </ul>



Component/ Aspect	Monitoring		Performance/Success Criteria	Corrective Action
	Methodology	Frequency/Duration		
Land Capability				
Final land capability	<p>Conduct a post-mining land capability assessment that includes:</p> <p>An assessment of soil bulk density on a predetermined grid (e.g. 25m x 25m)</p> <p>Collect soil samples for lab analysis of soil properties (bulk density &amp; soil texture), collect soil samples for lab analysis of soil (pH, resistance, organic carbon, major cations and anions)</p> <p>Create a GIS based land capability map indicating the status of rehabilitated areas within the land use plan for the project area</p> <p>Incorporate outcomes into the final Closure Plan</p>	Typically, a once-off exercise on rehabilitated units at the end of the 3-year rehabilitation monitoring and maintenance period	<p>Land capability aligned with end land use obligations and/or agreements with end land users</p> <ul style="list-style-type: none"><li>Revisit soil, vegetation and AIP removal corrective action as required</li></ul>	
Surface Water and Groundwater Management				

Component/ Aspect	Monitoring		Performance/Success Criteria	Corrective Action
	Methodology	Frequency/Duration		
Surface water quality	Monitor surface water quality in terms of the monitoring network that is aligned to the closure monitoring network	Bi-annually for at least a 10-year period after decommissioning or as deemed necessary	Acceptable threshold levels of salts, metals and other potential contaminants over the rehabilitated sites allocated in terms of the land use and downstream users  No possible surface contaminant sources remaining on the rehabilitated mine site that could compromise the planned land use and/or pose health and safety threats	As required: <ul style="list-style-type: none"> <li>Undertake a source-pathway investigation</li> <li>Devise measures to clean-up sources of contamination</li> </ul>
Groundwater quality	Monitor groundwater quality and levels in terms of the monitoring network that is aligned to the closure monitoring network	Bi-annually for at least a 10-year period after decommissioning or as deemed necessary	Acceptable threshold levels of salts, metals and other potential contaminants over the rehabilitated sites allocated in terms of the land use  The applicable thresholds do not pose a threat to surrounding land uses or land users	As required: <ul style="list-style-type: none"> <li>Undertake a source-pathway investigation</li> <li>Devise measures to clean-up sources of contamination.</li> </ul>
Dust Management				
Dust	Continuous PM10 monitoring by designated air quality officer at a sensitive receptor location	Quarterly for at least a 3-year period after decommissioning or as deemed necessary	Acceptable threshold levels that meet the South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)	As required: <ul style="list-style-type: none"> <li>Undertake an investigation to the source of the dust</li> <li>Devise measures to reduce dust to acceptable levels</li> </ul>

Component/ Aspect	Monitoring		Performance/Success Criteria	Corrective Action
	Methodology	Frequency/Duration		
Gas emissions	Natural gas emissions from soils above decommissioned gas wells	Bi-annually for at least a 10-year period after decommissioning or as deemed necessary for a competent person to conclude that the wells have been adequately decommissioned.	Acceptable thresholds aligned with licence requirements	Accurate well construction and decommissioning to specifications, supervised and signed off by a well engineer and the relevant authorities
Gas well integrity	Monitoring and management of well construction and decommissioning activities (Well engineer).	Well construction and decommissioning	Design specifications as agreed to with PASA and aligned with the MPRDA regulations	Accurate well construction and decommissioning to specifications, supervised and signed off by a well engineer and the relevant authorities

## 21. FINANCIAL PROVISION

The requirement for final rehabilitation, decommissioning and closure stems primarily from the legislative requirements of the MPRDA and NEMA. On 20<sup>th</sup> November 2015 the Minister promulgated the Financial Provisioning Regulations under the NEMA. The Regulations aim to regulate the determination of Financial Provision as contemplated in the NEMA for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from, prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future. These regulations provide for, inter alia:

1. Determination of Financial Provision: An Applicant or holder of a right or permit must determine and make Financial Provision to guarantee the availability of sufficient funds to undertake rehabilitation and remediation of the adverse environmental impacts of prospecting, exploration, mining or production operations, as contemplated in the Act and to the satisfaction of the Minister responsible for mineral resources.
2. Scope of the Financial Provision: Rehabilitation and remediation; decommissioning and closure activities at the end of operations; and remediation and management of latent or residual impacts.
3. Regulation 6: Method for determining Financial Provision – An applicant must determine the Financial Provision through a detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for:
  - Annual rehabilitation – annual rehabilitation plan.
  - Final rehabilitation, decommission and closure at end of life of operations – rehabilitation, decommissioning and closure plan.
  - Remediation of latent defects.
4. Regulation 10: An applicant must-
  - Ensure that a determination is made of the Financial Provision and the plans contemplated in regulation 6 are submitted as part of the information submitted for consideration by the Minister responsible for mineral resources of an application for environmental authorisation, the associated environmental management programme and the associated right or permit in terms of the Mineral and Petroleum Resources Development Act, 2002.
  - Provide proof of payment or arrangements to provide the Financial Provision prior to commencing with any prospecting, exploration, mining or production operations.
5. Regulation 11: Requires annual review, assessment and adjustment of the Financial Provision. The review of the adequacy of the Financial Provision including the proof of payment must be independently audited (annually) and included in the audit of the EMPR as required by the EIA Regulations.

Appendix 4 of the Financial Provisioning Regulations provides the minimum content of a final rehabilitation, decommissioning and closure plan (FRDCP).

### 21.1 Other Guidelines

The following additional guidelines which relate to Financial Provisioning and closure have been published in the South African context:

1. Best Practice Guideline G5: Water Management Aspects for Mine Closure: This guideline was prepared by the DWS and aims to provide a logical and clear process that can be applied by mines and the

competent authorities to enable proper mine closure planning that meets the requirements of the relevant authorities. The following technical factors which should be considered during closure, and which are likely to relate to mining activities, have been considered:

- Land use plan: directly interlinked with water management issues insofar as water is required to support the intended land use- in this regard the surrounding communities and the land uses implemented rely on available ground and surface water to be sustained.
  - Public participation and consultation: consultation is fundamental to closure and there is a need for full involvement of stakeholders in the development of the final closure plans, and in the agreement of closure objectives.
2. Guideline for the Evaluation of the Quantum of Closure Related Financial Provision Provided by a Mine: The objectives of the guideline include the need to improve the understanding of the financial and legal aspects pertaining to the costing of remediation measures as a result of mining activities. Whilst this guideline predates the recent NEMA Financial Provisioning Regulations, it does contain certain principles and concepts that remain valid.

## 21.2 Calculation Methodology

The Financial Provision was calculated in accordance with the legislative requirements presented above and it also considered the following:

1. Document review of available information to provide a basis for the costing.
2. Itemised layout plan indicating the battery limits for the closure costing.
3. A site-specific closure costing spreadsheet using an aligned template to develop a costing model.
4. Determine the site-specific closure and rehabilitation unit rates based on the Digby Wells rates database, interaction with rehabilitation contractors and from experience in the implementation of similar projects.
5. Documenting the methodology, outcomes and forward working plan to address the identified knowledge gaps.

## 21.3 Assumptions

The closure costing is based on the following assumptions developed from the information provided:

### 21.3.1 General

1. The closure costing addresses decommissioning, surface rehabilitation, well plugging the final closure and monitoring and corrective action of the site. Other aspects that are not addressed in this costing include staffing, separation packages, retraining or reskilling etc.
2. The closure costs represent present day value, no discounting or nett present value calculations have been included.
3. It is assumed that third party contractors would be commissioned to establish on site (preliminary and general costs included) and implement the decommissioning, site clean-up, related rehabilitation work and the post rehabilitation monitoring and maintenance.
4. The Preliminary and General costs are applied as a percentage of the total (15%). If the current amendments to GN R.1147 circulated for comment are promulgated, this figure will probably increase to align with industry standards.
5. Aligned with the requirements of international accounting standards and GN R.1147, no discounting of potential value recovered from the sale of recoverable material is considered.
6. No legal due diligence was done as part of this assessment.

7. The closure costing is based on the review of available information
8. A contingency of 10% has been allowed for in the financial provision. The contingency considers price fluctuations regarding plant hire, fuel prices, possible omissions and uncertainties in the cost estimate; and
9. The closure cost estimate does not include VAT.

### **21.3.2 Site Specific Costing Assumptions**

#### **21.3.2.1 Drill Sites**

1. Movable assets (temporary offices and ablutions) will be removed from site for sale and/or re-used by Allen Ridge and / or contactors, the cost associated with dismantling and transport of these items are not included in the cost determination.
2. It is assumed that no topsoil will be stripped prior to establishing the drilling sites, the in-situ soils will be ripped and revegetated as part of rehabilitation.
3. It is assumed that minimal (if any) storm water management measures will be required for each site. Recontouring of these measures is included in the levelling and shaping allowance for each drill site.
4. Unless firm agreements are in place with the next land user, all fencing will be dismantled and removed from site.
5. Allowance has been made to rehabilitate a disturbed area of 2,000 m<sup>2</sup> for each drill site.
6. It is assumed that no water, sludge or large waste storage facilities will be constructed on site and no contaminated material will require removal and disposal at closure.
7. It is assumed that effective operational measures will be implemented on site to prevent hydrocarbon spillages, and that potential spillages will be dealt with through the implementation of proper management procedures. No allowances have been made to remove and dispose of contaminated soils.

#### **21.3.2.2 Exploration Wells**

1. The specific well closure measures will be determined by the life of well data and a risk-based approach agreed to with PASA. It was assumed that the remaining two gas exploration wells will be sealed off by pumping grout/cement into the well as part of the closure and rehabilitation phase. The pressure grouting/cementing of the wells will be undertaken from near the base of the well to surface.

#### **21.3.2.3 Roads**

1. Allowance is made for shaping and levelling jeep tracks accessing the drill sites followed by ripping to alleviate compaction, soil amelioration and vegetation establishment.

Drainage lines will also be re-established where disruption due to the roads occurred.

#### **21.3.2.4 Post Closure Monitoring and Maintenance**

1. Allowance has been made for surface and groundwater quality monitoring to be conducted for a minimum period of 10 years post closure to assess the success of the implemented rehabilitation and closure measures.
2. Allowance for monitoring gas emissions from decommissioned and closed gas wells is included for a 10-year period.
3. Allowance for rehabilitation monitoring over rehabilitated areas has been made for a 3-year period.


#### **21.3.2.5 Residual Closure Costs**

1. The outcomes of the HIRA indicate that no residual risks are anticipated at this stage of the project planning.

## 21.4 Calculation of Financial Provision

The estimated Financial Provision required for the rehabilitation and closure of the Project is **ZAR 4 930 710.95** (excl. VAT). A summary of the Financial Provision estimates is presented in Table 24.

Table 24: Financial Provision summary.

	Digby Wells Environmental	
	Western Allen Ridge (Pty) Ltd, Kroonstad Gas Exploration, SHA6183 Revision: 0	
Area and Description	Current disturbance 2020	Life of Mine 2024
<b>Infrastructure and Rehabilitation</b>		
Well sites	R0,00	R241 299,54
Jeep track access roads	R0,00	R117 418,88
Gas wells	R0,00	R877 590,74
<b>Sub-total</b>	<b>R0,00</b>	<b>R1 236 309,16</b>
<b>Monitoring and Maintenance</b>		
Groundwater & Surface water monitoring (10yrs)	R0,00	R3 009 600,00
Gas emission monitoring (10yrs)	R0,00	R239 870,62
Vegetation Monitoring (3 yrs)	R0,00	R111 366,00
Rehabilitation Maintenance (3yrs)	R0,00	R24 487,88
<b>Sub-total</b>	<b>R0,00</b>	<b>R3 385 324,51</b>
Preliminary and General (15%)	R0,00	R185 446,37
Contingency (10%)	R0,00	R123 630,92
<b>GRAND TOTAL</b>	<b>R0,00</b>	<b>R4 930 710,95</b>

Closure and rehabilitation are a continuous series of activities that begin with planning prior to the project's design and construction; and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem.

Not only will the implementation of this concept result in a more satisfactory environmental outcome, but it will also reduce the financial burden of closure and rehabilitation. This initial Closure Plan provides a sound foundation for developing detailed rehabilitation measures to close the exploration activities safely and sustainably and according to its closure objectives.

## 22. PLAN OF STUDY FOR THE ENVIRONMENTAL IMPACT ASSESSMENT

The section below outlines the proposed plan of study which will be conducted for the various environmental aspects during the EIA phase. The plan of study has been compiled by the specialist consultants contracted to the project with select input from Shango Solutions. It is also important to note that the plan of study will also be guided by comment obtained from I&APs and other stakeholders during the PPP.

### 22.1 Description of Aspects to be Assessed in EIA

The following aspects will be assessed further during the EIA phase investigation to be undertaken:

1. Soil, Land Capability and Agricultural Potential.
2. Terrestrial Biodiversity (Fauna, Avifauna and Flora).
3. Hydrology and Wetland Delineation.
4. Financial Provision and Final Rehabilitation, Decommissioning and Closure Plan.
5. Geohydrology and Waste Classification.
6. Palaeontology.
7. Heritage.

### 22.2 Description of Specialist Studies

#### 22.2.1 Financial Provision and Final Decommissioning, Rehabilitation and Closure Plan

A Financial Provision Assessment will be undertaken during the EIA phase. The following scope of work applies for the Financial Provision Assessment:

1. Review of available information and specialist environmental assessments completed as part of the project.
2. Infrastructure mapping.
3. Development of a project specific Financial Provision cost model in Microsoft Excel.
4. Calculation of a Financial Provision estimate for planned activities.
5. Compilation of a Financial Provision report.
6. Compilation of a Final Decommissioning, Rehabilitation and Closure Plan as per the minimum content prescribed by Appendix 4 of GN R1147.
7. Compilation of an Environmental Risk Report as per the requirements of Appendix 5 of GN R1147.

#### 22.2.2 Hydrogeology and Geochemistry

The Hydrogeological and Geochemical Specialist Study will address affective mitigation and water management principles. The assessment process will comprise four phases, namely

1. Phase A: Data evaluation and hydrocensus user survey.
2. Phase B: Geochemical modelling and analyses for detailed waste classification.
3. Phase C: Construction of a detailed numerical groundwater flow model: Dewatering and contaminant transport modelling.
4. Phase D: Geohydrological assessment, reporting and cumulative impact assessments.

#### 22.2.3 Hydrology

A detailed Surface Water Assessment will be undertaken for the EIA phase of the proposed project. The assessment will be conducted on a desktop level and a site visit will be undertaken in order to (i) assess the hydrological characteristics of the proposed project area, (ii) sample watercourses upstream and downstream of the proposed project area. In addition to the site visit, the following will be undertaken in order to complete the Surface Water Assessment:



1. Description of the current (pre-exploration) surface water environment, in terms of the hydrological characteristics of the area.
2. Calculation of 1:50 and 1:100 years flood lines.
3. Preparation of a Surface Water Impact Assessment to identify potential impacts and provide mitigation measures.
4. Surface water quality, stream flow and storm water management monitoring programmes.

#### **22.2.4 Pedology, Land Capability and Agricultural Potential**

An Agricultural Assessment will be conducted utilising the Provincial and National Departments of Agriculture recommendations. The assessment is broken down into two phases:

1. Phase 1: Desktop assessment to determine the following:
  - Historic climatic conditions.
  - The terrain features using 5 m contours.
  - The base soils information from the land type database.
  - Geology of the proposed development site.
2. Phase 2: Soil survey to determine the actual agricultural potential.

#### **22.2.5 Ecology (Fauna, Avifauna and Flora)**

An Ecology Assessment will be undertaken during the EIA phase in order to assess potential impacts on the ecological receiving environment. A field survey will be undertaken in order to identify fauna, flora and habitat features within the proposed project area. The survey will include the project site and a 200 m radius.

#### **22.2.6 Wetland Delineation**

Wetland areas will be delineated as part of the Wetland Biodiversity Assessment. The Present Ecological Status and Ecological Importance and Sensitivity of the rivers and wetlands within the proposed project area will be ascertained. Furthermore, an appropriate buffer zone will be determined and a description of the wetland ecological services provided.

#### **22.2.7 Heritage and Palaeontology**

A HIA and PIA will be completed in compliance with Section 38(8) of the NHRA in support of the EIA for the Project. The HIA and PIA will be submitted, together with the EIA report and supporting specialist studies, to the relevant heritage authorities for Statutory Comment.

### **22.3 Environmental Impact Assessment Process**

#### **22.3.1 Method of Assessing Impact Significance**

The impact assessment methodology is guided by the requirements of the NEMA 2014 EIA Regulations (as amended). The broad approach to the significance rating methodology is to determine the Environmental Risk (ER) by considering the Consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the Probability/Likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a Prioritisation Factor (PF) which is applied to the ER to determine the overall Significance (S).

#### **22.3.2 Determination of Environmental Risk**

The significance (S) of an impact is determined by applying a Prioritisation Factor (PF) to the Environmental Risk (ER).

The Environmental Risk is dependent on the Consequence (C) of the particular impact and the Probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = (E+D+M+R) \times N$$

4

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 25.

Table 25: Criteria for determination of impact consequence.

Aspect	Score	Definition
Nature	- 1	Likely to result in a negative/ detrimental impact
	+1	Likely to result in a positive/ beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary),
	3	Local (i.e. the area within 5 km of the site),
	4	Regional (i.e. extends between 5 and 50 km from the site
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years)
	3	Medium term (6-15 years)
	4	Long term (the impact will cease after the operational life span of the project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected)
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected)
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way)
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease) or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease)
Reversibility	1	Impact is reversible without any time and cost
	2	Impact is reversible without incurring significant time and cost
	3	Impact is reversible only by incurring significant time and cost
	4	Impact is reversible only by incurring prohibitively high time and cost
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table 26.

Table 26: Probability scoring.

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows (Table 26):

$$ER = C \times P$$

Table 27: Determination of environmental risk.

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
Probability						

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 28.

Table 28: Significance classes.

Environmental Risk Score	
Value	Description
< 10	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥ 10; < 20	Medium (i.e. where the impact could have a significant environmental risk),
≥ 20	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/ mitigated.

### 22.3.3 Impact Prioritisation

In accordance with the requirements of Appendix 3(1)(j) of the NEMA 2017 EIA Regulations (GNR 326), and further to the assessment criteria presented in the Section above it is necessary to assess

- Each potentially significant impact in terms of: cumulative impacts.
- The degree to which the impact may cause irreplaceable loss of resources.

In addition, it is important that the public opinion, sentiment regarding a prospective development and consequent potential impacts is considered in the decision making process.

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to

focus the attention of the decision-making authority on the higher priority/ significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/ mitigation impacts are implemented (Table 29).

Table 29: Criteria for the determination of prioritisation.

Public response (PR)	Low (1)	Issue not raised in public response.
	Medium (2)	Issue has received a meaningful and justifiable public response.
	High (3)	Issue has received an intense meaningful and justifiable public response.
Cumulative Impact (CI)	Low (1)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change.
	Medium (2)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change.
	High (3)	Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change.
Irreplaceable loss of resources (LR)	Low (1)	Where the impact is unlikely to result in irreplaceable loss of resources.
	Medium (2)	Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited.
	High (3)	Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions).

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criterion. The impact priority is therefore determined as follows:

$$\text{Priority} = \text{PR} + \text{CI} + \text{LR}$$

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (Table 30).

Table 30: Determination of prioritisation factor.

Priority	Ranking	Prioritisation Factor
3	Low	1
4	Medium	1.17
5	Medium	1.33
6	Medium	1.5
7	Medium	1.67
8	Medium	1.83
9	High	2

In order to determine the final impact significance the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance (Table 31).

Table 31: Environmental significance rating.

Environmental Significance Rating	
Value	Description
< -10	Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area).
≥ -10 < -20	Medium negative (i.e. where the impact could influence the decision to develop in the area).
≥ -20	High negative (i.e. where the impact must have an influence on the decision process to develop in the area).
0	No impact
< 10	Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area).
≥ 10 < 20	Medium positive (i.e. where the impact could influence the decision to develop in the area).
≥ 20	High positive (i.e. where the impact must have an influence on the decision process to develop in the area)

#### 22.3.4 Evaluation of Impacts and Mitigation Measures

The significance of environmental impacts will be rated before and after the implementation of mitigation measures. These mitigation measures may be existing measures of additional measures that may arise from the impact assessment and specialist input. The impact rating system considers the confidence level that can be placed on the successful implementation of the mitigation. The impact assessment methodology enables the assessment of environmental issues including: the severity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring and the degree to which the impacts can be mitigated.

The specialist studies will recommend practicable mitigation measures or management actions that effectively minimise or eliminate negative impacts, enhance beneficial impacts and assist project design. If appropriate, the studies will differentiate between essential mitigation measures, which must be implemented and optional mitigation measures, which are recommended.

#### 22.4 Public Consultation Process in Environmental Assessment

An overview of the proposed public participation process to be followed for the EIA phase is provided below. Forecast dates provided below may change as the project progresses. However, authority submission deadlines will be strictly adhered to. The commenting periods that will be provided to I&APs will be thirty (30) days long.

Feedback from I&APs has been and will be solicited through the following means:

- Open Days.
- Advertisements.
- Site notices and posters.
- Registered mail, faxes and e-mails.
- Completion of the I&AP registration form.
- Any other communication with Shango Solutions.

The dates of the review and commenting period for the draft EIA report and associated EMPR will be determined at a later stage and communicated to all registered I&APs.

#### **22.4.1 Consultation Process with Competent Authority**

The conditions of the scoping approval from the competent authority (if any) will be implemented through the EIA process. A site visit and meeting with the competent authority shall be held, if requested. The Department Environmental Affairs will be invited to all public-feedback meetings/open days to be held. The EIA Report and EMPR will be submitted to the Department Environmental Affairs in both draft and final formats.

#### **22.5 Description of EIA Tasks**

The plan of study in terms of certain aspects is detailed in the above sections and summarized below. The following tasks will be undertaken as part of the EIA phase of the project:

0. Specialist studies:
  - Soil, Land Capability and Agricultural Potential.
  - Ecology (Fauna, Avifauna and Flora).
  - Terrestrial Biodiversity
  - Hydrology and Wetland Delineation.
  - Financial Provision and Final Rehabilitation, Decommissioning and Closure Plan.
  - Geohydrology and Waste Classification.
  - Palaeontology.
  - Heritage.
1. Public consultation:
  - Notification regarding availability of EIA Report and EMPR.
  - Open Day (EIA Phase).
2. Authority consultation:
  - Authorities meeting to provide authorities with project related information and obtain their feedback (if requested).
3. Document compilation:
  - The EIA Report and EMPR will be compiled in line with the requirements of Appendix 3 and 4 of the EIA (2014) Regulations (as amended).
  - The EIA Report and EMPR will be made available for public comment for a period of 30 days.
  - The EIA Report and EMPR will be finalised and submitted to the competent authority.

### **23. SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY**

No additional information was requested or is deemed necessary.

## 24. 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.
- (d) That the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties are correctly reflected herein.



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Signature of the Environmental Assessment Practitioner:

**Shango Solutions**

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Name of company (if applicable):

**30 October 2020**

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Date:

The Applicant herewith confirms:

- (a) The person whose name is stated below is the person authorised to act as representative of the Applicant in terms of the resolution submitted with the application.



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Signature of the applicant / Signature on behalf of the applicant:

**Western Allen Ridge Gold Mines (Pty) Ltd**

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Name of company:

**30 October 2020**

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Date:

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