



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

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

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FILE REFERENCE NUMBER DMR:	NC30/5/1/1/2(12190PR)

1 IMPORTANT NOTICE

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

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

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

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

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

2 OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

- (a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- (b) describe 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 the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- (d) determine the—
 - (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
 - (ii) degree to which these impacts—
 - (aa) can be reversed;
 - (bb) may cause irreplaceable loss of resources, and
 - (cc) can be avoided, managed or mitigated;
- (e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- (f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- (g) identify suitable measures to manage, avoid or mitigate identified impacts; and
- (h) identify residual risks that need to be managed and monitored.

Executive Summary

The Department of Mineral Resources (DMR) has accepted Hle Services and Supplies (Pty) Ltd (Hle Services and Supplies) application for a prospecting right, environmental authorisation and waste management licence for the proposed prospecting of sillimanite and quartz on a portion of Remainder of Pella Mission 39 is located within the Khâi-Ma Local Municipality under the jurisdiction of the Namakwa District Municipality in the Northern Cape Province. The lodged application was submitted to the Department of Mineral Resources (DMR) on the 19th June 2018 and the following reference number NC30/5/1/1/2(12190PR) was issued by the DMR.

The application includes various activities that are listed in terms of GNR listing number 983 and GNR listing 984 as promulgated in terms of the National Environmental Management Act 107 of 1998 (NEMA), as amended, requiring environmental authorisation. The project also triggers activities listed in Category A of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) and will therefore require a Waste Management Licence (WML) from the DMR. These listed activities cover the necessary infrastructure that would make the proposed prospecting activities to be feasible.

All activities that trigger GNR 984 of the NEMA require that a full EIA (Scoping and EIA Phases) be followed as summarised in Figure ES-1.

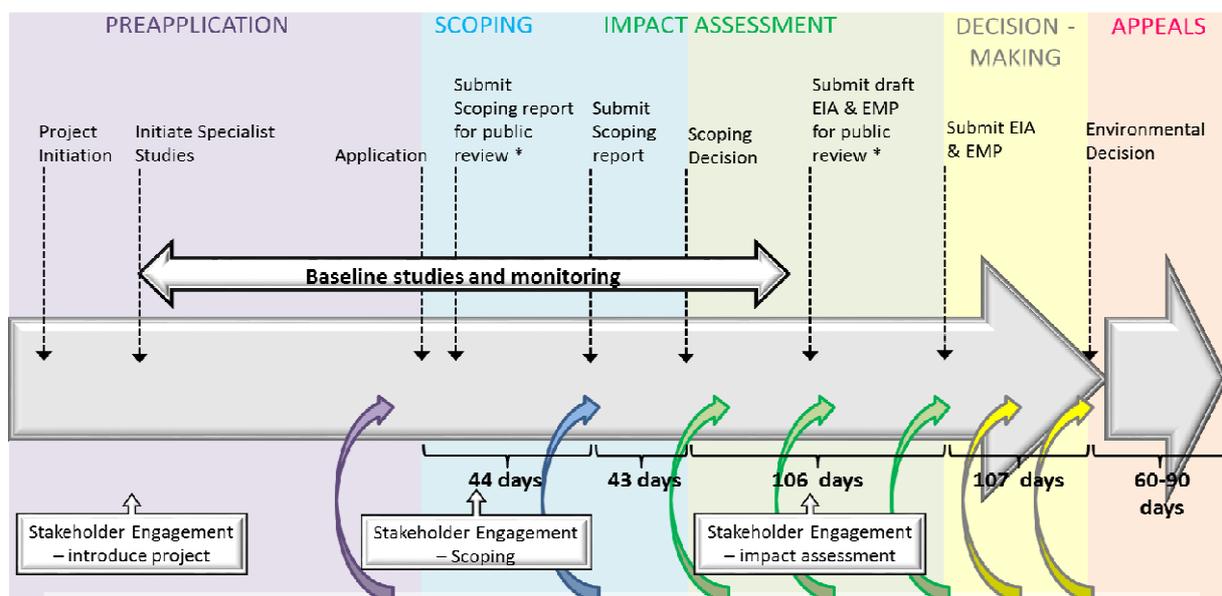


Figure ES-1: Overview of the EIA Process Followed

WHO IS CONDUCTING THE ENVIRONMENTAL IMPACT ASSESSMENT/ENVIRONMENTAL MANAGEMENT PROGRAMME?

Ndi Geological Services has been appointed by Hle Services and Supplies as the independent Environmental Assessment Practitioner (EAP) to conduct the prospecting right and EA/WML application process for the project.

The reports and documentation for the EA/WML application process will be compiled and finalised for submission to the DMR for consideration and decision making. The DMR will consult with other government authorities as required in terms of Section 24(K) of the NEMA.

WHO WILL EVALUATE THE ENVIRONMENTAL IMPACT ASSESSMENT/ENVIRONMENTAL MANAGEMENT PROGRAMME?

Before the proposed development can proceed, approval has to be obtained from the regulatory authorities. The Scoping Report was submitted to the DMR for review and the DMR approved the Scoping Report and associated Plan of Study and in the approval, the DMR advised the project team as to how the project should proceed for the Impact Assessment Phase of the project. The current Impact Assessment Phase entails detailed specialist investigations, reporting and further stakeholder involvement. Only once a Final Environmental Impact Assessment Report (EIAR) and EMPr have been submitted to DMR, can a decision be taken as to whether the project may proceed or not.

DESCRIPTION OF THE PROPOSED DEVELOPMENT

Phase 1

Desktop Studies

Available data on the area of study with relation to the topography, geology, mineralogy, geophysics, hydrology etc will be collated and analysed. This can be old data or recent data that have been collected on the area of study. This data will aid in determining the amount of potential minerals that the area carries in terms of sillimanite and quartz mineralisation and the factors that affect it and its extraction thereof.

Geophysical Survey

A desktop study is important in providing general information about the location of the outcrop; nevertheless it is important to follow up the process with physically locating the outcrop on the farm itself. Geophysics does not only aid in locating ore bodies buried under the subsurface but also identifies the other structures such as faults and intrusions. These affect the quality and the mine ability of sillimanite and quartz hence it is important to have information of their availability and the extent to which they occur.

Geological mapping

Surface geological mapping is a process of physically locating the sillimanite and quartzite orebody outcrops while obtaining detailed information about them. This information includes the strike and dip of the outcrop, the color, the grain size and shape amongst others. The end result of this stage will be a detailed geological map of the farm which will be correlated with the other maps obtained during the desktop study.

DESCRIPTION OF PLANNED INVASIVE ACTIVITIES:

(These activities result in land disturbances e.g. sampling, drilling, bulk sampling, etc.)

Phase 2

Drilling

Drilling is a process of extracting material from the subsurface. This process results in surface disturbance. This process is usually undertaken after as much data regarding the location of the orebody have been collected as it is expensive.

Both Reverse Circulation (RC) and diamond boreholes will be drilled. Reputable drilling companies will be hired to conduct the drilling. A qualified geologist from Hle Services and Supplies (Pty) Ltd (Hle Services and Supplies) will supervise the drilling as well as other administrative work related to it. It is envisaged that a total of fifty (50) boreholes will be drilled. Forty (40) boreholes will be drilled using the RC method whereas 10 boreholes will be drilled using the diamond drill method. The rehabilitation of drill holes will be done as soon as each hole is completed for safety reasons. Potential oil spillages will be collected and disposed of in the appropriate area designated for hydrocarbon waste. Hydrocarbon waste will be disposed of through an accredited waste disposal company. The geographic position of each borehole will be recorded and captured into the database.

Reverse Circulation (RC) drilling

This method of drilling involves the process of crushing the rock material into fragments. Using air pressure, the rock fragments are lifted up the hole into the cyclone where they are collected into sample bags. A rifle splitter is used to homogenize the sample and to split it into two. The weights of the samples are recorded. Part of the one sample is washed and placed into a labeled chip tray after logging by the Field Geologist. This sample is stored for future reference. The remainder of the logged sample is labeled while still in the sample bag and taken to an accredited laboratory for analysis.

Diamond drilling

Diamond drilling is more expensive compared to RC drilling and is usually done to ensure the accuracy of the stratigraphy determined by RC. This method produces core which is laid in the core trays and marked. The core lost and gained during drilling is also recorded and marked in the core trays. The Field Geologist will log the core taking into consideration the lithological characteristics of the rock and the type of contacts between each rock type. After logging, core samples are taken at 1m intervals and split into two pieces, using a core cutter. The one piece is bagged, labeled and taken to the laboratory for analysis. The other piece is kept for future reference. The holes will be drilled to a maximum depth of 150m.

Phase 3

Bulk Sampling

Bulk sampling will form part of the prospecting activities. A total of five trenches/pits will be excavated over all three farms. The size of the trenches/pits will be 100 m x 50 m x 20 m. The aim of this phase is to determine the sillimanite and quartz's likely performance under the actual conditions of usage by conducting tests. The overburden material amount to be removed is not yet known at this stage. This will be known after phase 2, when the overburden thickness will have been determined. The overburden material will be stored in a designated area to be used later for rehabilitation.

Phase 4

Analytical Desktop Study

The objective of analytical desktop studies is to determine the feasibility of the project considering factors such as environmental, technology, legal and economic factors. This study will involve a number of specialists to address all the components of the study. Besides determining the feasibility of the project, the study also helps to identify logistical problems. Project Need and Desirability

The consumption of sillimanite minerals is concentrated in the relatively highly industrialized areas where refractories are manufactured and which in turn are typically close to the major iron and steel producing regions in the world (Roskill 1990). The principal consumers in the western world are therefore found in the EU, North America, the Far East and South Africa, whereas mining of these minerals is controlled by five major producers situated in South Africa (andalusite), USA (kyanite) and France (andalusite) (Fig. 1). The majority of sillimanite minerals produced in other countries such as Australia, Brazil, China, India, Ukraine and Zimbabwe is mostly for domestic consumption. As a consequence, the trade in sillimanite minerals is international

Quartz on the other hand has great economic importance. Many varieties are gemstones, including amethyst, citrine, smoky quartz, and rose quartz. Sandstone, composed mainly of quartz, is an important building stone. Large amounts of quartz sand (also known as silica sand) are used in the manufacture of glass and ceramics and for foundry molds in metal casting. Crushed quartz is used as an abrasive in sandpaper, silica sand is employed in sandblasting, and sandstone is still used whole to make whetstones, millstones, and grindstones. Silica glass (also called fused quartz) is used in optics to transmit ultraviolet light. Tubing and various vessels of fused quartz have important laboratory applications, and quartz fibres are employed in extremely sensitive weighing devices. These minerals are therefore of economic importance.

Prospecting is the physical search for minerals, fossils, precious metals or mineral specimens, which allows a company to survey or investigate an area of land for the purpose of identifying an actual or probable mineral deposit, before investments are made into the mining activities.

Initial desktop studies has indicated that the proposed prospecting area has potential for sillimanite and quartz. The geology of the area supports this theory. Prospecting therefore has to be carried out to verify this information. The prospecting will also determine if there are any features that may have an impact on the economic extraction of the sillimanite and quartz.

The information that will be obtained from the prospecting to be done will be necessary to determine, should sillimanite and quartz be found, how and where the sillimanite and quartz will be extracted and how much economically viable sillimanite and quartz reserves are available within the proposed prospecting area. This will allow Hle Services and Supplies to enter into further studies towards a Mining Right.

Should sillimanite and quartz be found in the project area, Hle Services and Supplies will be able to mine the available reserves. This will result in job creation and boost to local businesses.

This prospecting activity has a potential to temporarily decrease the level of unemployment in the proposed areas and surroundings. In addition to employment, the proposed development also holds the potential for skills transfer. With an increase in employment, a definite transfer of skills will result. Skills development is a requisite for human resource development, and will have a lasting impact on the economy.

This prospecting activity will bring revenue into the town and the province which will in turn boost the economy of the country.

It is expected that the prospecting activity will also result in environmental and social impacts. The impacts have been assessed by qualified specialists and have been incorporated into these EIA/EMPr. The benefits from the prospecting activities must be offset against the costs of the project, including the impacts to land owners. As such, a process that ensures consultation with Interested and Affected Parties (I&APs) for the project is being undertaken. The stakeholder engagement process is being conducted in a way to provide all I&APs with an opportunity to comment on the project, with several platforms that allow public commenting opportunities being offered to the I&APs. All Issues raised by the I&APs to date have been recorded and addressed in the Scoping Report that was submitted to the DMR for decision making.

Stakeholders have been included in this EIA/EMPr phase of the project and will be provided with an opportunity to review and comment on the findings of the studies and impact assessment. Where required, the final layout plan of the project will be updated and/or revised to minimise and/or avoid impacting on sensitive environments.

Alternatives Considered

Specialist studies conducted as part of this impact assessment showed that there are no fatal flaws associated with the proposed site.

The invasive prospecting phase will be dependent on the results of the preceding phase. The location and extent of the trenching and drilling sites, soil sampling cannot be determined at this stage, therefore mapping of the specific prospecting activity site could not be undertaken at this stage. For the purposes of this report, the overall prospecting site is presented in Figure 2. The overall proposed site (Figure 3) was selected based on its potential to host the sillimanite and quartz orebody since it falls geologically under the Bushmanland Group which hosts the schist associated with sillimanite mineralisation. The area is also highly characterised by sandy soil and sandstone which implies the presence of quartz. Alternative borehole, trench/pit location and infrastructure location will be

considered to avoid environmental features and to avoid disturbing the current land uses of the farms. The final location of the intrusive drilling activities will be determined during Phase 1 of the Prospecting Works Programme and will be aimed at avoiding areas with sensitive environments. The issues raised by I&APs will be taken into account in considering alternative sites for the invasive phase of the process.

Environmental Impact Assessment Process

Approach to the Environmental Impact Assessment

An EIA seeks to identify the environmental consequences of a proposed project from the beginning, and helps to ensure that the project, over its life cycle, will be environmentally acceptable, and integrated into the surrounding environment in a sustainable way. Two parallel processes are followed during the Scoping Phase, the environmental technical process and the stakeholder engagement process.

Stakeholder Engagement Process

The stakeholder engagement process, which was undertaken for this project was aimed to comply with the relevant legislative requirements of the NEMA, as prescribed in Chapter 6 of the NEMA and GNR 982. The process included:

- Development of a stakeholder database:
 - The stakeholder database comprises a variety of stakeholders identified from previous projects in the area, newly identified stakeholders and through the initial registering process of this project.
- The opportunity to participate in the EIA process and to register as an Interested and Affected Party (I&AP) was announced in July 2018 through the following means:
 - Letter of invitations to register and background information documents;
 - Newspaper advertisements were placed in the Die Plattelander and GemsbokNews newspapers on 11 and 13 July 2018; and
 - English and Afrikaans site notices were erected at several places in and around the proposed study area.

The Draft Scoping Report was made available for a 30-day commenting period. A stakeholder engagement meeting was also held on 18 July 2018. All issues, comments and suggestions received from stakeholders were incorporated into the Scoping report and have been incorporated into this report.

The availability of the Draft EIAR for review will again be communicated to the registered I&AP's. The Draft EIAR will be made available to public review for a period of 30 days.

Key comments received from stakeholders to date are summarised in Table 7.

Specialist Studies

The following specialist studies were conducted as part of the EIA process:

- Biodiversity studies;
- Soils and Land Capability;
- Geohydrological assessment;
- Surface water assessment; and
- Heritage resources.

The studies entailed:

- Baseline characterisation of the area;
- Identification of potential impacts;
- Assessment of the significance of identified impacts; and
- Identification of feasible and effective mitigation measures that can be implemented to avoid and/or reduce the significance of the identified impact; and

The EAP incorporated the findings from the specialist studies into the impact assessment process and quantified the impacts. The EAP also included an assessment of the impacts on the socio-economic environment, visual, noise, waste management; stormwater management and traffic.

SUMMARY OF THE IMPACT ASSESSMENT PROCESS

This section contains the assessment of potentially positive and negative environmental impacts that could possibly be caused by the proposed cement-ash mixing plant.

The impacts are linked to the activities conducted for the proposed development, broadly relating to construction and operational phases. Specific emphasis was placed on any relevant environmental, social and economic impacts identified by the specialist studies, comments received during the stakeholder engagement process, issues highlighted by relevant authorities; as well as a professional judgement of the EAP team through appraisals on the project description, listed activities and the receiving environment.

The objectives for each of the potential environmental impacts identified was to determine their significance and to identify mitigation measures that may be implemented to reduce the impacts to an acceptable level where required.

The anticipated impacts were rated against a set impact rating methodology ranging from Low to High. The anticipated impacts for the proposed project, which were rated low to medium low , with the socio-economic impact rating as low (+). The summary of the quantitative impact assessment can be found in Table ES-1 to Table ES-3.

Table ES-1: Impact Rating For the Construction Phase

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation	Environmental Impact Significance Before Mitigation
Site Establishment: Establishment of the access (tracks) to the prospecting site, Establishment of the campsite, site physical surveying and pegging of drilling sites			
Social	Influx of job seekers will have a negative social impact on the landowners and land occupiers.	Medium Low	Low
	Unauthorised access to private property outside of the demarcated areas will result in conflict with landowners.	Medium Low	Low
	Increased traffic in the area will increase the likelihood of accidents on the roads, posing a health and safety issue for the land owners and land occupiers.	Medium Low	Low
	The influx of job seekers in the area may result in an increase in petty crimes.	Medium Low	Low
	Ineffective communication channels leading to community unrest.	Medium Low	Low
	Negative impact as a result of the dissection of land by clearing and excavations for construction of infrastructure, constraints to access to cultivated land to farmers, impacting on day to day farm activity.	Medium Low	Low
	Negative impact as a result of localised loss of cultivated land, impacting on potential crop yield.	Low	Low
	Possible boost in short term local small business opportunities.	Medium Low positive	Medium Low positive
Groundwater	Localised spillages of oils from machinery leaching to groundwater contamination.	Medium Low	Low
	Existing boreholes within the prospecting area may create conduits of flow to the groundwater unless sealed.	Medium Low	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation	Environmental Impact Significance Before Mitigation
Surface Water	Increase in silt load in runoff due to site clearing, grubbing and the removal of topsoil from the footprint area associated with the drill sites and associated infrastructure.	Medium Low	Low
	Potential deterioration in water quality due to the potential accidental spillages of hazardous substances.	Medium Low	Low
	Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution.	Low	Low
	Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality.	Medium Low	Low
	Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred.	Medium Low	Low
Wetlands and Aquatic Ecosystems	Localised changes to the riparian areas as a result of vegetation clearing.	Medium Low	Low
	Loss of habitat and wetland ecological structure as a result of site clearance activities and uncontrolled wetland degradation.	Medium Low	Low
	Impact on the wetlands systems as a result of changes to the socio cultural service provisions.	Medium Low	Low
	Increased runoff due to topsoil removal and vegetation clearance leading to possible erosion and sedimentation of wetland and riparian resources.	Medium Low	Low
	Soil compaction and levelling as a result of construction activities and vehicle movement leading to loss of wetland and riparian habitat.	Medium Low	Low
	Impact on the hydrological functioning of the wetland systems.	Medium Low	Low
Heritage	The proposed project has the potential to impact on local graves within the area.	Low	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation	Environmental Impact Significance Before Mitigation
Resources	The proposed project has the potential to impact on sites of archaeological importance.	Low	Low
Palaeontological Resources	Drilling of exploratory boreholes has potential to impact on palaeontological resources	Low	Low
Flora	Loss of localised biodiversity habitats within sensitive areas due to site clearance and establishment of drill sites.	Low	Low
	Loss of localised floral species diversity including RDL and medicinal protected species due to site clearance and establishment of drill sites.	Low	Low
	Potential spreading of alien invasive species as indigenous vegetation is removed and pioneer alien species are provided with a chance to flourish.	Low	Low
Fauna	Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	Low	Low
	Habitat fragmentation as a result of construction activities of the access roads leading to loss of floral diversity.	Low	Low
	Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal specie trapping.	Low	Low
	Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	Low	Low
Air Quality	Possible increase in dust generation, PM ₁₀ and PM _{2.5} as a result of bulk earthworks, operation of heavy machinery, and material movement.	Low	Low
	Increase in carbon emissions and ambient air pollutants (NO ₂ and SO ₂) as a result of movement of vehicles and operation of machinery/equipment.	Low	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation	Environmental Impact Significance Before Mitigation
Visual	Scaring of the landscape as a result of the clearance of vegetation.	Low	Low
	Visual intrusion as a result of the movement of machinery and the establishment of the required infrastructure.	Low	Low
	Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.	Low	Low
Noise	The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity.	Low	Low
Soil, Land use and Land Capability	Localised chemical pollution of soils as a result of vehicle hydrocarbon spillages and compaction.	Low	Low
	Localised clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	Low	Low
	Localised loss of resource and its utilisation potential due to compaction over unprotected ground/soil.	Low	Low
	Localised loss of soil and land capability due to reduction in nutrient status - denitrification and leaching due to stripping and stockpiling footprint areas.	Low	Low
Traffic	Increase in traffic volumes as a result of pre-construction activities which may lead to an increase in traffic congestion along the R82 and R723 roads as well as the farm roads around the prospecting area.	Medium Low	Low
Climate	Emissions of Green House Gases as a result of the use of plant, heavy moving machinery, generators etc.	Low	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation	Environmental Impact Significance Before Mitigation
Waste Management	Potential water and soil pollution as a result of inappropriate waste management practices.	Medium Low	Low

Table ES 2: Impact Rating for the Operation Phase

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation	Environmental Impact Significance After Mitigation
Social	Uncontrolled access of private property during operation may result in conflict with affected landowners and occupiers.	Low	Low
	Negative impact as a result of additional trucks on the roads, impacting on local communities' health and safety.	Low	Low
	Negative impact on, local community health and safety due to potential influx of employees, the presence of job seekers, which may lead to prostitution and conflict with the local communities. Illegal informal settlement of job seekers in the area may exacerbate the situation.	Low	Low
	As a result of drilling activities during operation, potential damage to adjacent landowner's/occupiers infrastructure	N/A	N/A
	As a result of drilling, there is potential for the occurrence of subsidence, impacting on the safety surface land dwellers and users.	N/A	N/A
Groundwater	The use of vehicles during the drilling of the exploration boreholes may result in the spillages of hydrocarbon liquids from the vehicles and machinery. This will result in the contamination of the vegetation cover and soils. The material removed from the drilling exercises will contain carbonaceous material, which has a potential for pollution should it be allowed stay for a prolonged period at the drilling site.	Medium Low	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation	Environmental Impact Significance After Mitigation
	Drilling of exploration boreholes may result in groundwater contamination from drill mud, cuttings etc. contaminating the aquifer	Medium Low	Low
	Storage of hydrocarbons and chemicals, which may impact on groundwater as a result of spillages and uncontrolled release.	Medium Low	Low
	The prospecting operations will require the drilling of boreholes. The boreholes may result in the drawdown, which may affect the yield to the surrounding groundwater users. Material used for backfilling may leach pollutants that will result in the pollution of the surrounding groundwater regime. This may even spread beyond the backfilling site via plume migration.	Low	Low
Surface Water	The drilling operations may result in the generation of surface water runoff contaminated with drilling muds and cuttings should spillages occur. The sedimentation and possible contamination with carbonaceous material will have negative impacts on the surrounding clean water environment. These will cause an increase in the turbidity and will decrease acidity of the water in the streams, which will affect the aquatic habitat of the wetland, hence important habitats may be lost.	Low	Low
Biodiversity	Continued destruction of potential floral habitats for species of conservational concern as a result continual disturbance of soils leading to altered floral habitats, erosion and sedimentation.	Low	Low
	Impact on floral species of conservational concern as a result of an increased in alien species proliferation and ineffective rehabilitation of exposed areas	Low	Low
	<p>The use of vehicles during the sitting, pegging and drilling of the exploration boreholes may result in the spillages of hydrocarbon liquids from the vehicles and machinery. This will result in the contamination of the vegetation cover and soils.</p> <p>The material removed from the drilling exercises will contain carbonaceous material, which has a potential for pollution should it be allowed stay for a prolonged period at the drilling site.</p> <p>The above material, if not properly managed, may result in the contamination of the surrounding soils and vegetation cover, which may render the land not usable after the backfilling operation.</p>	Medium Low	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation	Environmental Impact Significance After Mitigation
	Loss of faunal habitat and ecological structure as a result of increased fires during operation and introduction of alien species, leading to transformation of the natural habitat	Low	Low
Geology	Removal of geological bulk samples for testing may result in changes in geology and loss of soils	Medium Low	Low
Soils Land use and Land Capability	Topsoil removal, storage and replacement during the excavation of the sumps will result. This will result in the disruption of the soils profile.	Low	Low
	Soil contamination as a result of operational activities can be as a result of a number of activities (i.e. hazardous substance storage, incidental hydrocarbon leakages from construction vehicles).	Low	Low
Air Quality	The prospecting operation will require vehicular movement which may result in Possible increase in dust generation, PM10 and PM2.5 as a result of stockpiling material, use of heavy machinery, and material movement.	Medium Low	Low
	Increase in carbon emissions and ambient air pollutants (NO2 and SO2) as a result of movement of vehicles and operation of machinery/equipment.	Medium Low	Low
Visual	The drill rigs and towers used during the drilling operations will be visible from the nearby residents and properties.	Medium Low	Low
Heritage Resources	The drilling operation may result in the destruction of graves and any other heritage sites during operational phase of the project.	Low	Low
Noise	The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity	Low	Low
	Increase in ambient noise levels during drilling, trenching and bulk sampling where noise will be generated from use of drilling and excavation machinery,	Low	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation	Environmental Impact Significance After Mitigation
Traffic	Increase in traffic volumes as a result of pre-construction activities which may lead to an increase in traffic congestion along the R82 and R723 roads as well as the farm roads around the prospecting area.	Low	Low
Climate	Emissions of Green House Gases as a result of the use of plant, heavy moving machinery, generators etc.	Low	Low
Drilling and Vibrations	Impact of drilling ground vibration on houses, boreholes and roads, resulting in possible damage to infrastructure	Low	Low
	Fly rock impact on houses, boreholes and roads, resulting in possible damage to infrastructure;	Low	Low
Waste Management	Inadequate Waste Management	Low	Low

Table ES-3: Impact Rating for the Decommissioning and Closure Phase

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation	Environmental Impact Significance After Mitigation
Soils, Land and Land Use	The removal of the campsite equipment and the rehabilitation of the drilling sites and associated access infrastructure will result in the affected soil and land use being restored. This will also result in the resumption of the use of the land since the infrastructure would have been removed.	N/A	N/A
Land Use	Positive impacts will result due to the reduction in areas of disturbance and the return of land use of the affected areas and making available an area that was covered by the campsite and drilling sites.	N/A	N/A

Soils and Vegetation	The use of vehicles/machinery during the rehabilitation of the exploration sites may result compaction of soils and in the spillages of hydrocarbon liquids from the vehicles and machinery. This will result in the contamination and destruction of the vegetation cover and soils.	Low	Low
Surface Water	During the decommissioning and closure phases equipment will be removed, stockpiled soils will be used for rehabilitation, remaining sumps will be backfilled, levelled, top soiled and the area re-seeded. During the process of rehabilitation, surface water runoff from the rehabilitation site may have elevated silt load, which may cause pollution of the nearby water environment.	Medium Low	Low
Air Quality	Rehabilitation including removal of drill rig and backfilling of trenches and removal of the prospecting sites, and equipment will require vehicular movement. This will result in the generation of dust by movement of vehicles and due to blowing winds. Vehicles and machinery will also generated diesel or petrol fumes. Generated dust will migrate towards the predominant wind direction and may settle on surrounding properties including nearby vegetation.	Low	Low
Noise	Noise will be generated during the removal of equipment and rehabilitation of the sites. This noise is not expected to exceed occupational noise limits and will be short lived.	Low	Low

Environmental Management Programme

All potential negative environmental impacts identified will be managed and mitigated whilst positive impact will be mitigated to enhance the potential positive impacts through the implementation of the commitments stipulated in the EMPr.

Hle Services and Supplies will be responsible for ensuring that all environmental obligations pertinent to the proposed project are met. The implementation of the EMPr and the meeting of the environmental objectives and targets is also the responsibility of Hle Services and Supplies).

Conclusion

Ndi Geological Services has undertaken the EIA and EMPr for the proposed sillimanite and quartz prospecting in accordance with the requirements of the NEMA. This has included a comprehensive stakeholder engagement process which has sought to identify stakeholders, provide these parties with an adequate opportunity to participate in the project process and guide technical investigations that have taken place as part of the Impact Assessment Phase of this study. Specialist input has been included for all key environmental aspects.

To date, there are no serious flaws that have been identified for the proposed project. It is the considered opinion of the EAP that the potential positive socio-environmental impacts associated with the project are low and it is not anticipated that the construction and operation of the cement-ash mixing plant will result in any detrimental environmental impact. Findings from specialist studies have been incorporated into the EIA and EMPr.

An EMPr has been developed as part of this EIA to ensure the mitigation of these impacts as far as practicable. It is anticipated that it will be possible to successfully mitigate the potential environmental impacts to acceptable levels. The implementation of the EMPr will be monitored and audited to determine the effectiveness of the measures implemented. The EMPr is considered to assist the project in striving towards the principles of the NEMA.

The majority of the impacts identified were classified as low to medium without mitigation. All the identified impacts can be mitigated to low significance impact rating. It is recommended that the proposed project is allowed to proceed.

The project team believes that the EIA undertaken for the project plant fulfils the process requirements of the NEMA and the NEM: WA. The EAP recommends that an EA/ WML be issued by the DMR and that the construction and operation of the prospecting activities should be conducted under duty of care and must be in accordance with the recommendations that were included in this EIR, the accompanying EMPr and specialist studies reports.

YOUR COMMENT ON THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

This Draft EIA/EMPr will be available for comment for a period of 30 days from **09 November 2018 to 10th December 2018**. Copies of the Draft EIR Report have been made available at the following public places for review:

Public Place	Locality	Telephone
Pella Library	Library	
Ndi Geological Services Website	http://www.ndigeoservices.co.za/	082 760 8420

An electronic copy can also be e mailed on request from the stakeholder engagement officers. I&APs are requested to provide comments and information on the following aspects of the proposed project:

1. Information on how I&APs consider that the proposed activities will impact on them or their socio-economic conditions;
2. Written responses stating their suggestions to mitigate the anticipated impacts of each activity;
3. Information on current land uses and their location within the area under consideration;
4. Information on the location of environmental features on site to make proposals as to how and to what standard the impacts on site can be remedied; and
5. How to mitigate the potential impacts on their socio economic conditions and to make proposals as to how the potential impacts on their infrastructure can be managed avoided or remedied.

DUE DATE FOR COMMENT

10th December 2018

Please submit comments to the stakeholder engagement officers:

Ndivhudzannyi Mofokeng
Ndi Geological Consultant Service
P.O. Box 10489, Beaconsfield
Phone: 082 760 8420
Fax: 086 538 1069
Email: atshidzaho@gmail.com

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PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

3 Contact Person and correspondence address

a) Details of

i. Details of the EAP

Table 1: Environmental Assessment Practitioner Details

Company:	Ndi Geological Consultant Service
Company Reg. No.:	
Postal Address:	P.O. Box 10489, Beaconsfield
Contact Persons:	N. Mofokeng
Contact Number:	053 842 0687 / 082 760 8420
Facsimile:	086 538 1069
Email:	atshidzaho@gmail.com
Website	http://www.ndigeoservices.co.za/

ii. Expertise of the EAP

1) The qualifications of the EAP

(with evidence)

Ndivhudzannyi Mofokeng have the following qualifications:

- BSc (Hons) Earth Sciences in Mining and Environmental Geology.

Please refer to Appendix B for a copy of the EAP's Qualifications.

2) Summary of the EAP's past experience.

(In carrying out the Environmental Impact Assessment Procedure)

Ndivhudzannyi holds BSc (Hons) Earth Sciences in Mining and Environmental Geology. She has close to 10 years' experience in the exploration and open cast work in the mining industry. She has proven leadership skills from supervising exploration rigs (Reverse Circulation and percussion drilling). She has proven working experience in field exploration and mapping, borehole logging, borehole sampling, sample preparation for laboratory analysis, handling of GPS, supervisory duties within the field, geological report and progress report writing, including Prospecting Work Programmes and Environmental Management Plans, handling the Department of Mineral Resources (DMR) documents

in general. Ndivhudzannyi has as a solid technical background in GIS Arcview software (GSSA Prof Reg), Rockworks, Turbo-Cad and Turbo-Sketch, and Global Mapper 9 Application.

Please refer to Appendix B for a copy of the EAP's Curriculum Vitae and Professional Registration Certificate.

b) Description of the property.

Table 2: Description of the property

Farm Name:	The proposed prospecting project will take place on a portion of Remainder of Pella Mission 39.
Application area (Ha)	1 069.1650 ha
Magisterial district:	Namakwa District Municipality
Distance and direction from nearest town	±8km South West of Pella town ± 28 km West of Pofadder
21 digit Surveyor General Code for each farm portion	C05300000000003900000

c) Locality map

(show nearest town, scale not smaller than 1:250000).

Please

refer

to

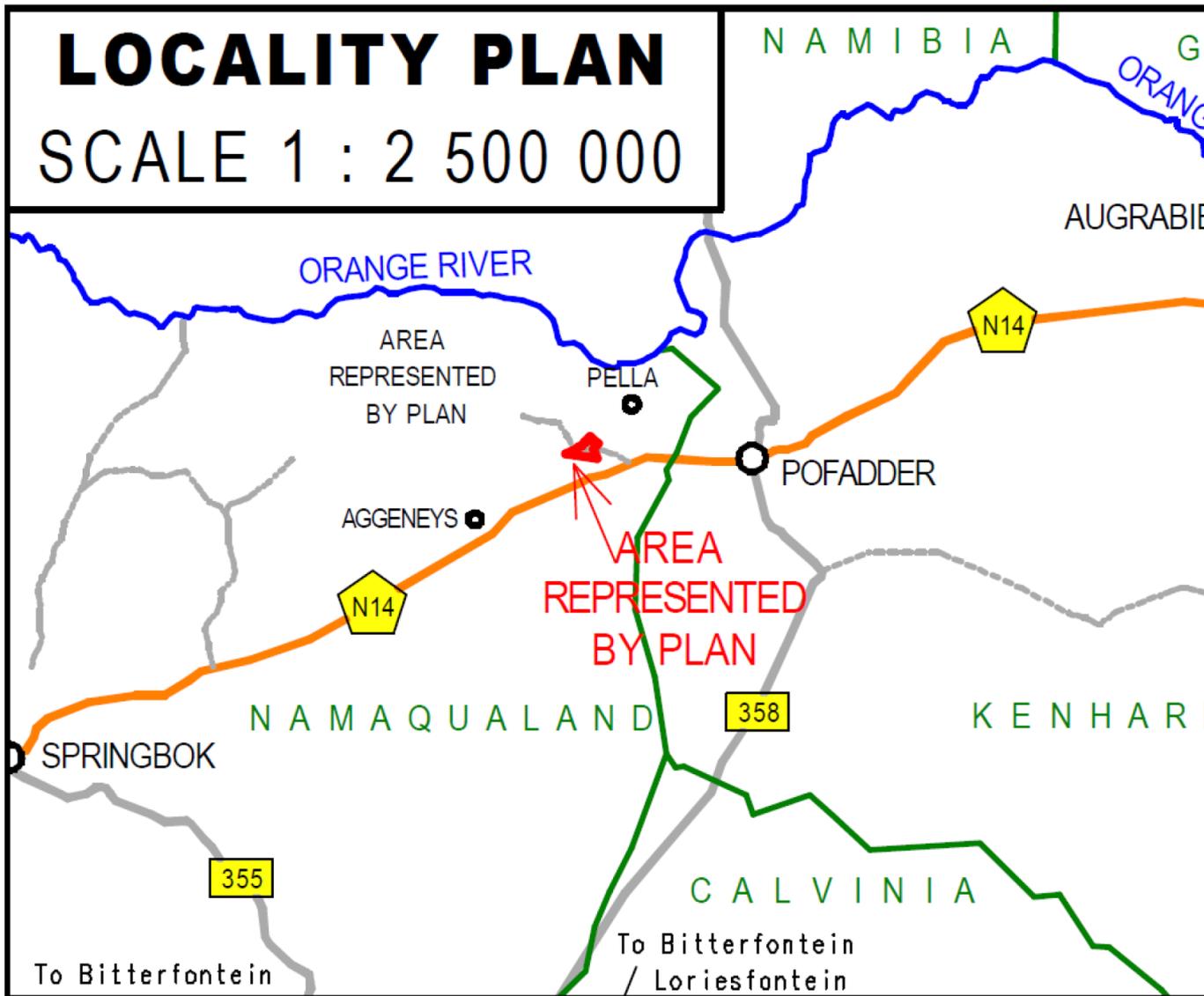


Figure 1 illustrating the regional setting, as well as the farm portions associated with the project.

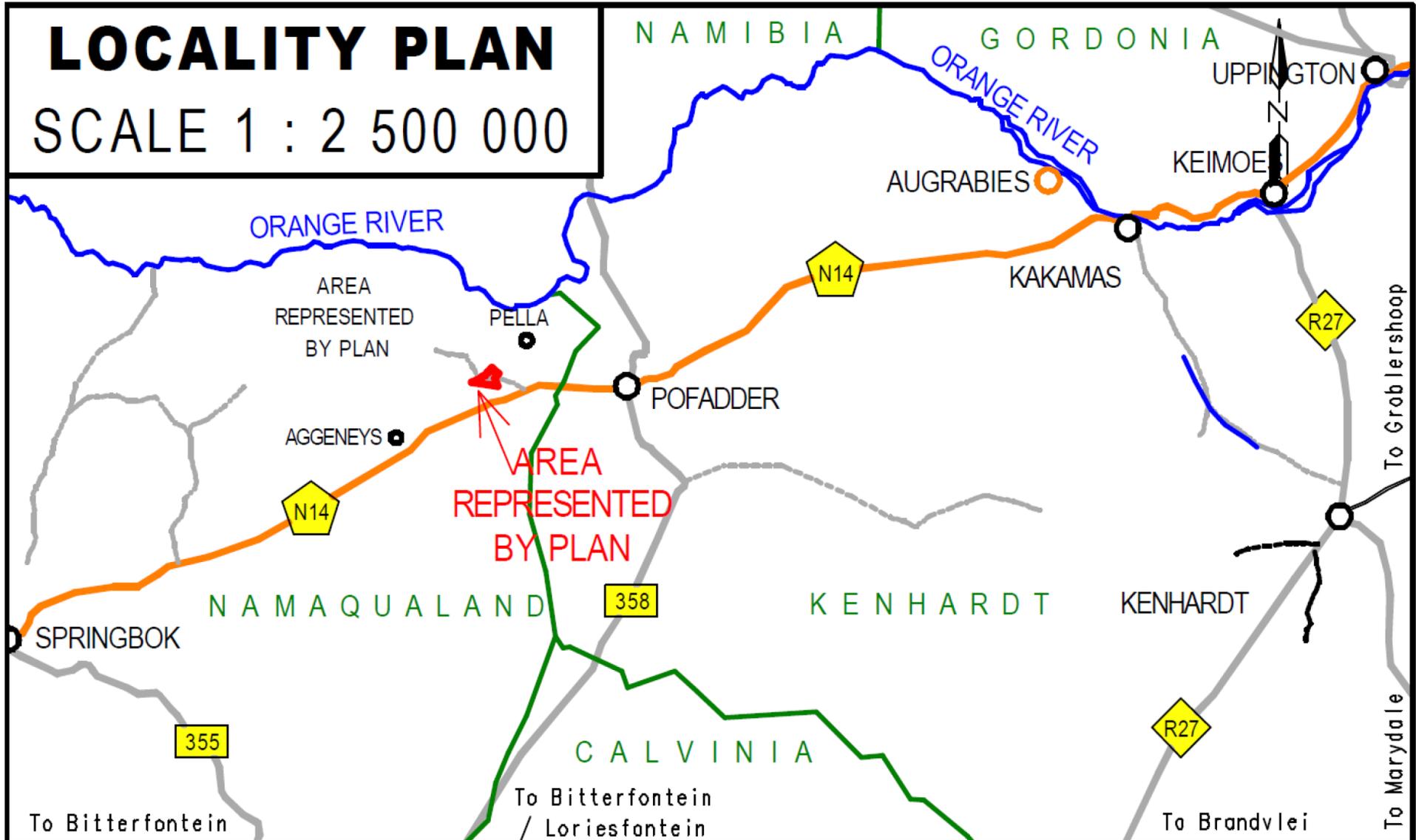


Figure 1: Locality Map

d) Description of the scope of the proposed overall activity.

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1 : 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site

Figure 2 shows the plan contemplated in Regulation 2(2) of the MPRDA, showing the land to which application relates. The map also denotes the directly affected farms and the boundary coordinates of the application area.

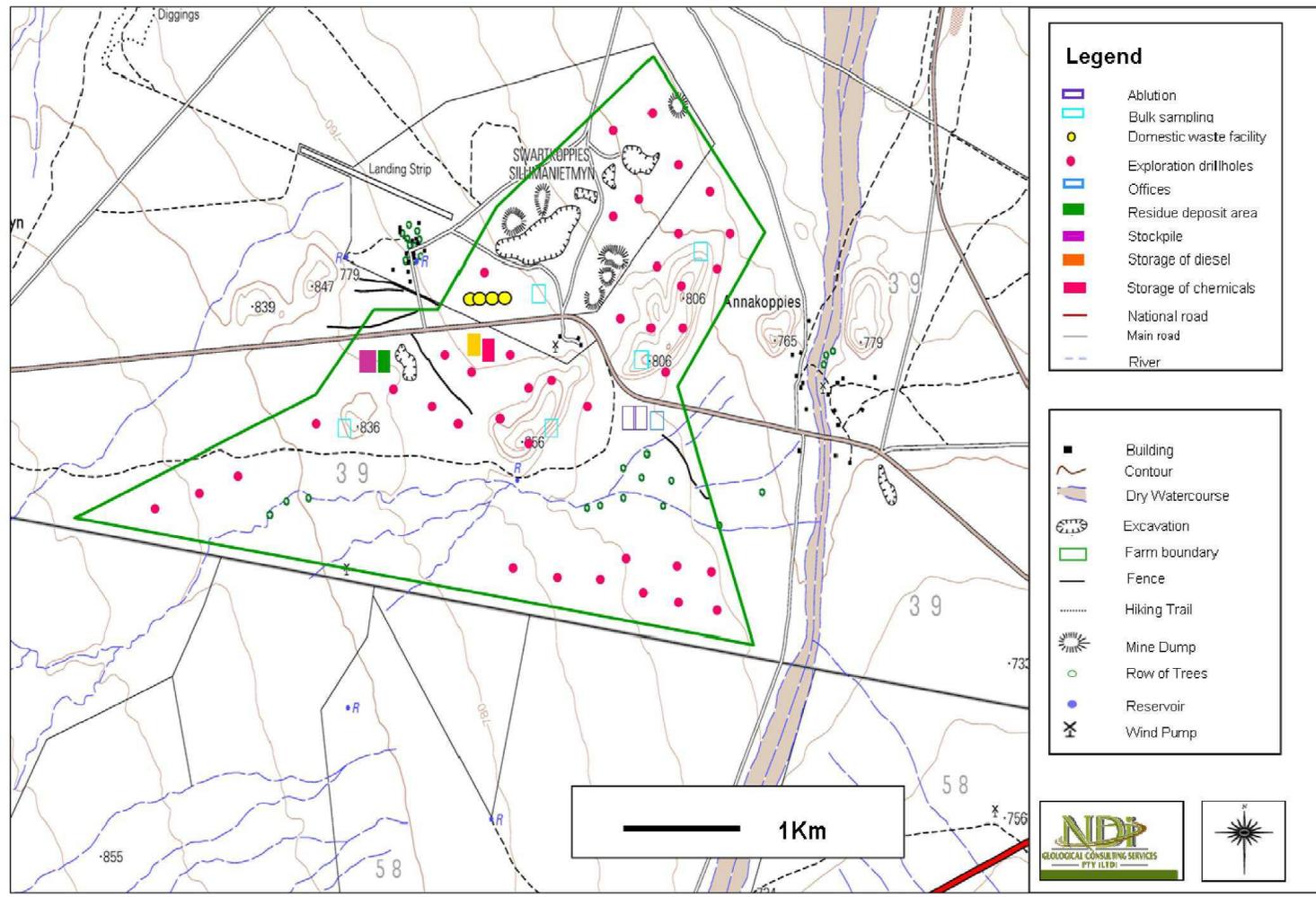


Figure 2: Prospecting Right Application Area- Regulation 2.2 Map

i. Listed and specified activities

Table 3: Listed Activities

<p>Name of the activity (All activities including activities not listed) E.g. Excavation, blasting, stockpiles, discard dumps or dams, Loading, Hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc....etc...etc.)</p>	<p>Aerial extent of the activity in Ha or m²</p>	<p>Listed activity mark with an x where applicable or affected</p>	<p>Applicable listing notice (GNR 983,GNR 984 or GNR 985 or NOT LISTED)</p>
<p>Prospecting with bulk sampling and associated activities</p>	<p>1069.1650ha</p>	<p>X</p>	<p>GNR 984 as amended by 325, Listing Notice 2 Activity No.19</p>
<p>Drill boreholes (40 RC and 10 Core drilling)</p>	<p>0.5ha</p>	<p>X</p>	<p>GNR 984 as amended by 325, Listing 20</p>
<p>5 Sampling trenches (100MX50MX20M)</p>	<p>2.5ha</p>	<p>X</p>	<p>GNR 984 as amended by 325, Listing 2, Activity 19</p>
<p>Vegetation clearance of less than 20 ha</p>	<p>2.5ha</p>	<p>X</p>	<p>GNR 983 as amended by GNR 327, Listing 27</p>
<p>Residue deposit area</p>	<p>0.5ha</p>	<p>X</p>	<p>Category A, Schedule 3 of NEMWA</p>
<p>Storage of hazardous substances (Diesel storage tanks, chemical storage containers)</p>	<p>0.025ha</p>	<p>X</p>	<p>Category A, Schedule 3 of NEMWA</p>
<p>Domestic Waste Facility</p>	<p>0.025ha</p>	<p>X</p>	<p>Category B, Schedule 3 of NEMWA</p>
<p>Removal of Sensitive Species</p>		<p>X</p>	<p>GNR 983 as amended by GNR 327, Listing 30</p>

Name of the activity (All activities including activities not listed) E.g. Excavation, blasting, stockpiles, discard dumps or dams, Loading, Hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc....etc...etc.)	Aerial extent of the activity in Ha or m²	Listed activity mark with an x where applicable or affected	Applicable listing notice (GNR 983,GNR 984 or GNR 985 or NOT LISTED)
Fencing	2000m	-	-
Access and Mine Roads	1 000m ²	X	GNR 983 as amended by GNR 327,Listing 1, Activity 20
Temporary Camp Site	0.04ha	-	-
Topsoil	0.1ha	-	GNR 984 as amended by 325, Listing 2, Activity 19
Stock piles	0.05ha	-	GNR 984 as amended by 325, Listing 2, Activity 19
overburden storage	0.1ha	-	GNR 984 as amended by 325, Listing 2, Activity 19
Plant Site	0.04ha	-	GNR 983 as amended by GNR 327, Listing 1, Activity 20
Site Office	0.002ha	-	GNR 983 as amended by GNR 327, Listing 1, Activity 20
Vehicle parking	0.02ha	-	GNR 983 as amended by GNR 327, Listing 1, Activity 20
Domestic Waste Facility	-	-	GNR 983 as amended by GNR 327, Listing 1, Activity 20
Rehabilitation	-	-	GNR 983 as amended by GNR

Name of the activity (All activities including activities not listed) E.g. Excavation, blasting, stockpiles, discard dumps or dams, Loading, Hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc....etc...etc.)	Aerial extent of the activity in Ha or m²	Listed activity mark with an x where applicable or affected	Applicable listing notice (GNR 983,GNR 984 or GNR 985 or NOT LISTED)
			327, Listing 1, Activity 20

ii. Description of the activities to be undertaken

(Describe Methodology or technology to be employed, including the type of commodity to be mined and for a linear activity, a description of the route of the activity)

DESCRIPTION OF PLANNED NON-INVASIVE ACTIVITIES:

(These activities do not disturb the land where prospecting will take place e.g. aerial photography, desktop studies, aeromagnetic surveys, etc.)

PHASE 1

Desktop Studies

Available data on the area of study with relation to the topography, geology, mineralogy, geophysics, hydrology etc will be collated and analysed. This can be old data or recent data that have been collected on the area of study. This data will aid in determining the amount of potential minerals that the area carries in terms of sillimanite and quartz mineralisation and the factors that affect it and its extraction thereof.

Geophysical Survey

A desktop study is important in providing general information about the location of the outcrop; nevertheless it is important to follow up the process with physically locating the outcrop on the farm itself. Geophysics does not only aid in locating ore bodies buried under the subsurface but also identifies the other structures such as faults and intrusions. These affect the quality and the mineability of sillimanite and quartz hence it is important to have information of their availability and the extent to which they occur.

Geological mapping

Surface geological mapping is a process of physically locating the sillimanite and quartzite orebody outcrops while obtaining detailed information about them. This information includes the strike and dip of the outcrop, the color, the grain size and shape amongst others. The end result of this stage will be a detailed geological map of the farm which will be correlated with the other maps obtained during the desktop study.

DESCRIPTION OF PLANNED INVASIVE ACTIVITIES:

(These activities result in land disturbances e.g. sampling, drilling, bulk sampling, etc.)

Phase 2**Drilling**

Drilling is a process of extracting material from the subsurface. This process results in surface disturbance. This process is usually undertaken after as much data regarding the location of the orebody have been collected as it is expensive.

Both Reverse Circulation (RC) and diamond boreholes will be drilled. Reputable drilling companies will be hired to conduct the drilling. A qualified geologist from Hle Services and Supplies (Pty) Ltd (Hle Services and Supplies) will supervise the drilling as well as other administrative work related to it. It is envisaged that a total of fifty (50) boreholes will be drilled. Forty (40) boreholes will be drilled using the RC method whereas 10 boreholes will be drilled using the diamond drill method. The rehabilitation of drill holes will be done as soon as each hole is completed for safety reasons. Potential oil spillages will be collected and disposed of in the appropriate area designated for hydrocarbon waste. Hydrocarbon waste will be disposed of through an accredited waste disposal company. The geographic position of each borehole will be recorded and captured into the database.

Reverse Circulation (RC) drilling

This method of drilling involves the process of crushing the rock material into fragments. Using air pressure, the rock fragments are lifted up the hole into the cyclone where they are collected into sample bags. A rifle splitter is used to homogenize the sample and to split it into two. The weights of the samples are recorded. Part of the one sample is washed and placed into a labeled chip tray after logging by the Field Geologist. This sample is stored for future reference. The remainder of the logged sample is labeled while still in the sample bag and taken to an accredited laboratory for analysis.

Diamond drilling

Diamond drilling is more expensive compared to RC drilling and is usually done to ensure the accuracy of the stratigraphy determined by RC. This method produces core which is laid in the core trays and marked. The core lost and gained during drilling is also recorded and marked in the core trays. The Field Geologist will log the core taking into consideration the lithological characteristics of the rock and the type of contacts between each rock type. After logging, core samples are taken at 1m intervals and split into two pieces, using a core cutter. The one piece is bagged, labeled and taken to the laboratory for analysis. The other piece is kept for future reference. The holes will be drilled to a maximum depth of 150m.

Phase 3**Bulk Sampling**

Bulk sampling will form part of the prospecting activities. A total of five trenches/pits will be excavated over all three farms. The size of the trenches/pits will be 100 m x 50 m x 20 m. The aim of this phase is to determine the sillimanite and quartz's likely performance under the actual conditions of usage by conducting tests. The overburden material amount to be removed is not yet known at this stage. This will be known after phase 2, when the overburden thickness will have been determined. The overburden material will be stored in a designated area to be used later for rehabilitation.

DESCRIPTION OF BULK SAMPLING ACTIVITIES

The dimensions of the pit, quantity location and duration of the activity are presented in Table 4.

Table 4: Description of bulk sampling activities.

ACTIVITY		DETAILS		
Number of pits/trenches planned		5 Pits/Trenches		
	Number of pits/trenches	Length	Breadth	Depth
	5	100 m	50 m	20 m
Locality		Exact locality unknown-to be determined on completion of phase 1.		
Volume Overburden (Waste)		50 000 m ³ on each excavation		
Volume Ore		50 000 m ³ on each excavation		
Density Overburden		Unknown-to be determined on completion of phase 2-3.		
Density Ore		Unknown-to be determined on completion of phase 2-3.		
Phase(s) when bulk sampling will be required		Phase 3		
Timeframe(s)		From time-to-time during Months 33-54		

PHASE 4

Analytical Desktop Study

The objective of analytical desktop studies is to determine the feasibility of the project considering factors such as environmental, technology, legal and economic factors. This study will involve a number of specialists to address all the components of the study. Besides determining the feasibility of the project, the study also helps to identify logistical problems.

e) Policy and Legislative Context

Applicable legislative and guidelines used to complete the report are provided in Table 5.

Table 5: Policy and legislative context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED
<i>(a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process</i>	

<p>APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT</p> <p><i>(a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)</i></p>	<p>REFERENCE WHERE APPLIED</p>
<p>The South African Constitution</p> <p>This section provides an overview of the legislative requirements applicable to this project and it includes the Acts, guidelines and policies considered in the compilation of this report. The legislative motivation for this project is underpinned by the Constitution of South Africa, 1996 (Act No. 108 of 1996), which states that:</p> <p>The State must, in compliance with Section 7(2) of the Constitution, respect, protect, promote and fulfil the rights enshrined in the Bill of Rights, which is the cornerstone of democracy in South Africa. Section 24 of the Constitution:</p>	<p>Public participation process and consultation at every stage of the EIA phase.</p>
<p>Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).</p> <p>The MPRDA makes provision, for persons to apply for a prospecting right. A prospecting right granted in terms of the MPRDA is a limited real right in respect of the type of resources and the land to which the right relates. The holder of a prospecting right is entitled to the rights referred to in the MPRDA or any other law.</p> <p>The applicant requires a prospecting right and environmental authorisation from the DMR.</p>	<p>Application for Prospecting in terms of Section 16 A prospecting right application was submitted to the DMR by the applicant on 31 August 2017.</p> <p>A revised application with the revised affected property list was submitted to the DMR with the Draft BAR/EMPr on 9 February 2018.</p>
<p>Mine Health and Safety Act 29 of 1996</p> <p>The Act provides for the protection of health and safety of employees and other persons in the mines. It provides for the health and safety measures.</p>	<p>The proposed project will be located within a mining lease area and Hle Services and Supplies will therefore need to ensure that employees, contractors, sub-contractors and visiting personnel, adhere to this Act and subsequent amendment regulations on site.</p>
<p>National Environmental Management: Air Quality Act (Act No 39 of 2004)</p> <p>The Act makes provision for the control of dust cause by general activities or machinery. Applicants to take responsibility in ensuring dust control, noise control and control of offensive odours.</p>	<p>All phases of the project will result in dust production which will have an impact on ambient air quality.</p> <p>Dust created during the construction and operational phases of the proposed project could influence air quality and thus make this legislation relevant to this development. Air quality management and implementation of mitigation measures during the prospecting will be considered to be a measure to exercise duty of care, since it aims to minimise volumes of dust emissions emanating from the operational activities.</p>
<p>National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)</p> <p>The Act aims at managing cultural heritage resources and encourages conservation and nurturing of cultural legacy for future generations.</p> <p>For development exceeding 0.5 Ha it is important that cultural heritage studies be undertaken. The Act provides guidelines for impact assessment studies to be undertaken</p>	<p>A Phase 1 Heritage resources study was conducted. The study shows that there are no heritage resources located on the Pella 39 property. However, should there be any heritage and/or cultural resources encountered during the construction phase of the project, a phase 2 Heritage Study for grave relocation permits shall be conducted.</p>

<p>APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT</p> <p><i>(a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process</i></p>	<p>REFERENCE WHERE APPLIED</p>
<p>where cultural resources may be disturbed by development activities. Archaeological impact assessments (AIAs) are often commissioned as part of the heritage component of an EIA and are required under Section 38(1) of the NHRA of 1999, Section 38(8) of the NEMA and the MPRDA.</p> <p>The South African Heritage Resources Agency (SAHRA) will need to approve the heritage assessment undertaken as part of the impact assessment process.</p>	
<p>National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)</p> <p>NEMA underpins the environmental authorisation in South Africa. The regulations with listed activities are identified under the Regulations GNR 982,983,984 and 985 have been amended in 2017 through GNR 324, 325, 326 AND 327 respectively.</p> <p>The competent authority for this activity is the DMR which deal with mining related applications in terms of NEMA.</p>	<p>Environmental authorisation has been lodged with the DMR on 19th June 2018.</p> <p>Section 21-24 of NEMA</p> <p>For the purpose of this report GNR 983 and 984 will be applicable.</p>
<p>National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM: WA)</p>	<p>Waste management on site. The project also triggers activities listed in GNR 921 of the NEM: WA and require a Waste Management Licence from the DMR. An integrated application for an Environmental Authorisation and WML was submitted to the DMR.</p>
<p>National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA)</p> <p>The Act provides for the management and conservation of Biodiversity, the protection of species and ecosystems in South Africa. It also warrants the national protection and use of indigenous biological resources.</p>	<p>The possibility of the presence of protected flora. The EMPr will regulate the applicant to apply for tree removal permits prior to removal of any sensitive and/or protected species.</p>
<p>National Water Act, 1998 (Act No. 36 of 1998)</p> <p>The Act recognises that water is a scarce and unevenly distributed resource nationally. Where applicable a water use licence will be lodged with the Department of Water and Sanitation (DWS) in terms of Section 21 of the Act with several water use activities listed which require authorisation of the DWS. An integrated water and waste management plan will be compiled in support of the water use licence application.</p>	<p>Bulk Sampling and drilling site establishment</p> <p>There are watercourses and drainage lines that may be affected by the project. In terms of the NWA, any activities undertaken within 500 m of a wetland or within 100 m of a watercourse require a Section 21 (c) and (i) Water Use Licence (WUL). Should water required for the project be from groundwater and /or surface water, a Section 21 (a) WUL will also be required.</p> <p>Should the impacts of the activities be of low significance, the activities may also be Generally Authorised (GA).</p>
<p>The National Forests Act 84 of 1998</p> <p>The applicant needs to take cognisance of protected trees under this act and if there are any on site which will be required to be removed, the necessary authorisations will need to be obtained from the Department of Agriculture Forestry and Fisheries (DAFF).</p>	<p>The possibility of the presence of protected flora. The EMPr will regulate the applicant to apply for tree removal permits prior to removal of any sensitive and/or protected species</p>
<p>Municipal Integrated Development Plans (IDPs)</p>	<p>Land Claims. One of the key issues identified by</p>

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT <i>(a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process)</i>	REFERENCE WHERE APPLIED
	the IDPs is to facilitate the land claims.

By laws

By laws applicable to this process are provided in

Table 6: Applicable By Laws

Name of by laws	Year
According to the Khai Malntegrated Development Plan	2012 - 2017

f) Need and desirability of the proposed activities.

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

The consumption of sillimanite minerals is concentrated in the relatively highly industrialized areas where refractories are manufactured and which in turn are typically close to the major iron and steel producing regions in the world (Roskill 1990). The principal consumers in the western world are therefore found in the EU, North America, the Far East and South Africa, whereas mining of these minerals is controlled by five major producers situated in South Africa (andalusite), USA (kyanite) and France (andalusite) (Fig. 1). The majority of sillimanite minerals produced in other countries such as Australia, Brazil, China, India, Ukraine and Zimbabwe is mostly for domestic consumption. As a consequence, the trade in sillimanite minerals is international

Quartz on the other hand has great economic importance. Many varieties are gemstones, including amethyst, citrine, smoky quartz, and rose quartz. Sandstone, composed mainly of quartz, is an important building stone. Large amounts of quartz sand (also known as silica sand) are used in the manufacture of glass and ceramics and for foundry molds in metal casting. Crushed quartz is used as an abrasive in sandpaper, silica sand is employed in sandblasting, and sandstone is still used whole to make whetstones, millstones, and grindstones. Silica glass (also called fused quartz) is used in optics to transmit ultraviolet light. Tubing and various vessels of fused quartz have important laboratory applications, and quartz fibres are employed in extremely sensitive weighing devices. These minerals are therefore of economic importance.

Prospecting is the physical search for minerals, fossils, precious metals or mineral specimens, which allows a company to survey or investigate an area of land for the purpose of identifying an actual or probable mineral deposit, before investments are made into the mining activities.

Initial desktop studies has indicated that the proposed prospecting area has potential for sillimanite and quartz. The geology of the area supports this theory. Prospecting therefore has to be carried out to verify this information. The prospecting will also determine if there are any features that may have an impact on the economic extraction of the sillimanite and quartz.

The information that will be obtained from the prospecting to be done will be necessary to determine, should sillimanite and quartz be found, how and where the sillimanite and quartz will be extracted and

how much economically viable sillimanite and quartz reserves are available within the proposed prospecting area. This will allow Hle Services and Supplies to enter into further studies towards a Mining Right.

Should sillimanite and quartz be found in the project area, Hle Services and Supplies will be able to mine the available reserves. This will result in job creation and boost to local businesses.

This prospecting activity has a potential to temporarily decrease the level of unemployment in the proposed areas and surroundings. In addition to employment, the proposed development also holds the potential for skills transfer. With an increase in employment, a definite transfer of skills will result. Skills development is a requisite for human resource development, and will have a lasting impact on the economy.

This prospecting activity will bring revenue into the town and the province which will in turn boost the economy of the country.

It is expected that the prospecting activity will also result in environmental and social impacts. The impacts have been assessed by qualified specialists and have been incorporated into this EIA/EMPr. The benefits from the prospecting activities must be offset against the costs of the project, including the impacts to land owners. As such, a process that ensures consultation with Interested and Affected Parties (I&APs) for the project is being undertaken. The stakeholder engagement process is being conducted in a way to provide all I&APs with an opportunity to comment on the project, with several platforms that allow public commenting opportunities being offered to the I&APs. All Issues raised by the I&APs to date have been recorded and addressed in the Scoping Report that was submitted to the DMR for decision making.

Stakeholders have been included in this EIA/EMPr phase of the project and will be provided with an opportunity to review and comment on the findings of the studies and impact assessment. Where required, the final layout plan of the project will be updated and/or revised to minimise and/or avoid impacting on sensitive environments.

g) Motivation for the preferred development footprint within the approved site including a full description of the process followed to reach the proposed development footprint within the approved site.

NB!! – This section is about the determination of the specific site layout and the location of infrastructure and activities on site, having taken into consideration the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site.

Specialist studies conducted as part of this impact assessment showed that there are no fatal flaws associated with the proposed site.

The invasive prospecting phase will be dependent on the results of the preceding phase. The location and extent of the trenching and drilling sites, soil sampling cannot be determined at this stage, therefore mapping of the specific prospecting activity site could not be undertaken at this stage. For the purposes of this report, the overall prospecting site is presented in Figure 2. The overall proposed site (Figure 3) was selected based on its potential to host the sillimanite and quartz orebody since it falls geologically under the Bushmanland Group which hosts the schist associated with sillimanite mineralisation. The area is also highly characterised by sandy soil and sandstone which implies the presence of quartz. Alternative borehole, trench/pit location and infrastructure location will be considered to avoid environmental features and to avoid disturbing the current land uses of the farms. The final location of the intrusive drilling activities will be determined during Phase 1 of the Prospecting Works Programme and will be aimed at avoiding areas with sensitive environments. The issues raised by I&APs will be taken into account in considering alternative sites for the invasive phase of the process.

i. Details of the development footprint alternatives considered.

With reference to the site plan provided as Appendix 4 and the location of the individual activities on site, provide details of the alternatives considered with respect to:

- a) The property on which or location where it is proposed to undertake the activity

The proposed project site is preferred due to its location in the Aggenys Subgroup which falls under the Bushmanlan Group (Figure 3). The sillimanite-corundum rocks occur as massive bodies in a basal biotite-sillimanite schist. The schist has been correlated with the Aluminous Schist of the Bushmanland Sequence at Aggeneys (Praekelt et al., 1983). The sillimanite-corundum rock consists of radiating fibrolite masses which merge into colourless sillimanite prisms containing corundum cores and ilmenite inclusions (Coetzee, 1941). Biotite-sillimanite schist overlies the sillimanite-corundum rock. Massive quartzite forms the uppermost unit in the Pella area.

As shown in Figure 3 the farm is underlain by Medium yellow (Q-S1) = red aeolian sands of the Gordonia Formation (Kalahari Group) and pale yellow (Q-s2) = sand, scree, rubble and sandy soil. In liners of basement rocks in the area (Kkop, Kwr, kbk,nsm) include highly metamorphoses sediments and intrusive granites of Mokolian (Mid Proterozoic) age that are unfossiliferous

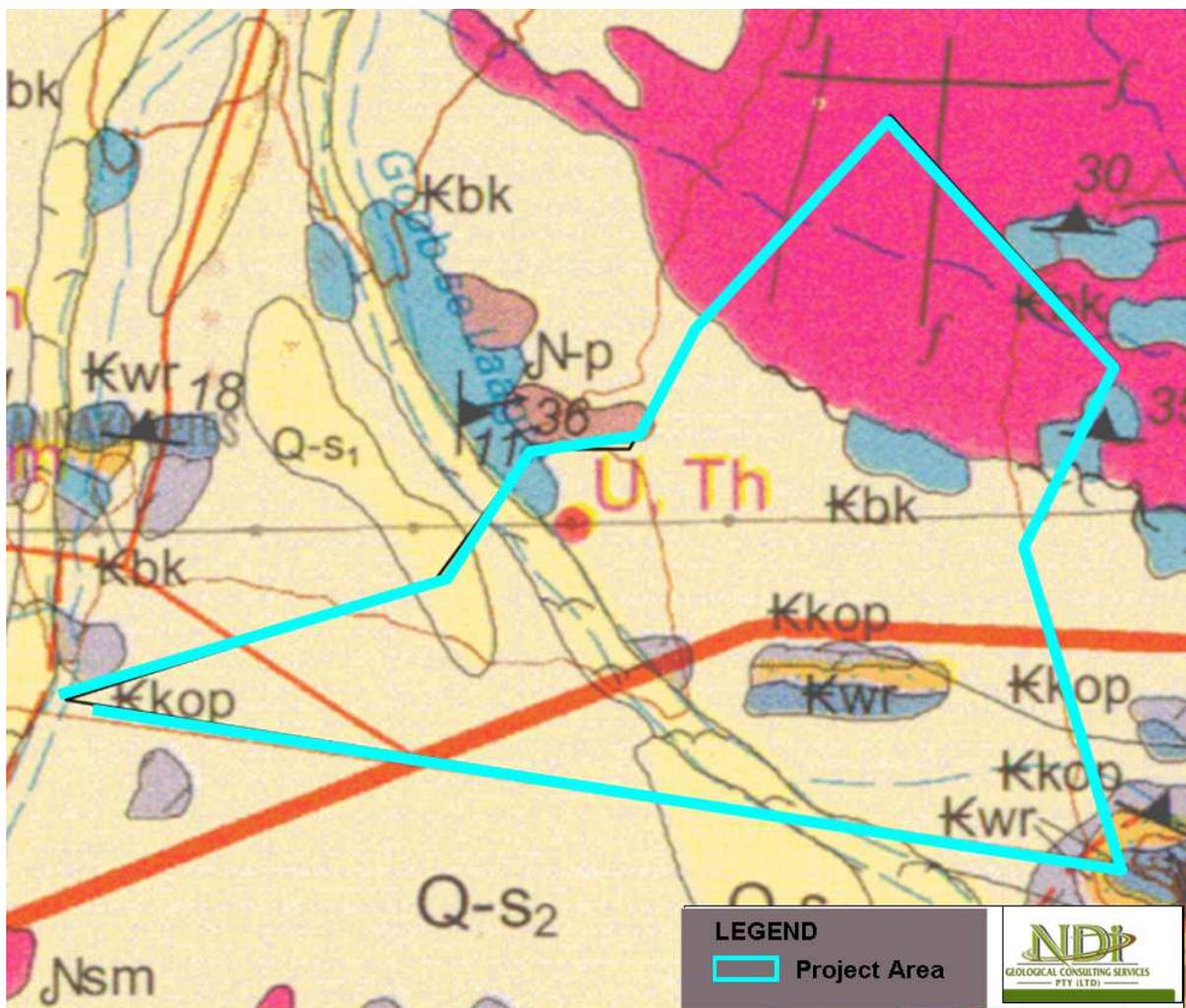


Figure 3: Geology of the farm Pella Mission 39

- b) The type of activity to be undertaken;

The application is for prospecting right and no alternatives were considered. The activity will be conducted in phases as described in Section i of this report. The prospecting phase of the Prospecting Works Programme will be dependent on the findings of Phase 1 of the process.

c) The design or layout of the activity

The location of the infrastructure will be determined based on the location of the prospecting activities, which will only be determined during Phase 1 of the Prospecting Works Programme, as well as the presence of sensitive environmental attributes such as wetlands, watercourses, protected flora and graves. All infrastructures will be temporary and/or mobile.

d) The technology to be used in the activity

The proposed technologies have been selected based on long term proven success in prospecting. The prospecting activities proposed in the Prospecting Works Programme are dependent on the preceding phase (desktop studies), therefore no alternatives have been indicated. The location of the intrusive drilling activities will be determined during Phase 1 of the Prospective Works Programme. All infrastructures will be temporary and/or mobile. Earth moving machinery and vehicles such as drill rigs, dumper trucks, 4 x 4 vehicles, front end loader, grader will be utilised during prospecting period.

e) The operational aspects of the activity

No permanent services in terms of water supply, electricity, and or sewage facilities will be required. The source of water has not yet been determined. The option will be to purchase from the local municipality, or to make arrangements with the farmers to use water from the available waterbodies on the farms. Temporary access roads will however be constructed in areas where there are no existing access routes

The activities will commence with Phase 1, during which desktop studies will be conducted. After the desktop studies, geological mapping will be undertaken to ensure that all the targets with sillimanite and quartz outcrop identified during the desktop study are not cultural features. This phase will also include planning for the drilling survey.

Phase 2 will entail the invasive prospecting drilling campaign where the extent of mineralisation will be defined and the geological continuity of the mineralised zone will be determined. The drilling information will also be used to construct ore thickness, overburden thickness and basement elevation contour plans.

f) The option of not implementing the activity

The option of not implementing the activity will result in a loss of valuable information regarding the minerals status (sillimanite and quartz) present on the affected properties. In addition to this, should economical reserves be present and the applicant does not have the opportunity to prospect, the opportunity to utilise the reserves will be lost.

ii. Details of the Public Participation Process Followed

Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land.

Public participation is defined as a process that leads to a joint effort by stakeholders, technical specialists, the authorities and the proponent to work together to produce better decisions than if they had acted independently. This is a two-way communication and collaborative problem solving with the goal of achieving better and more acceptable decisions.

Background

Public Participation is an integral part of the EIA process and is regarded as a way of empowerment and as a vital part of our democratic governance. Ndi Geological Consulting Services (Pty) Ltd has

been appointed by Hle Services and Supplies as a main independent consultant to undertake the EIA process as required in terms of the NEMA.

Public participation is defined as a process that leads to a joint effort by stakeholders, technical specialist, the authorities and the proponent to work together to produce better decisions than if they had acted independently. Some of the key EIA requirements with regards to public participation include the following:

- Prospecting application and EIA must be publicly advertised (e.g. on site and or in newspaper);
- Public consultation during scoping phase to identify issues of concern which needs to be considered during the EIA phase of the project;
- Public to review the Scoping Report and EIA Report;
- Public may appeal within 21 days after the Environmental Authorization has been issued by the authority.

Public participation in EIA

NEMA supports the engagement of all stakeholders in environmental governance. Consultation in the EIA process achieves the following aspects:

- Inform and raise awareness of the proposal;
- Increase understanding amongst stakeholders;
- Identify and learn from local sources of information; and
- Inform and improve decision-making.

Consultation methods

Announcement Phase

Interested and Affected Parties (I&APs) were notified using relevant guidelines applicable to public participation process as contemplated in Section 24J of the NEMA. Notifications which relate to the prospecting right application were distributed after the acceptance of the prospecting right application and Environmental Authorisation application. I&APs parties were notified of the project and application as follows:

- Newspaper advertisement: A newspaper advertisement was placed in the Die Plattelander and GembokNews which was published on the 11th and 13 July 2018 respectively. The aim of the advertisement was to notify the public of the EIA process and requesting I&APs to register with, and submit their comments to Ndi Geological Consulting Services. I&APs were given 30 calendar days to submit their comments on the proposed prospecting project.
- Site notices: Site notices were placed on site in English and Afrikaans to further inform the stakeholders and the public in general about the proposed prospecting activities.
- Key stakeholders were notified of the project using letters that were delivered by email and hand delivery from the 2nd of July 2018. The notification letters sent to stakeholders included a Background Information Document (BID), which had a comments sheet attached to it for registered I&APs to submit their comments on the project.

Scoping Phase

Direct notification and circulation of the Draft Scoping Report to identified registered stakeholders: The key stakeholders were also informed about the availability of the Draft Scoping Report which could be sent via email.

Comments and concerns from the stakeholders have been documented and addressed. Stakeholders requested to be registered as I&APs as well as requested documents relating to the project. These conversations were conducted telephonically and via email. Proof of email conversations formed part of the final Scoping Report submitted to the DMR, and will also be attached to the EIAR/EMPR.

A public meeting for the scoping phase was conducted on the 18th of July 2018 at Pella community hall. The comments raised by I&APs were recorded, addressed and incorporated into the Final Scoping Report that was submitted to the DMR for decision making.

EIA Phase

This phase commenced once the DMR accepted the final Scoping Report. The stakeholders will be given 30 days to review and comment on the draft EIA/EMPr documentation. Comments on the draft EIA/EMPr received from the stakeholders will be incorporated into the final EIA/EMPr which will be submitted to the DMR for review and decision making. The DMR will then review the documents within 107 days and make a decision on the application.

Appeal Phase

The stakeholders will be notified of the DMR decision. Information on how to appeal the decision made by the DMR will be made available to the stakeholders.

iii. Summary of issues raised by I&APs

(Complete the table summarising comments and issues raised, and reaction to those responses)

Table 7: Issues raised by I&APs

Interested and affected parties. List the names of person consulted in this column, and mark with an X where those who must be consulted were in fact consulted	Date comments received	Issues raised	EAPs response to issues as mandated by the applicant.	Section and paragraphs reference in this report where the issues and or response were incorporated
INTERESTED AND AFFECTED PARTIES Land owners Khai-Ma Municipality Ishmael Kokerberg	18th of July 2018	Hy wil weet of da erts verwyder sal word van die side af gedurende die prospekter fase. Hy stel ook voor dat ons al o's dokumente in afrikaans moet opstel. Huveel persentasie aandeel hul gaan kry tydens die prospekter tydperk.	As already mentioned during the presentation, the applicant have applied for prospecting right which include bulk sampling, and accompanied the application with section 20 to remove the material from site. In future the presentation and notification letters will be drafted in Afrikaans but not the Scoping Report or EIA/EMP Report. At this stage No, this is a prospecting right application not a mining right.	Minutes of the meeting attached.
M.A Rosina	18th of July 2018	Versoek dat die aanbieding in Afrikaans aangebied word sodat almal kan deelneem, en dit sal ook veilige tyd hê. In plaas van die anbieding in Engels en Afrikaans. Sy het ook genoem dat daar mense is wat vrae wil vra, maar dit nie duidelik verstaan nie, alhoewel die aanbieding in Engels en Afrikaans is.	Noted	Minutes of the meeting attached.

Interested and affected parties. List the names of person consulted in this column, and mark with an X where those who must be consulted were in fact consulted	Date comments received	Issues raised	EAPs response to issues as mandated by the applicant.	Section and paragraphs reference in this report where the issues and or response were incorporated
Mr. R. Basson	18th of July 2018	Hulle is nie teen enige mynbou-aktiwiteite wat in die toekoms sal plaasvind nie, maar mynmaatskappye moet hou aan die beloftes wat hulle aan gemeenskappe doen. Die gemeenskap benodig werkseleenthede wat deur hierdie projek voorsien kan word. Die gemeenskap verwelkom enige nuwe ontwikkelings in hul gemeenskap en wil graag hê dat die gemeenskap voordeel moet trek uit hierdie projekte.	As already mentioned in the presentation, the labour force will be sourced from Pella community. The People from Pella will be trained on machinery that will be used (Skills transfer)	Minutes of the meeting attached.
John	18th of July 2018	Die aansoeker het na die perseel gegaan om te ondersoek of daar erts was, en die gemeenskap is genooi om die vergadering by te woon om voort te gaan met hierdie projek en nie terug te gaan nie. As die aansoeker kan wys dat hy die gemeenskap sal ophef, sal hulle hierdie pad saam met hulle loop.	Approximately 10 job will be created during the prospecting phase, and more jobs will be created when we have the mining right, but jobs will be created for the community, if the prospecting is successful, more job opportunities will come out of this project.	Minutes of the meeting attached.
Resident	18th of July 2018	Hoe lank sal die gemeenskap moet wag om te hoor wanneer hierdie projek sal begin?	At this stage we will not be able to can say because the applicant is still on early stage, and what we are currently busy with is the points we need to complete as part of the application. But we will inform the community when the project	Minutes of the meeting attached.

Interested and affected parties. List the names of person consulted in this column, and mark with an X where those who must be consulted were in fact consulted	Date comments received	Issues raised	EAPs response to issues as mandated by the applicant.	Section and paragraphs reference in this report where the issues and or response were incorporated
			starts.	
Hans	18 th of July 2018	Notules moet geneem word vir rekorddoeleindes en toekomstige verwysing vir almal wat vandag teenwoordig is in hierdie vergadering	Everything in this meeting is being recorded and will be available upon request. A copy will also be made available to the Department of Minerals and Resources.	Minutes of the meeting attached.
Kevin Waterboer	18th of July 2018	Die advertensie op mynhope, hy het gehoop dat die fokus van die vergadering op dumps sal wees. Hy wou ook weet of die gemeenskap van Pella aandeelhouers sal wees op permit omdat hulle nie net belangstel in werkseleenthede nie, maar ook voordeel trek uit die winste van hierdie projek. Mense moet ook nie min betaal word nie. Hy het ook genoem dat hy gelukkig is dat die aanbieding in Engels is en na Afrikaans vertaal word. Engels is ook aanvaarbaar.	The meeting is currently only focusing on the area of application and not on other projects. The applicant and the community will get a chance during the mining right application to discuss on their social responsibility toward the community. In this prospecting right (PR), the applicant will be paying for all the rentals. The community will benefit from the mining Right (MR).	Minutes of the meeting attached.
M A Rosina	18th of July 2018	Daar moet ook 'n vergadering met die munisipaliteit wees sodat hulle kan weet wat die gemeenskap van hierdie projek verwag.	There will be a separate meeting with the municipality if necessary. Office of the mayor is represented in this meeting by Mr Ishmael.	Minutes of the meeting attached.

Interested and affected parties. List the names of person consulted in this column, and mark with an X where those who must be consulted were in fact consulted		Date comments received	Issues raised	EAPs response to issues as mandated by the applicant.	Section and paragraphs reference in this report where the issues and or response were incorporated
Resident			Hoekom word dit nie met die gemeenskap gepraat voor die aansoek gedoen word nie.	We can only consult with the community once the application has been lodged and accepted by the DMR as the law requires us to and also we cannot give out our plans/intentions without knowing if the department will accept our application.	Minutes of the meeting
M A Rosina		18th of July 2018	Sy het weer gekla oor die aanbieding in Engels en Afrikaans en het gesê dat daar mense is wat nog nie verstaan het nie en waar nie vrae kon vra nie	Donavan, explained again (for the 3 rd time in Afrikaans).	Minutes of the meeting attached.
SAHRA			Waiting on comments		
Chief Director: Land Restitution		22nd of July 2018	Waiting on comments		
Department of Environment and Nature Conservation. Onwabile Ndzumo			Waiting on comments		
Department of Agriculture,			Waiting on comments		

Interested and affected parties. List the names of person consulted in this column, and mark with an X where those who must be consulted were in fact consulted	Date comments received	Issues raised	EAPs response to issues as mandated by the applicant.	Section and paragraphs reference in this report where the issues and or response were incorporated
Forestry and Fisheries Jacoline Mans				
Department of Water and Sanitation Chantèl Schwartz		Waiting on comments		
AFFECTED PARTIES				

iv. The Environmental attributes associated with the development footprint alternatives. (The environmental attributed described must include socio-economic, social, heritage, cultural, geographical, physical and biological aspects)

1) Baseline Environment

a) Type of environment affected by the proposed activity.

(its current geographical, physical, biological, socio- economic, and cultural character).

Topography and Drainage

The proposed prospecting activities will be located in the Khai Ma Local Municipality. The greater extent of the Khai Ma Local Municipality presents fairly flat areas. Mountainous areas occur in the northern part along the Orange River and around Aggeneys town including Dabenoris Mountain, Elsberg, Groot Pellaberg and Namiesberg. Numerous non-perennial streams traverse the Municipality flowing in a northerly direction towards the Orange River. Runoff is generally high after heavy rainfalls due to the hard soil conditions.

Socio-Economic Environment

The main economic sectors, in terms of contribution to GDP and/or employment, of Khai Ma Local Municipality are:

- Agriculture
- Mining
- Tourism

Mining

The Northern Cape Province has most of its mineral deposits concentrated along its northern sector, which has been stripped of its Karoo cover. Khai Ma Local Municipality is rich in minerals and metals such as sillimanite, zinc, copper, lead, granite, quartz and aventurine.

Households per town

Pella has the third least household of the five towns that belong to the Khai Ma Local Municipality. Figure 4 shows the household of Khai Ma Municipality per town.

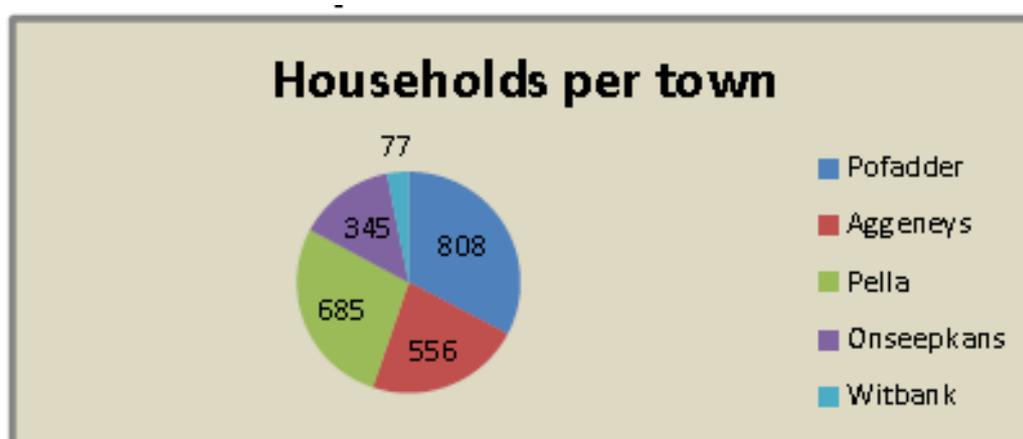


Figure 4: Household per town

Khai Ma has experienced an increase in population of 3 216 individuals, 34.4%. This significant increase will have an impact on service delivery and social infrastructure within the Municipality. Figure 5 shows the employment status in the following ways:

- In 2001, 731 people were unemployed.
- The dependency ratio, (% economically inactive people depending on the economically active people), for Khai Ma was unemployed, 2 789 not economically active and 3975 ±60% in 2001. From 2001 to 2007 (Figure 6), there is a general increase in employed, unemployed economically inactive individuals which can be linked to the increase in population

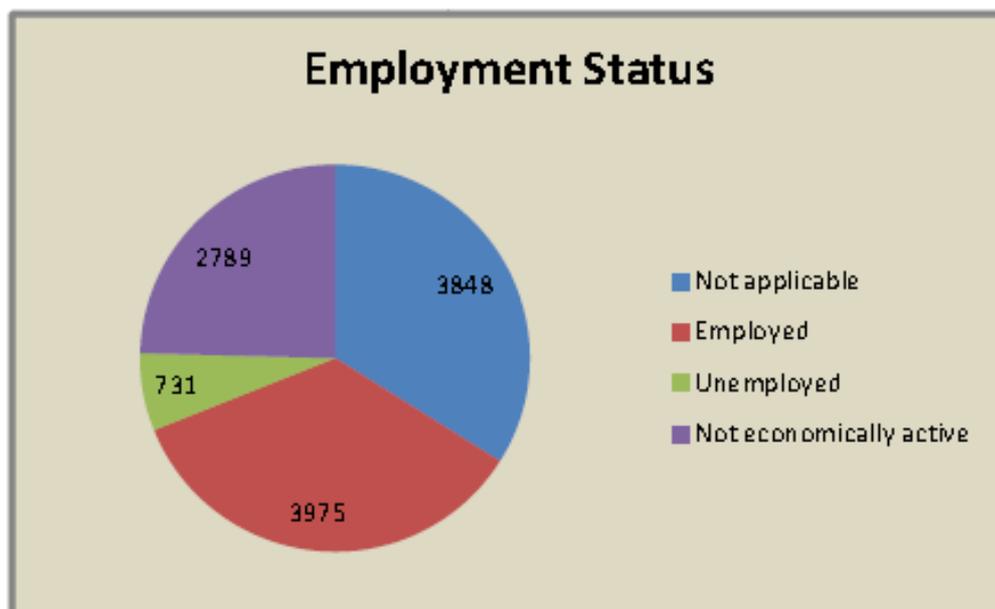


Figure 5: Employment status

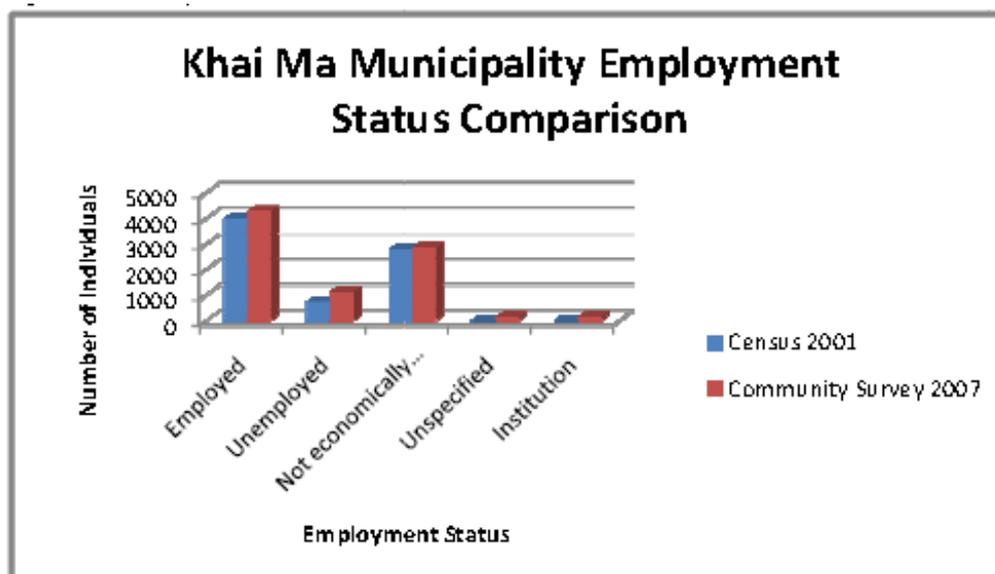


Figure 6: Employment status comparison

Education levels

Education levels displayed in Figure 7 show that 30.8% of the population has some secondary education, while 10% have a Grade 12 certificate. Only 2.4% of the Khai Ma population has received tertiary education, this can be ascribed to the fact that Namakwa District and the Province as a whole has no university and students who move to attend universities around the country tend not return to Namakwa after gaining their qualification.

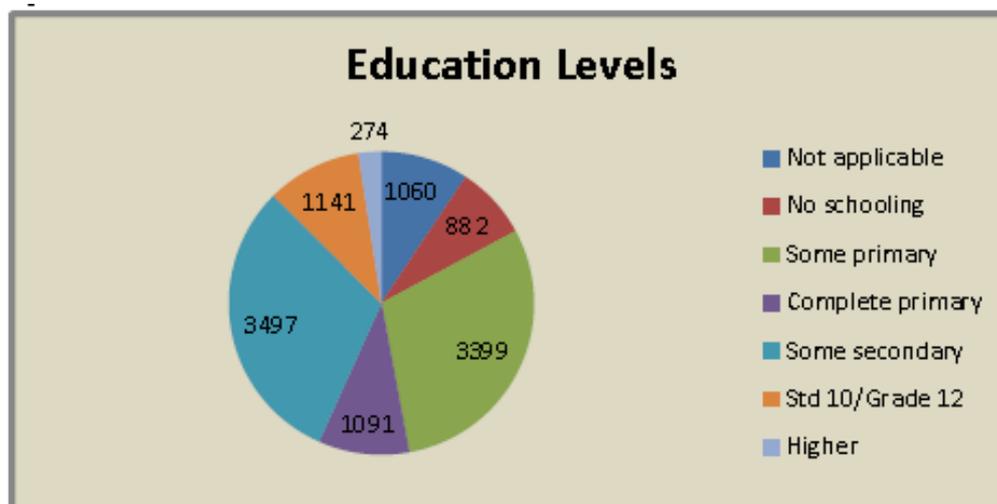


Figure 7: Education levels

DEMOGRAPHICS

Population

The population for Khai Ma is estimated at 11 340 people. The municipality is sparsely populated (± 1 person/km²), most people are settled in the towns along the N14 and in agricultural clusters along the Orange River.

The Khai Ma Municipality has experienced a significant growth in population and number of households during the period 1996 – 2007 (Table 8). The average population increase for this period is 34.37% with a corresponding increase in number of households of 70.35%. The statistics for 1996 are for the area previously known as Boesmanland and it is possible that, in later years, additional areas were included, leading to this rather large increase in population and household figures.

Table 8: Population and number of households

	Population			Households		
	1996 Statistics SA	2001 Statistics SA	2007 Community Survey	1996 Statistics SA	2001 Statistics SA	2007 Community Survey
Khai Ma	9 355	11 344	12 571	2 223	3 362	3 787
% Increase/Decrease	n/a	21.26%	10.82%	n/a	51.24%	12.64%

Population and gender composition

The gender ratios are almost equal, at 51% males and 49% females (Figure 8). The younger age structure implies a population explosion resulting in additional strain on social and engineering infrastructure (i.e. health care facilities, schools, water, sanitation, electricity etc.). A fairly young population requires skills development programmes matched with appropriate jobs to ensure that this group do not immigrate to other parts of the country in search of a) tertiary education and employment or b) rely on grants to survive. 67% of the population, numbering 8 411

people, of Khai Mai is in the age group 15-64 and is therefore able to contribute to the economic base of the Municipality.

The biggest population age shift occurred in the upper age groups between 40 and 54 which are likely to have a negative impact on social service infrastructure in the future.

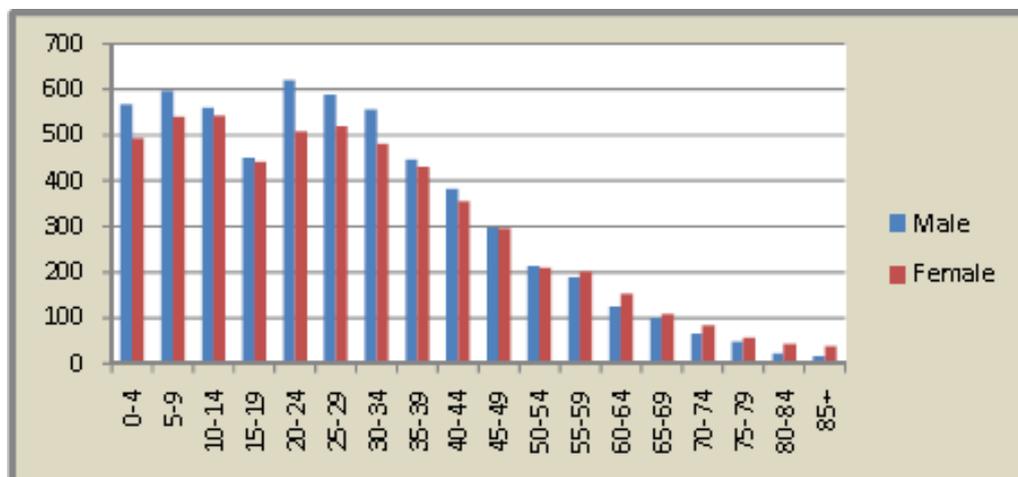


Figure 8: Population and gender composition

Soils

- Soil forms present in the study area: The study area is currently characterised by sandy to gravel soil. The soil is sandier in the edge of the proposed mining area and the central portion is characterised by hill to mountain which is sedimentary to metamorphic rocks.



Figure 9: Overview of soil condition

- Soil chemical conditions of the study area: The pH of the majority of the analyzed soil samples in the study area ranges from 7.30 (Slightly Alkaline) to 8.0 (Alkaline soil) and this confirms the general pH of the area (Figure 5). For successful crop

production, a pH of between 5.8 and 7.5 is optimum and crops produced in soils with lower pH may suffer aluminium (Al) toxicities if toxic levels of Al are present. The danger of Al toxicity in maize only exists when the pH (KCl) is lower than 4.5. Even under these low pH levels, Al toxicity may not prevail. The pH of the soil can be improved by the addition of dolomitic lime or gypsum. However, this process is costly and adds to production costs of crops. The clay plus silt content in the top 150 mm of the soil ranges is between 2% and 4% in the majority of the topsoil samples taken. The calcium and magnesium levels are very ranging between Mg (8.6 to 17.3%) and Calcium (65.4 to 82.5%) it is within the acceptable limits of WHO. The potassium levels are low for all sampling points. The balance between these three cations can be corrected with chemical fertilizer. The soil chemistry of the samples analysed indicate that soil at the project site has the chemical suitability for crop production. Intensive annual crop production would however require proper fertilization as soil nutrients should be balanced and will get depleted. No serious soil chemical issues such as soil salinity or sodicity occur on site. Where the sodium (Na) concentration is less than 10% of the sum of all cations, crop production may not be impaired.

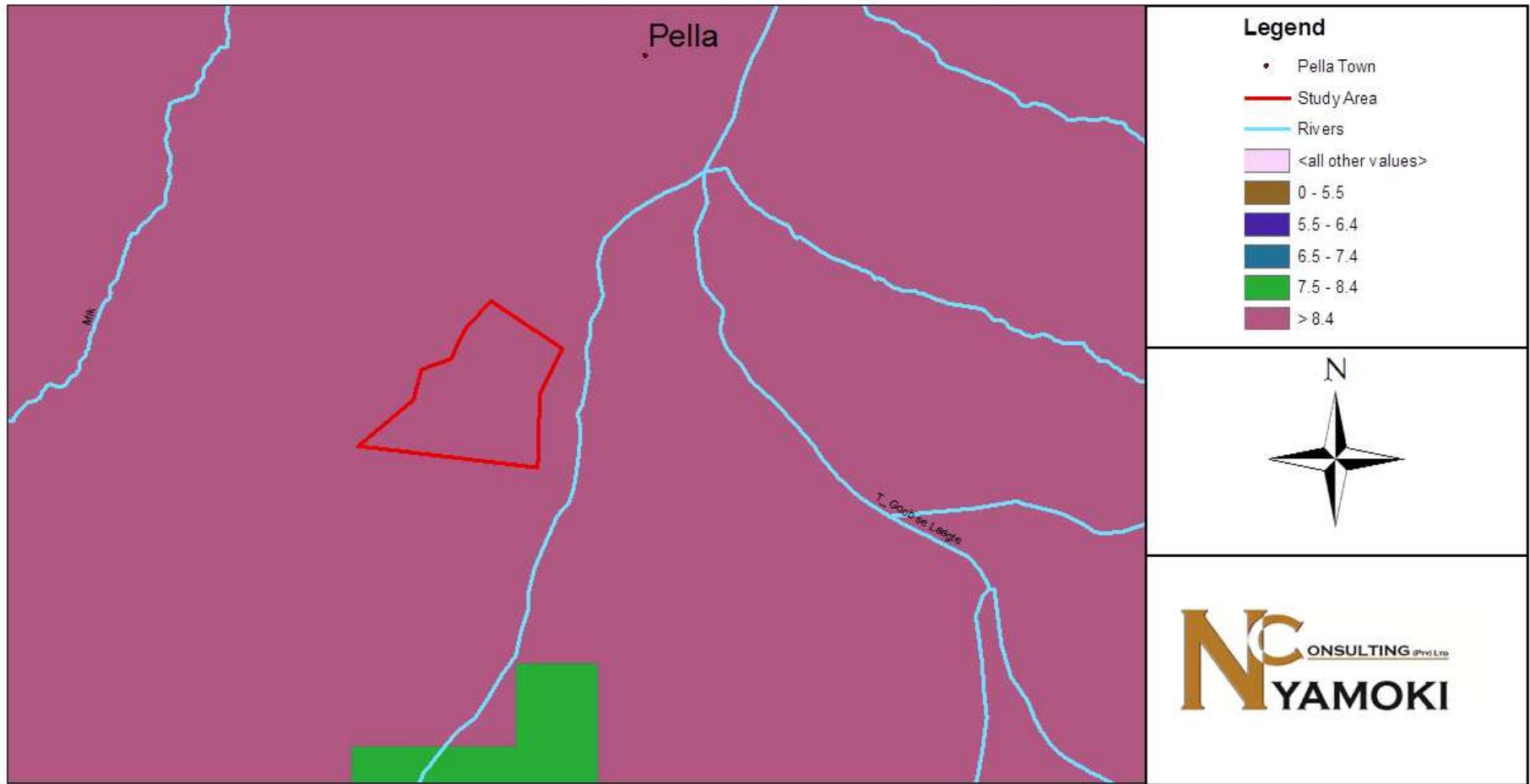


Figure 10: Pella Mission general pH map

Table 9: Soil fertility analysis report

			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	Cmol H+/Kg Soil	%	%	%	%	Calculati on	Calculati on	Calculati on	Calculati on
Sample Lab number	Sample Identificat ion	pH (KCl)	PBray1	Na	K	Ca	Mg	Exchngea ble acid	%Ca	%Mg	%K	%Na	Acid Saturation %	Ca:Mg	(Ca+Mg)/ K	Mg:K
#WC- 18/288	SP1	7.56	16	47	287	691	109	0	65.4	16.9	13.9	3.9	0	3.9	5.9	1.2
#WC- 18/289	SP2	7.54	6	15	72	452	55	0	76.2	15.3	6.2	2.2	0	5	14.7	2.5
#WC- 18/290	SP3	8	15	259	281	1440	104	0	72.7	8.6	7.3	11.4	0	8.4	11.2	1.2
#WC- 18/291	SP4	7.74	14	22	152	1044	76	0	82.5	9.8	6.2	1.5	0	8.4	15	1.6
#WC- 18/292	SP5	7.3	23	10	79	476	67	0	74.9	17.3	6.3	1.4	0	4.3	14.5	2.7

		Calculati on (Ca+Mg+ K+Na)	Calculati on	Calculati on (Ca+Mg+ K+Na+H)	g/ml	mg/kg	%	%	%	%	µs/cm
Sample Lab number	Sample Identificat ion	S-Value	Na:K	CEC	Digtheid	S	Clay	Sand	Silt	C	EC
#WC- 18/288	SP1	5.3	0.3	5.3	1.709	15.44	4	91	5	0.4	119.1
#WC- 18/289	SP2	3	0.4	3	1.672	8.79	4	94	2	0.3	54.9
#WC- 18/290	SP3	9.9	1.6	9.9	1.708	24.69	4	87	9	0.5	199.7
#WC- 18/291	SP4	6.3	0.2	6.3	1.658	18.59	4	92	4	0.3	95.1
#WC- 18/292	SP5	3.2	0.2	3.2	1.647	7.52	2	83	15	0.4	62.1

Agriculture Potential

Agricultural potential: The current land is capable to support cattle, sheep and horses. Sheep were encountered during filed assessment. No wild animals were observed in the surrounding area. The area is currently occupied by individuals dispersed from each other. The agriculture potential study found the following:

- Dry land crop production: The largest part of the study site is currently used for stock farming production. All the soil forms encountered at the study site are suitable and highly suitable for crop production. This average annual rainfall is below the country's average rainfall of 400 mm which indicates that the area is in a low rainfall zone. The low rainfall within the area has negative impact on the crop farming for successful maize production.
- Irrigated crop production: The study site did not have any current irrigation infrastructure that was being used for irrigation purposes. No large dams with irrigation potential have been observed on site. The soil forms identified on the site have medium suitability for irrigated crop production but the low rainfall will negatively impact the production of such crops.
- Cattle farming: The grazing capacity of a specified area for domestic herbivores is given either in large animal unit per hectare or in hectares per large animal unit. One large animal unit is regarded as a steer of 450kg whose weight increases by 500g per day on veld with a mean energy digestibility of 55%. Almost 95% hectares of the land is used for the grazing capacity around the study area for sheep farming and cattle farming purposes. Cattle farming are a viable long-term land use of certain parts of the site as long as the field quality is maintained by never exceeding the grazing capacity. Land use after decommissioning of the project should aim to re-establish the cattle farming potential of the land.
- Land capability: Following the classification system above in Section 6.4, the soil and land types identified in the study area could all be classified into four different land capability classes. The Pella Mission soil form indicates areas of seasonal to permanent dryness in the study area and has dryness land capability. Soil of the Pella form has karoo land capability since it has already been significantly altered by mining activities and the potential of this land to be used for agriculture after rehabilitation is very limited.

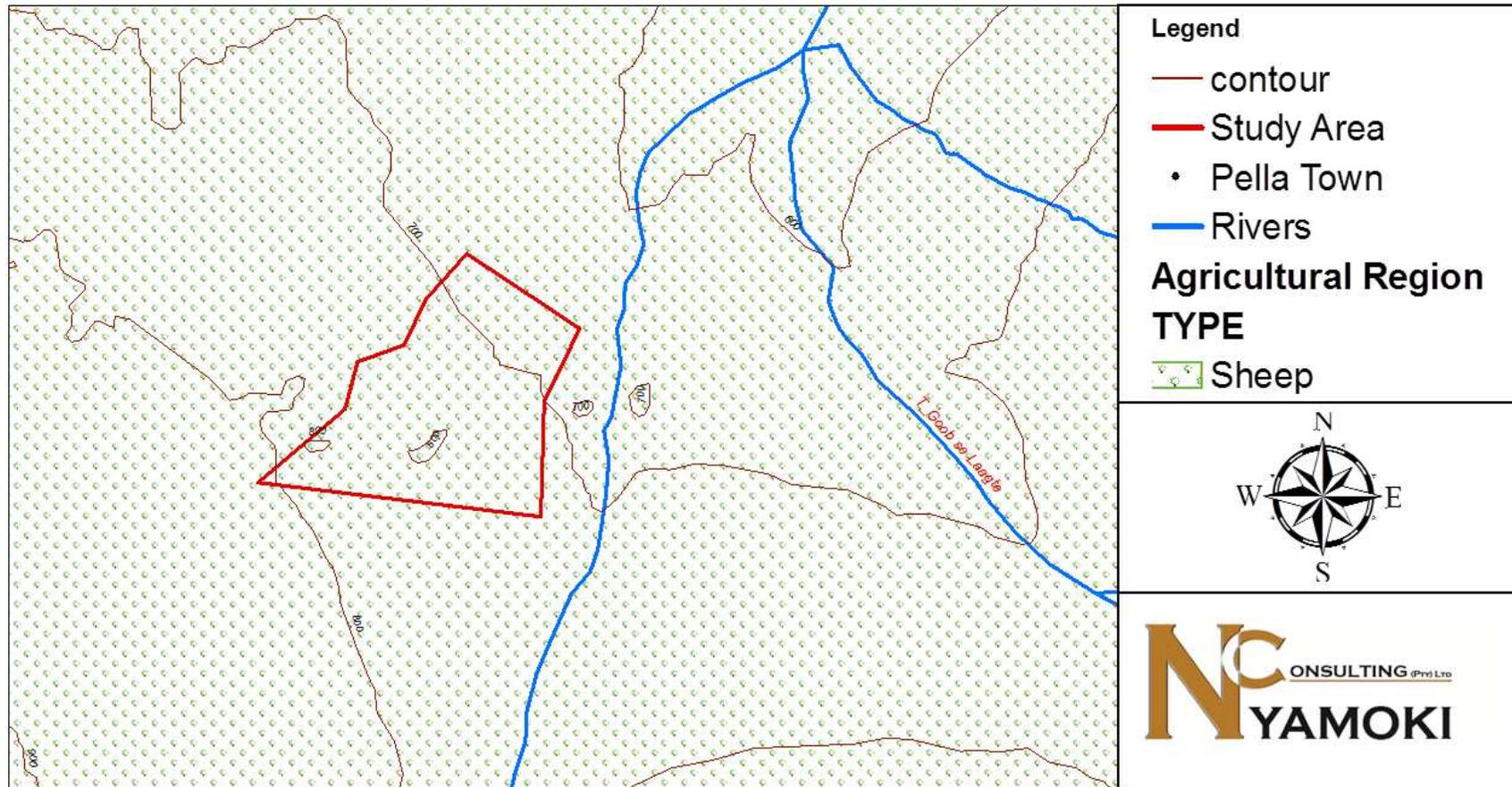


Figure 11: Land capability map of the Pella Mission

Climate

Low rainfall and restricted water resources confines economic opportunities to extensive agriculture and dispersed irrigated agricultural opportunities along the banks of the Orange River. A further decrease in rainfall resulting in a significant decrease in 'livestock carrying capacity' of the agricultural land and this necessitates the investigation of alternative economic opportunities.

Winters are cold and dry with severe frost occurring between April and August. Only selected areas along the Lower Orange River and coastal plain are frost-free. The summers in contrast are characterized by intense heat, up to 44 °C. Warm north winds accompanied with dust storms occur from August to December. Apart from a narrow strip of winter-rainfall area along the coast, the Northern Cape is a semi-arid region with little rainfall in summer. These weather patterns affect the land use options in the province.

The Northern Cape is the most arid province in the country, with a rainfall averaging less than 200 mm per annum over the largest part of the province. Rainfall occurs very sporadically in the form of summer thunderstorms and hail, except in the west where rain occurs mainly in winter.

Evaporation during the summer months is very high, and over the year exceeds 2 000 mm for the larger part of the province. The Northern Cape is periodically affected by prolonged droughts that are often terminated by severe floods.

Geology

Superficial deposits i.e. alluvium, windblown sand and dunes, calcrete, surficial sand, scree and rubble ranging in age from Tertiary to Recent cover a considerable portion of the Region, particularly in the area west of Pofadder. They are of interest not only as potential aquifers but also by impeding groundwater recharge.

Relatively little is known about the extent and thickness of fluvial deposits that occur along rivers such as the Mottels and the Rugseer in the Kenhardt area, the Brabees which joins the Orange River at Augrabies, the Nous, Goob se Laagte and more. At Kenhardt alluvial deposits in the Hartbees River attain a thickness of 37 m downstream of the confluence of Driekop se Rivier.

Pella Mission 39 is located in the Aggenys Subgroup which falls under the Bushmanlan Group. The following formations and their lithologies fall within the Subgroup:

Riet Put consists of migmatized and crenulated cleaved biotite gneiss, amphibolite, marble, calc-silicate rocks, quartz-feldspar gneiss. Kameel Puts formation consists of quartz-feldspar gneiss, banded biotite gneiss, amphibolite, biotite quartz-feldspar gneiss. Brulkolk is underlain by pegmatite-bearing quartz-feldspar gneiss, calc-silicate rocks with lenses / layers of muscovite schist, marble, conglomerate, and amphibolites. Koeris consists of psammitic schist, conglomerate, amphibolite, quartzite. Gams Member hosts sulphide-bearing magnetite-grunerite-garnet-pyroxene rocks, cordierite fels, sillimanite schist, quartzite. Hotson is underlain by rhythmically layered quartzite, quartz-feldspar-biotite gneiss sillimanite nodules, quartz-biotite sillimanite schist. Wortel hosts a sequence of medium- to thickbedded white quartzite with polyitic schist and interbedded sillimanite bodies. Koeipoort Gneiss formation is made of medium- to coarse-grained leucogneiss in places biotite- and augen-rich.

Swartkoppies sillimanite-corundum deposit is situated on Pella Mission farm approximately 30 km north-west of Pofadder and 35 km north-east of Aggenys in northern Namaqualand. It was first described by Coetzee and the discovery of further sillimanite deposits in northern Namaqualand led to follow up investigations by de Jager and von Backstrom (1961), Frick and Coetzee (1974) and Moore (1977).

Local geology and mineralization

The farm Pella Mission 39, as shown in Figure 12 is underlain by Medium yellow (Q-S1) = red aeolian sands of the Gordonia Formation (Kalahari Group) and pale yellow (Q-s2)= sand, scree, rubble and sandy soil. In liners of basement rocks in the area (Kkop, Kwr, kbk, nsm) include highly metamorphosed sediments and intrusive granites of Mokolian (Mid Proterozoic) age that are unfossiliferous.

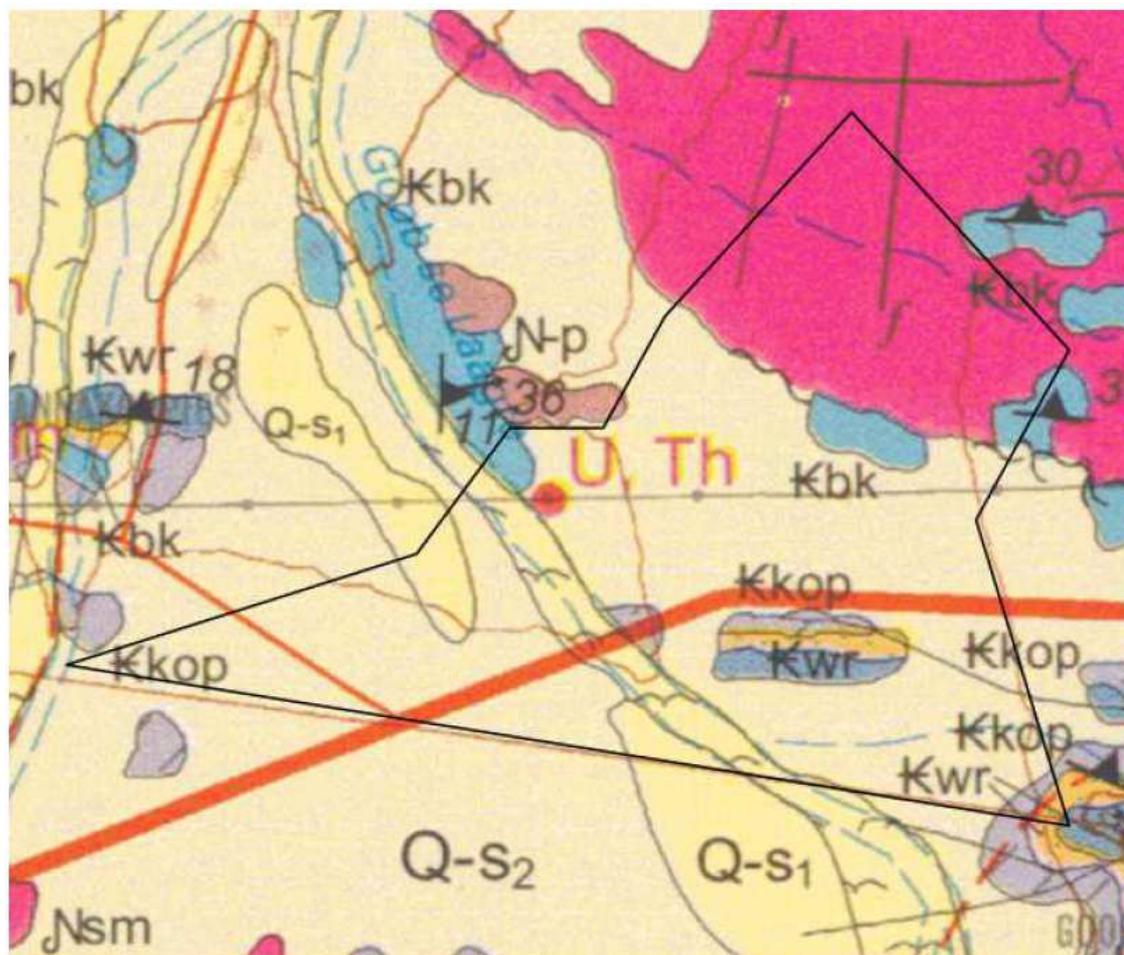


Figure 12: Geological map of Pella Mission 39

Areas of Conservation Concern

According to the Northern Cape Conservation plan, about 60% of the site is located within under Ecological Support Area with approximately 25 % located with Critical Biodiversity Area 2. This is due to the potential of harbouring regional important plants as well as being part of the remaining natural area around the larger centurion area.

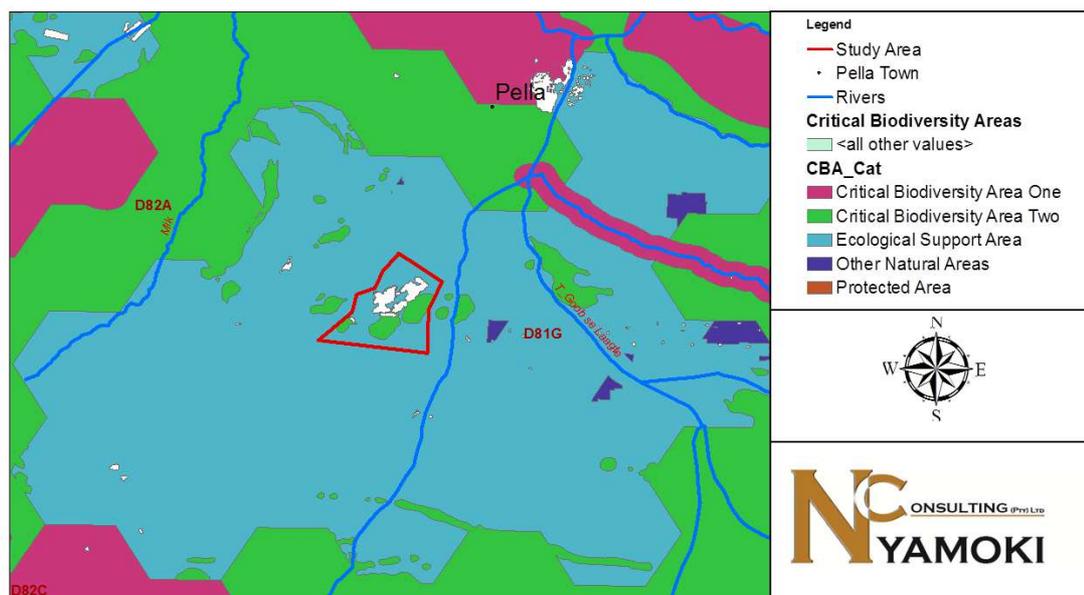


Figure 13: Sensitivity of the study area in relation to the Northern Cape Conservation Plan

Biodiversity

According to Mucina & Rutherford's (2006) classification of South Africa's vegetation, the proposed area falls in the Kimberley Thornveld which is regarded as Least Threatened.

Floral survey

A floral specialist study was conducted as part of the biodiversity assessment. According to the study, the area is considered to be of high conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type and protected/Red Data listed species. Biodiversity is however still relatively ubiquitous due to the vast and homogenous surrounding landscape.

Although the assessment was done during what is supposed to be a wetter season, the grass layer was found to be dry and some of the species could not be identified to the species level. Dominant floral species in this community include *Eragrostis lehmanniana*, *Aristida congesta*, *A. canescens*, *Digitaria eriantha*, *Urochloa mosambicensis*, *Setaria sphacelata*, *Themenda triandra*, *Cynodon dactylon* and *Heteropogon contortus*.



Figure 14: Dry grasses (grassland) noticed on site

Towards the river species such as *Salix mucronata*, *Searsia lancea* and *Vachellia (Acacia) karroo*. Other species include *Ziziphus mucronata*, *Gymnosporia buxifolia*, *Asparagus laricinus*, *Phragmites australis* were all recorded in seasonal and temporary saturation zones.



Figure 15: *Phragmites australis* and *Vachellia karoo* towards the river

A section of the site is characterised by trees, shrubs (being dominated) as well as a well-developed grass layer. It is mainly dominated by shrubs such as *Diospyros lycoides*, *Grewia occidentalis*, *Ziziphus mucronata*, *Rhus lancea*, *Acacia karroo*, *Acacia tortilis*, and *Acacia hebeclada*. Other species include *prosopis glandulosa*, *Melia azedarach*, *Asparagus densiflorus*, and *Asparagus laricinus*. The grass species include *Melinis repens*, *Themenda triandra*, *Panicum coloratum*, *Sporobolus africanus*, *Andropogon eucomus* and *Urochloa panicoides*.



Figure 16: Shrub-layer on site

Alien invasive plants

Declared weeds and invaders have the tendency to dominate or replace the herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Numerous alien plant species were recorded in the study area at the time of the survey; most notably the extensive invasions by species such as *Opuntia ficus-indica* and *Argemone mexicana* also have the potential to form dense stands. Table 10 lists the alien species as well as the various NEMBA categories for the alien species recorded during the survey.

Table 10: Alien species recorded in the study area.

Scientific name	Common name	NEMBA Category
<i>Phragmites australis</i>	Bird's brandy; cherry pie; tick-berry	1b
<i>Opuntia ficus-indica</i>	Prickly pear	1b
<i>Argemone Mexicana</i>	Mexican prickly poppy	1b
<i>Prosopis glandulosa</i>	Honey mesquite	2



Figure 17: *Opuntia ficus-indica* recorded as an invader on site

Medicinal Plants

The demand for medicinal plants is increasing while the frequently used species and the communal land that it is harvested from are on the decline. Most of the medicinal plant species recorded in the study area was alien species (Table 11).

Table 11: Medicinal plants recorded in the study areas.

Scientific name	Common name	Conservation Status
<i>Opuntia ficus-indica</i>	Prickly pear	Exotic
<i>Rhus lancea</i>	Karee	Indigenous
<i>Ziziphus mucronata</i>	Buffalo thorn	Indigenous

Faunal survey

A qualified zoologist undertook faunal survey in conjunction with the botanical study. Animals that were encountered during field survey include the rabbits, cows, donkeys, snakes, tortoise, kudu, birds, and wild dogs.

Signs of other mammals encountered were common warthog (*Phacochoerus africanus*), duiker (*Sylvicapra grimmia*) and steenbok (*Raphicercus campestris*) which are all provincially protected. This subsequently means that various meso-predators are also highly likely to be present. These species naturally utilise the area for breeding and/or persistence habitat but,

their mobility and the broad, continuous surrounding savannah landscape allows for individuals to simply leave an area where disturbance is taking place and disperse to other similar, adequate areas.

Avi-fauna

A desktop assessment (SABAP 2) showed that a total of 181 bird species have been confirmed within the 3 QDGCs.

Surface Hydrology

The proposed prospecting site is located on Farm Pella Mission 39. The southern edge of the project site is bounded by the non-perennial river. A hydrology specialist was appointed to undertake the specialist studies which composed of a desktop review of the regional as well as the site's hydrology, the rainfall and evaporation characteristics as well as the general climate of the area.

Flood lines for the sub-catchment were analysed to evaluate risks associated with potential flooding of infrastructure and to facilitate the protection of natural resources. The flood lines were determined using HEC-RAS model to indicate areas within the site where infrastructure associated with the proposed prospecting activities should not be built. The flood lines were determined for the 1:10 and 1:100 flood peaks as the 1:50 was very close to the 1:100 and therefore no difference could be observed.

Both the 1:10 and 1:100 year events indicated that the spread of water could not reach the proposed prospecting area and was therefore away from the 100m legislated boundary (Figure 18).

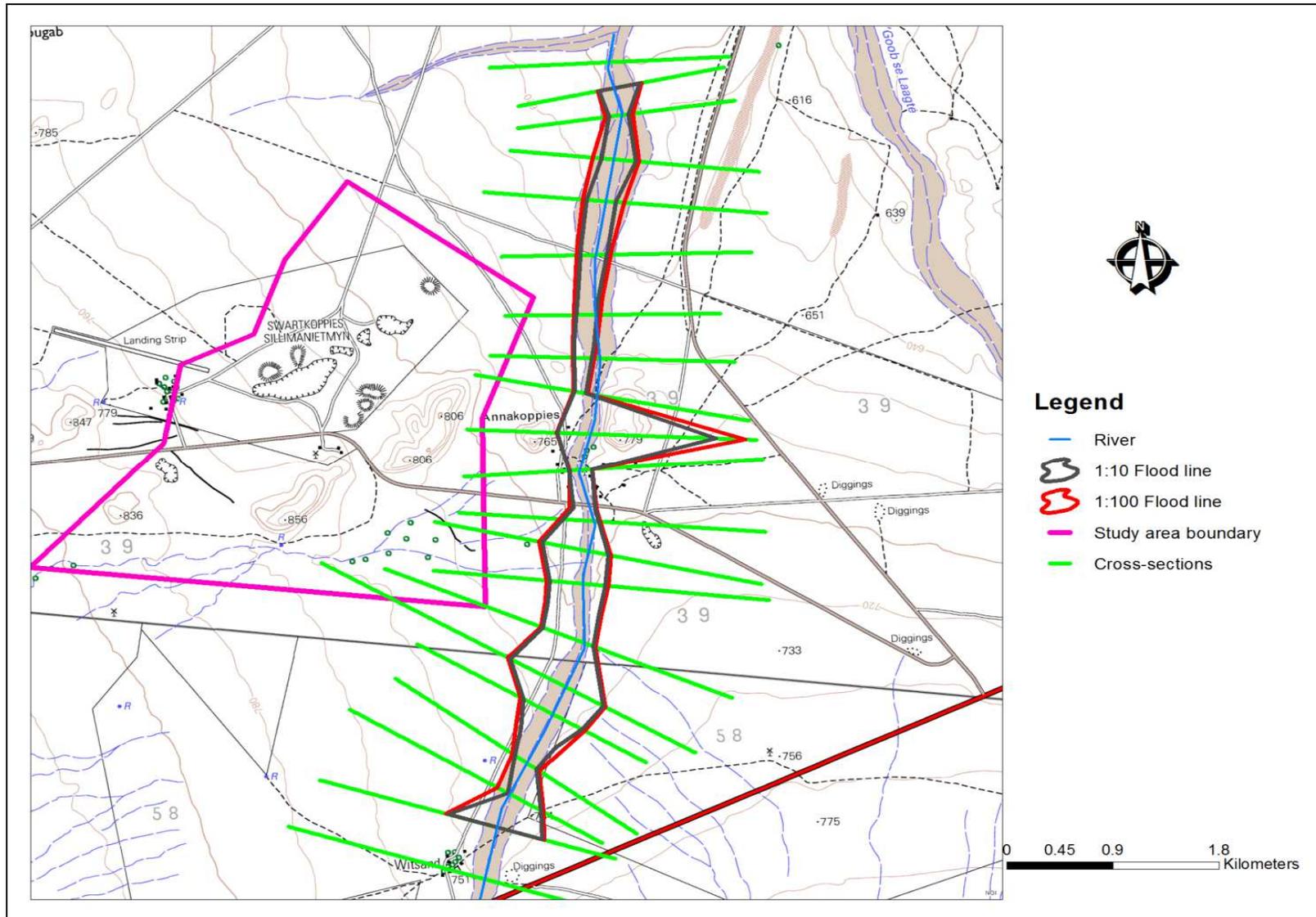


Figure 18 : Water Profile for the water course

Stormwater Management

According to the hydrology study, the principle conditions of GN 704 applicable to the development of a SWMP for the site are Conditions 5, 6 and 7. According to the study, the following stormwater management issues apply:

- Clean and dirty water catchments: Considering that at the moment, no infrastructure or equipment associated with the proposed activities is on site as well as the fact that the no fixed prospecting infrastructure is planned for use at the site. Delineation of the catchment to which the site belongs into Clean and Dirty Water areas is not warranted at this stage.
- Storm water management infrastructure: On account of no present prospecting activities on site, an absence of infrastructure and no detail yet on the proposed activities, it is not possible to develop a storm water management plan for the site as design information essential for determining the storm water infrastructure capacity to adequately contain dirty water is largely unavailable.

Water Quality Monitoring

The surface water flow on the site is known to only occur for short durations following significant rainfall events. Subsequently no surface water sampling was possible as part of this study.

The hydrology study concluded that the proposed study may not have impact on the non-perennial river; however caution should be exercised to ensure that the river course is protected.

Heritage Resources

A Heritage Assessment conducted for the project found that very little is known of the archaeology of the area, however prior desktop study of the region confirmed the distributions of both middle and later Stone Age artefacts commonly recorded around the Pans and calcrete deposits. The study found that the area is not rich in heritage resources; meaning that the proposed prospecting is generally acceptable. The study concluded that the proposed Sillimanite and Quartz prospecting activities are scheduled to take place on the lower lying area of the farm that encompasses previously disturbed areas. The surveys of the top soil show no other evidence of archaeological materials remains, capped or distributed as surface scatters on the landscape. There is no indication of graves or burial sites. There are no primary or secondary effect at all that are important to scientist or the general public that will be impacted in terms of generally protected heritage resources.

Groundwater

Pertinent geohydrological information as gathered from Department of Water and Sanitation (DWS) map: Groundwater Resources of the Republic of South Africa, sheet 1 and 2, 1995 is presented in Table 12.

Table 12: Regional Characteristics – Groundwater Resources of the Republic of South Africa

Characteristics	Prospecting Area
Nature of the water bearing rocks/surface/sub-surface lithology	Assemblage of compact sedimentary, extrusive and intrusive rocks.
Saturated interstice (storage medium) aquifer	Fractures restricted principally to a zone directly below groundwater level. This zone is transitional between weathered and fractured rock.

Characteristics	Prospecting Area
Recommended drilling depth	<20 m below groundwater table
Typical storage coefficient	< 0.001
Qualitative indication of spatial distribution of storage media based on successful drilling rate	<40 %
Probability of drilling a successful borehole (Accessibility)	<40% (A borehole is deemed successful if upon completion it yields more than 0.1 l/s)
Probability of drilling a successful borehole, yielding more than 2l/s (Exploitability)	10-20%
Mean depth to water table, according to Vegter (1995). Depth range: Standard deviation range from mean	30 – 50 m
	>30 m
Typical mean annual recharge	Ranges between 1mm – 5 mm/a (0.01 – 0.05% of MAP)
Groundwater component of river base low. Mean annual flow	1
Groundwater quality	TDS: 1000 - 1500mg/l (Lower standard deviation) and >3500 mg/l (Upper standard deviation)
Hydro-chemical type	Type A water (represented by 40% of the samples analysed). With type A, the major cations being Ca and/or Mg and dominant anions being Cl and/or SO ₄

Pertinent geohydrological information as gathered from DWS 1:500 000 Hydrogeological Map series of the Republic of South Africa, sheet 2916 Springbok (2001) is presented in Table 13.

Table 13: Regional Characteristics - 1:500 000 Hydro-geological map series

Characteristics	Prospecting Area
Nature of the water bearing rocks/surface/sub-surface lithology.	Predominantly meta-arenaceous rocks (quartzite and gneiss).
Saturated interstice (storage medium) aquifer.	Intergranular and fractured

Characteristics	Prospecting Area
Borehole yield class (median l/s) (excluding dry boreholes)	Ranges between 0.1/s to 0.5 l/s
Distribution of borehole data-points per 1 minute grid	No borehole information to 2 to 10 boreholes
Elevation above sea level	400 – 800 m
Mean annual precipitation	<100 mm
Groundwater quality	Electrical conductivity ranges between 70m ·/m – 300m ·/m Nitrates of >10mg/l and fluoride of >1.5mg/l

Pertinent geohydrological information as gathered from DWS map: Groundwater Harvest Potential of the Republic of South Africa, 1996 is presented in **Error! Reference source not found..**

Table 14: Regional Characteristics – Groundwater Harvest Potential of the Republic of South Africa

Characteristics	Prospecting Area
Maximum volume of groundwater (m³/km²/annum) that may annually be abstracted per surface area of an aquifer system to preserve a sustained abstraction	2500 m³/km²/annum to 4 000 m³/km²/annum
Factors restricting harvest potential	Volume of average annual recharge
Average borehole yields (geometric yield of blow yield l/s)	0.4 l/s
Groundwater quality	The geometric mean concentration of TDS is 1500 - 2000mg/l

Hydrocensus

Hydro-census was conducted as part of the groundwater specialist studies within a limited distance of 1 km radius of the study area to establish groundwater use information such as the registered and unregistered boreholes, borehole depth to water level, groundwater use, springs etc.

No registered boreholes were identified from the desktop study, so the exercise was narrowed to unregistered boreholes, springs and other relevant features. One (1) production borehole used by a far a farm on the eastern boundary of the study area was identified (Figure 19).

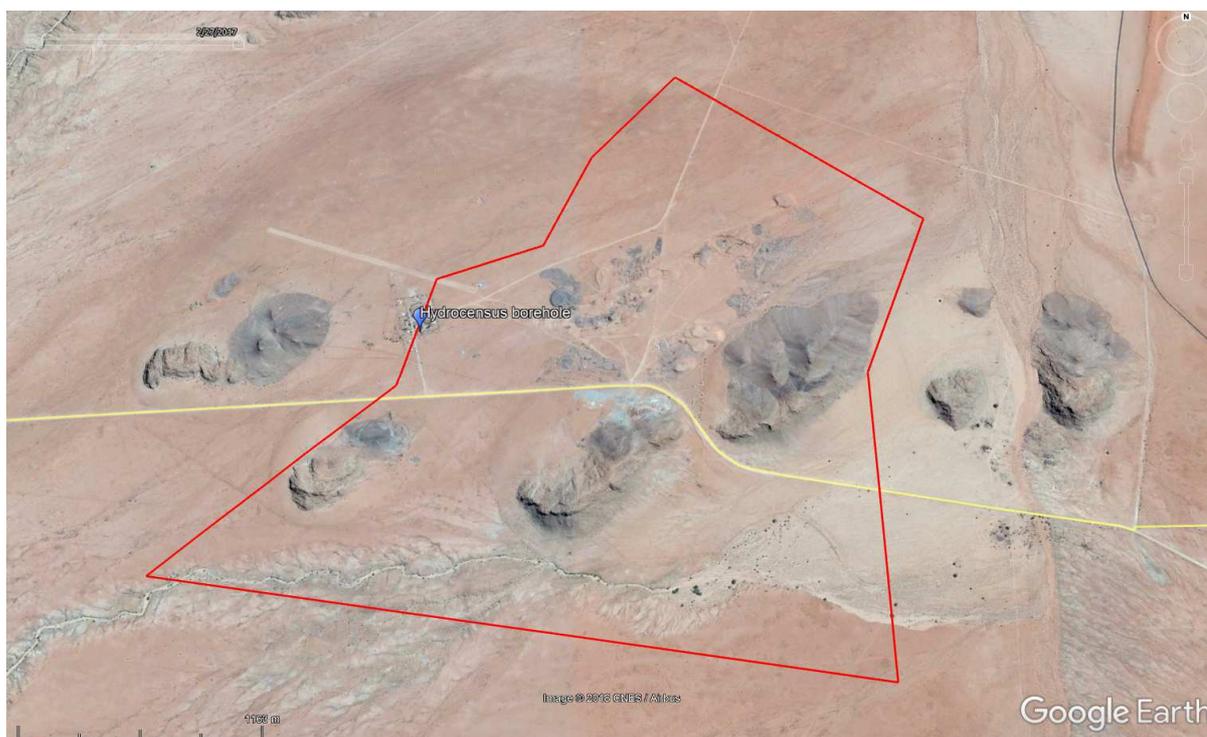


Figure 19: Hydrocensus borehole

This borehole is used for local residents and to support livestock farming. The farm house in the eastern side of the proposed mining area uses river water which during the fieldwork was total dry. Most of the house farm settlers were abandoned due to drought within the area.

Groundwater Quality

Water quality sampling was conducted both for the physical and chemical quality of the water within the proposed prospecting area. This sampling was done in order to determine the quality of groundwater before the prospecting which will serve as the control when sampling after the prospecting.

The water qualities have been defined in terms of the DWS quality of Domestic Water Supplies Assessment Guide (DWS, 1998).

Sampling was conducted for 4 boreholes within the study area here referred to as borehole 1 to borehole 4. On site sampling analysis was conducted for the physical properties of the water which was; total dissolved solids, pH, total dissolved oxygen, electrical conductivity and temperature.

The chemical quality of water was analysed at the laboratory for borehole 2 to 4 as borehole 1 water spilled on the way. The sample analysis result for both the physical and chemical quality is presented in Table 15.

Table 15: Water Quality Analysis

Sample descript	Unit	PL1	Class0	ClassI	ClassII	ClassIII	ClassIV
			Ideal	Good	Marginal	Poor	Dangers
PH		7.09	5-9.5	4.5-5&9.5-10	4-4.5&10-10.5	3-4&10.5-	<3&>11
ElectricalConduc tivity	mS/m	5	<70	70-150	150-370	370-520	>520
TotalDissolv edSolids	mg/L	303	<450	450-1000	1000-2400	2400-3400	>3400
Turbidity	NTU	2	<0.1	0.1-1	1- 20	20-50	>50

			Class0	ClassI	ClassII	ClassIII	ClassIV
Totalhardness	mg/L	176.90	0-200	200-300	300-600	>600	
Chloride	mg/L	5	<100	100-200	200-600	600-1200	>1200
Sulphate	mg/L	57.30	<100-200	200-400	400-600	600-1000	>1000
Nitrate	mg/L	0	<6	6- 10	10-20	20-40	>40
Fluoride	mg/L	0.26	<0.7	0.7-1.0	1.0-1.5	1.5-3.5	>3.5
Calcium	mg/L	3	0-80	80-150	150-300	>300	
Potassium	mg/L	1	<25	25-50	50-100	100-500	>500
Sodium	mg/L	4	<100	100-200	200-400	400-1000	>1000
Magnesium	mg/L	23.56	<30-70	70-100	100-200	200-400	>400
Manganese	mg/L	0,38	<0.05-0.1	0.1 -0.4	0.4 -4.0	4.0-10.0	>10.0
Iron	mg/L	0,15	<0.01-0.5	0.5-1.0	1.0-5.0	5.0-10.0	>10
Zinc	mg/L	<0.019	<3	3-5	5- 10	10-20	>20
Copper	mg/L	<0.4	0-1	1- 1.3	1.3-2	2- 15	>15
Cadmium	mg/L	1.45	<.003	0.003- .005	0.005- .02	0.02-0.05	>0.05

The result indicates that groundwater along the study area has high cadmium. The chronic exposure to this metal can result in kidney, bone and lung disease. It is therefore advised that groundwater from this borehole should be treated before use.

Cadmium sources could generally be natural and human induced. The natural source is mine with human intervention while the human sources could be activities such as landfill, crude oils, industrial and effluents.

The position of the old mine within the study area is on the lower gradient in relation to the sampled borehole. This rule out the possibility of contaminated groundwater flowing towards the borehole within the household on the western boundary of the study area. Therefore, the source of high cadmium could be from the community dump as the map indicates that there used to be more that 1 house on the western boundary of the study area

Aquifer Risk Assessment

An aquifer risk assessment was carried out in terms of 2 stages: evaluation of aquifer’s strategic value and the evaluation of vulnerability of the aquifer.

- **Aquifer Classification:** Aquifer classification was conducted in terms of the “South African Aquifer System Management Classification, December 1995” manual. The study found that the study area aquifer is classified as a minor aquifer system.
- **Aquifer Strategic Value:** The aquifer has medium strategic value as it does provide water supply for a household, small scale irrigation and also livestock/game farming. This aquifer also provides base flow for non-perennial rivers flowing into the Orange River. The area does not have prospects for development; however the aquifer needs to be protected as it’s the main source of water for game farming and livestock farming.
- **Aquifer Vulnerability:** The vulnerability, or tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer, in terms of the above is classified as medium. The aquifer is characterised by compact mudstone with low permeability, however water may flow through fractures and grains so should contaminant be introduced, it may not easily spread.
- **Aquifer Susceptibility:** Aquifer susceptibility, a qualitative measure of the relative ease at which a groundwater body can be potentially contaminated by anthropogenic activities and which include both aquifer vulnerability and the relative importance of the aquifer in terms of its classification, in terms of the above, is classified as medium.

Wetlands

The SANBI National Freshwater Priority Areas (NFEPA) database shows that there are no wetlands located on and / or within 500 m of the Pella 39 property.

Geology

The study area is situated in the Bushmanland terrane, one of the Northern Cape's tectonically bound terrains. The area consists of hard-rock formations; metasedimentary, metavolcanic and intrusive rock units of the Namaqua Metamorphic Province (Vegter, 2006), or Namaqua-Natal Province (SRK, 2010).

The Bushmanland Terrane is composed of basement granitic rocks (1 700- 2 050Ma), supracrustal sequences of sedimentary and volcanic origin (1 200, 1 600 and 1 900Ma) and intrusive charnokite to granitic rocks (950, 1 030-1 060 & 1 200Ma). The rocks here have been subjected to multiple phases of deformation and medium- to high-grade metamorphism during the Namaqua Orogeny at ~1 200-1 000Ma (SRK, 2010).

The plains consist of various depths of surficial, relatively thin cover of wind-blown sand, dunes, scree rubble, sandy soil and alluvium (SRK, 2010). Underlying this in the vicinity of the inselberg is the Haramoep Gneiss Member of the Koeipoort (Gneiss) Formation, which is a pink medium to fine grained, biotite-rich, leucogneiss. The gneiss can be considered the basement rocks in the region.

The Namies Schist Member of the Wortel (Witputs) Formation overlies the Haramoep Gneiss. It is pelitic schist around 70 m thick. The schist is clearly visible in the walls of the inselberg, and the base of the schist forms a bowl shape. Overlying the Koeipoort Formation, is the Pella Quartzite Member of the Wortel (Witputs) Formation, reported as a layered sequence of medium to thick bedded quartzite with interbedded sillimanite, lenticular quartzite, biotite gneiss and amphibolite/calc-silicate gneiss (SRK, 2010). Outcrops of the Pella Quartzite in Pella inselberg suggest the interbedded units are minor, and the massive fractured quartzite dominates. The unit reaches a maximum stratigraphic thickness 375 m.

b) Description of the current land uses.

The municipality has extensive land which is predominantly used for livestock farming. The grazing potential (measured in hectares required to sustain one large livestock unit) is relatively low. This necessitates large farming units, mainly used for livestock (cattle, sheep and antelope) and game farming (80%).

The soils and land capability specialist studies found that the entire subject property and its immediate surrounds can be broadly defined as Nama Karoo. The land use on the study area can be defined as stock farming production and a smaller part as part for crop farming. Some 44% of the Nama Karoo in which the study area falls is transformed primarily by mines and settlement. According to the study, cattle and sheep farming will be a viable post mining land use of the site as long as the field quality is maintained by never exceeding the grazing capacity. Post-mining land use should aim to re-establish the cattle and sheep farming potential of the land.



Figure 20: Old mining area

c) Description of specific environmental features and infrastructure on the site.

The proposed prospecting area is characterised by rivers in the bottom half of the area. A row of trees along the rivers in some places is observed. There is a dry water course at about 3.5 km east of the study area. There are few buildings as well as a wind pump that can also be noticed within the study area. The northeastern side is dominated by mine dumps and excavations. Figure 21 shows the environmental features in the study area.

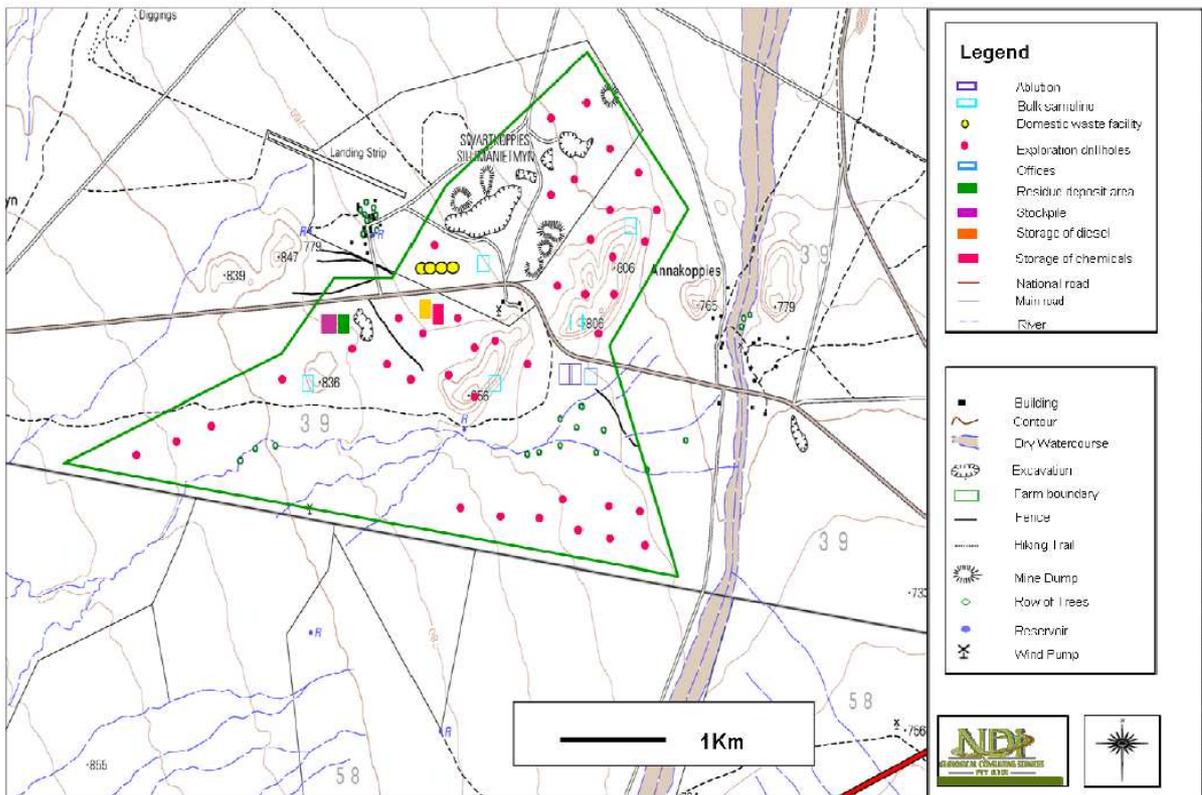


Figure 21: Environmental Features and Infrastructure

d) Environmental and current land use map.

(Show all environmental, and current land use features)

According to the DEA datasets, the landuse shows that the project area is characterised by old mining area, bare areas and low shrub land (Figure 22).

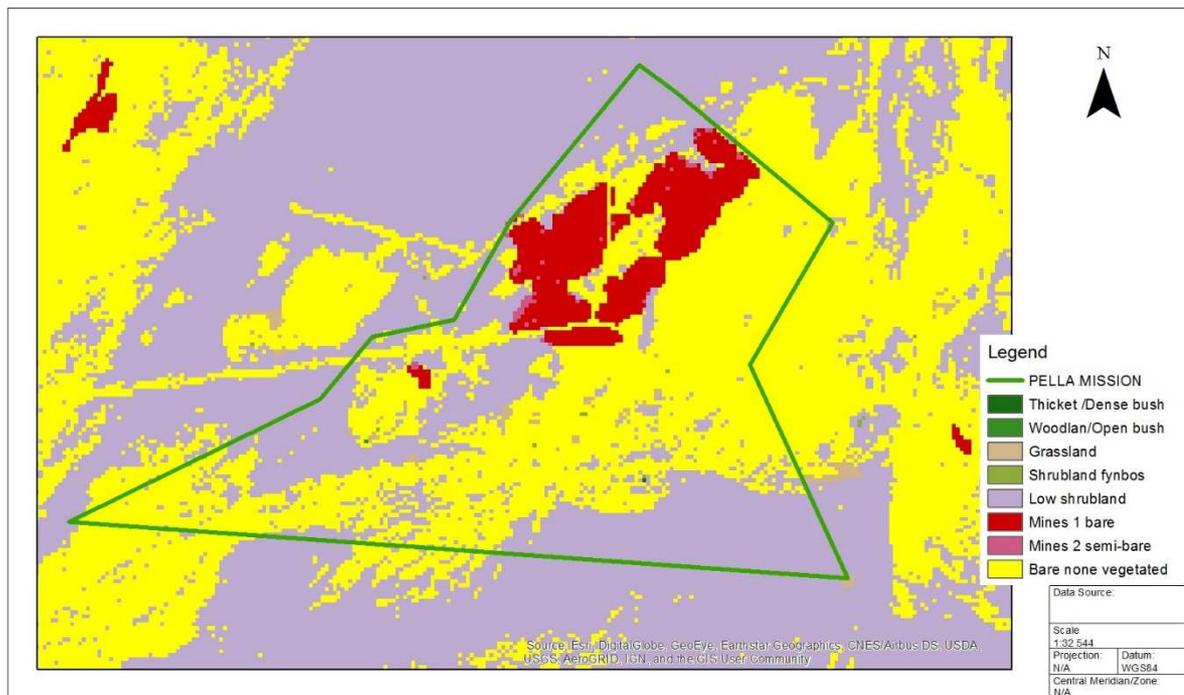


Figure 22: Environmental and current landuse

The site visit conducted by the EIA team found that the current land use indicators are subsistence farming. The land is capable for crop farming but due to the insufficient surface water available within the study area, the area is mostly used for livestock farming. The land has been previously used for mining activity which seemly closed down past years.

v. Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).

Construction

The construction phase of the project will entail the site establishment for the access roads, the camp site as well as surveying and pegging sites. Environmental impacts on the biophysical and socio-economic environment which are anticipated to occur throughout the construction were identified as follows:

- **Socio-Economic:** The main positive impacts of the prospecting activities will be the temporary creation of jobs during the construction phase of the project. The project may also result in a temporary boost in small local businesses in the area. Although the heritage assessment found that there are no heritage and/or cultural resources on the proposed project site, it must be noted that there is a possibility that there may be graves located on the site. Site establishment activities may result in grievance as a result of possible grave relocation. It is expected that the final site layout will take into account all the sensitive environment in the area and will avoid graves and other heritage and cultural resources in the area. Movement of construction vehicles on the roads (R723 and R82 and other farm roads) may increase the risks accidents on the roads. Other health and safety risks may be as a result on construction workers lighting fires on site, littering and lack of housekeeping. Potential increase in social pathologies and negative health impacts due to potential squatting of job seekers and increase in nuisance dust may also occur.
- **Groundwater:** The use of earth moving machinery and construction vehicles on site poses the risk of chemical spillages including fuel and oils, which may leach into the groundwater. The removal of vegetation could furthermore lower the evapotranspiration rates, thereby allowing a greater volume of potentially contaminated water to percolate to the underlying aquifer in the event of an accidental spill from the machinery. It must however be noted that the removal of vegetation will be limited to the required footprints for the access roads, the boreholes and sumps as well as the camp sites. The impact on evapotranspiration is therefore expected to be negligible. Site clearing and grubbing is unlikely to materially affect the groundwater within the project area. However, care should be taken during the utilisation and storage of hydrocarbons and chemicals, which may have an impact on groundwater quality as a result of spillages and uncontrolled release.
- **Surface water:** The potential impacts on surface water during the construction phase of the proposed project are as follows:
 - Accidental spillages of hazardous substances from construction vehicles used during construction, as well as from hazardous storage areas;
 - Contamination of runoff by poor materials/waste handling practices;
 - Debris from poor handling of materials and/or waste blocking watercourses;
 - Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality;

- Increase in turbidity of the local water streams as a result of runoff of cleared areas; and
- Increase of surface runoff and potentially contaminated water that needs to be controlled in the areas where site clearing has occurred.

Some level of sedimentation is expected to occur in the watercourses that traverse the project area as runoff is naturally anticipated to pick up environmental debris as it crosses natural areas. Increased turbidity is reversible and surface water should return to pre-impact turbidity levels once sediment levels entering the watercourse are reduced. Settled sediments should naturally move downstream during periods of high flow flowing storm events.

- **Wetlands and Aquatic Ecosystems:** The removal of vegetation from the construction area is also expected to have an impact on the provision of ecological and sociocultural services by wetlands by flood attenuation and assimilation abilities of the wetlands. In addition, construction waste dumping and oil leakages from construction vehicles will alter biodiversity maintenance of the wetland features, which endangers the survival of wetland species inhabiting the area. Impacts on the wetlands will include:
 - Loss of habitat and wetland ecological structure as a result of site clearance activities and uncontrolled wetland degradation;
 - Impact on the wetlands systems as a result of changes to the sociocultural service provisions though site clearance, waste management and wetland disturbance;
 - Potential poor planning, resulting in the placement of the access roads across wetland habitats, leading to altered habitat;
 - Impact on the hydrological functioning of the wetland systems;
 - Soil compaction and levelling as a result of construction activities and vehicle movement leading to loss of wetland and riparian habitat; and
 - Increased runoff due to topsoil removal and vegetation clearance leading to possible erosion and sedimentation of wetland and riparian resources.
- **Heritage and Archaeological Resources:** Although the heritage resources assessment found that there are no heritage resources located on the proposed project site, there is a possibility that some graves may have been missed during the assessment. The siting of the boreholes and infrastructure will be in such a way as to avoid sensitive environments, which include graves and archaeological resources as far as is practicable.
- **Palaeontology Impacts:** Earth moving activities may result in the unearthing and destruction of fossils (if any). It is however expected that the probability of the construction activities to impact on palaeontology resources will be low, given that the area was previously used for mining.
- **Flora:** The project may result in the following impacts on the floral environment during the construction phase:
 - Destruction of potential floral habitats for species of conservational concern, including the medicinal plant species as a result of site clearing, proliferation of uncontrolled alien species and soil compaction;
 - Vegetation clearance may lead to floral habitat loss of potential species of conservational concern;
 - Impact on floral diversity as a result of site clearance, anthropogenic activity, and possible uncontrolled fires;
 - Potential spreading of alien invasive species as a result of floral disturbance;

- Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase;
- Generation of waste and incorrect disposal from construction material may lead to disturbance of natural vegetation; and
- Habitat fragmentation as a result of construction activities of the access roads leading to loss of floral diversity.
- Fauna: The project may result in the following impacts on the faunal environment during the construction phase:
 - Loss of faunal habitat and ecological structure as a result of site clearing, alien invasive species, erosion, and general construction activities;
 - The establishment of trenches poses a threat to fauna due to falling into the trenches;
 - Loss of faunal species due to collisions with construction vehicles and machinery;
 - Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal specie trapping;
 - Impact on faunal species of conservational concern due to habitat loss and collision with construction vehicles;
 - Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts on faunal habitat during the operation phase.

The loss of biodiversity is expected be insignificant as it will be limited to the footprints of the required infrastructure. However, mitigation and management of species of conservational concern, if any, needs to be adhered to. The infrastructure that will have the significant impact on biodiversity is expected to the access roads.

- Air Quality: The movement of construction vehicles and earth moving machinery as well as the stripping of vegetation will likely result in an increase in nuisance dust, PM10 and PM2.5. There is also potential for increase in carbon emissions and ambient air pollution due to the movement of vehicles and construction machinery. It is expected that the implementation of dust suppressing mitigation measures will result in the reduction in nuisance dust.
- Visual: The following impacts on the visual character as a result of the proposed project are envisaged during the construction phase:
 - Scaring of the landscape as a result of the clearance of vegetation;
 - Visual intrusion as a result of the movement of machinery and the erection of contractor camps; and
 - Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.
- Ambient Noise: The use of vehicles and machinery may result in an increase in ambient noise in the immediate vicinity of the project.
- Soil Landuse and Land Capability: During the construction phase, all infrastructure and activities required for the operational phase will be established. The main envisaged activities include the following:
 - Movement of construction vehicles, machinery and workers in unprotected areas (bare) may result in compacting of the soil of the existing roads. Fuel and oil spills from vehicles may result in soil chemical pollution;

- Clearing of vegetation will result in the soils being particularly more vulnerable to soil erosion. The impact can persist long after cessation of prospecting activities depending on mitigation and rehabilitation strategies. Strategic stormwater management should be put in place to minimise soil losses.
- Soil contamination as a result of construction activities can be as a result of a number of activities (i.e. incorrect hazardous substance storage, incidental hydrocarbon leakages from construction vehicles);
- Loss of soil resource and utilisation as a result of the cleaning and topsoil stripping of the construction footprint. Although soils will be stripped and stockpiled, loss of seed reserve and organic matter depletion through decomposition during stockpiling will severely reduce soil quality and its ecological function if not managed appropriately. Re-vegetation should be imposed as far as is possible to maintain soil fertility through natural nutrient cycling during soil storage prior to rehabilitation phase; and
- In areas of permanent changes such as the borehole and sump area access roads (tracks), the erection of infrastructure and stockpiles, the current land capability and land use will be lost permanently. This will however be localised to the footprint of the infrastructure.
- Traffic: The movement of construction vehicles in the project area will result in an increase in traffic on the roads.
- Climate Change: The movement of vehicles and earth moving machinery may result in the production of carbon dioxide (Green House Gas), which may have an impact on the climate in the area.

The above mentioned impacts were assessed based on the quantitative impact assessment methodology described in Section VI of this Report. For each impact assessed, mitigation measures have been proposed to reduce or avoid negative impacts and enhance positive impacts. These mitigations were also incorporated in the EMPr to ensure that they are implemented during the various phases of the proposed project.

It is not anticipated that the proposed prospecting activities will have any lasting material effects on existing land uses on the prospecting areas or any other areas in the vicinity thereof. It is expected that all of the potential impacts will be reversible except in the event that areas of archaeological importance are disturbed which may cause irreplaceable damage.

The summary of the impact assessment during the construction phase is provided in Table 16.

Table 16: Impact Assessment Table for the Construction Phase

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation								
		Consequence			Probability		Frequency: Impact	Significance		Significance Rating	Consequence			Probability		Frequency: Impact	Significance	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Severity					Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance			
Site Establishment: Establishment of the access (tracks) to the prospecting site, Establishment of the campsite, site physical surveying and pegging of drilling sites																		
Social	Influx of job seekers will have a negative social impact on the landowners and land occupiers.	2	2	3	2	2	28	Medium Low	Random and regular alcohol and drug testing shall be conducted on all personnel responsible for operating machinery and driving construction vehicles to ensure the safety of the public; Security and safety should be emphasised; Recruitment will not be undertaken on site; Recruitment practises will favour locals, but farm labourers will not employed unless agreed to with the farm owners; Liaise with the SAPD and existing forums in order to implement effective crime prevention strategies; and No construction workers shall be allowed to access private properties without the owner's knowledge and consent.	1	1	1	1	2	9	Low		
	Unauthorised access to private property outside of the demarcated areas will result in conflict with landowners.	2	2	3	2	2	28	Medium Low		1	1	1	1	2	9	Low		
	Increased traffic in the area will increase the likelihood of accidents on the roads, posing a health and safety issue for the land owners and land occupiers.	2	2	3	2	2	28	Medium Low		1	1	1	1	2	9	Low		
	The influx of job seekers in the area may result in an increase in petty crimes.	2	2	3	2	2	28	Medium Low		1	1	1	1	2	9	Low		
	Ineffective communication channels leading to community unrest.	2	2	3	2	2	28	Medium Low		1	1	1	1	2	9	Low		
	Negative impact as a result of the dissection of land by clearing and excavations for construction of infrastructure, constraints to access to cultivated land to farmers, impacting on day to day farm activity.	3	1	3	2	2	28	Medium Low		1	1	1	1	2	9	Low		
	Negative impact as a result of localised loss of cultivated land, impacting on potential crop yield.	3	1	2	2	2	24	Low		1	1	1	1	2	9	Low		
	Possible boost in short term local small business opportunities.	3	1	3	2	2	28	Medium Low positive		3	1	3	2	2	28	Medium Low positive		
Groundwater	Localised spillages of oils from machinery leaching to groundwater contamination.	3	2	2	2	2	28	Medium Low	No washing of vehicles shall be allowed outside demarcated areas. The bays will be clearly demarcated and will not be allowed to contaminate any surface runoff; Sufficient areas shall be provided for the maintenance and washing of vehicles; Refuelling of vehicles will only be allowed in designated areas; All construction equipment shall be parked in a demarcated area Drip trays shall be used when equipment is not used for some time; On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the material; Bund areas shall contain 110% of the stored volume; Bund areas must be impermeable; Bund areas must have a facility such as a valve/sump to drain or remove clean stormwater; Contaminated water shall be pumped into a container for removal by an approved service provider; Regular inspections shall be carried out to ensure the integrity of the bundwalls; All preventative servicing of earth moving equipment and construction vehicles shall be undertaken off site; Runoff from this area shall be contained; Spill kits shall be made available and all personnel shall	2	1	1	2	2	16	Low		
	Existing boreholes within the prospecting area may create conduits of flow to the groundwater unless sealed.	3	2	2	2	2	28	Medium Low		2	1	1	2	2	16	Low		

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation							
		Consequence			Probability					Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating	
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating									
									Management and Mitigation Measures								
									be trained on how to use the kits and training records shall be made available on request.								
Surface Water	Increase in silt load in runoff due to site clearing, grubbing and the removal of topsoil from the footprint area associated with the drill sites and associated infrastructure.	2	3	2	2	2	28	Medium Low	Ensure that topsoil is properly stored, away from the streams and drainage areas; No construction activities will be undertaken within 100 metres of the nearby streams and 500 meters from wetlands and/or riparian areas without consent from the DWS; Vehicle and personnel movement within watercourses and wetland areas shall be strictly prohibited; Adequate stormwater management must be incorporated into the design of the project in order to prevent contamination of water courses and wetlands from dirty water.	1	1	1	2	2	12	Low	
	Potential deterioration in water quality due to the potential accidental spillages of hazardous substances.	2	3	2	2	2	28	Medium Low		1	1	1	2	2	12	Low	
	Debris from poor handling of materials and/or waste blocking watercourses, resulting in flow impediment and pollution.	2	2	2	2	2	24	Low		1	1	1	2	2	12	Low	
	Contaminated dirty water runoff to surrounding areas resulting in the impact on local surface water quality.	2	3	2	2	2	28	Medium Low		1	1	1	2	2	12	Low	
	Increase of surface runoff and potentially contaminated water that needs to be maintained in the areas where site clearing occurred.	3	2	2	2	2	28	Medium Low		1	1	1	2	2	12	Low	
Wetlands and Aquatic Ecosystems	Localised changes to the riparian areas as a result of vegetation clearing.	2	2	2	2	3	30	Medium Low	Adequate stormwater management must be incorporated into the design of the project in order to prevent erosion and the associated sedimentation of the aquatic system; No construction activities shall be allowed within 500 m of wetlands and/or riparian zones without consent from the DWS; No vehicles may be allowed to indiscriminately drive through the riparian areas or within the active stream channels; All disturbed areas shall be re-vegetated with indigenous species; All construction materials shall be kept out of the wetlands and riparian areas; and All vehicles shall be regularly inspected for leaks. Re-fuelling must take place outside the project area, on a sealed surface area to prevent ingress of hydrocarbons into topsoil and aquatic ecosystems	1	1	1	1	1	6	Low	
	Loss of habitat and wetland ecological structure as a result of site clearance activities and uncontrolled wetland degradation.	3	2	2	2	2	28	Medium Low		1	1	1	1	1	6	Low	
	Impact on the wetlands systems as a result of changes to the sociocultural service provisions.	3	2	2	2	2	28	Medium Low		1	1	1	1	1	6	Low	
	Increased runoff due to topsoil removal and vegetation clearance leading to possible erosion and sedimentation of wetland and riparian resources.	3	2	2	2	2	28	Medium Low		1	1	1	1	1	6	Low	
	Soil compaction and levelling as a result of construction activities and vehicle movement leading to loss of wetland and riparian habitat.	3	2	2	2	2	28	Medium Low		1	1	1	1	1	6	Low	
	Impact on the hydrological functioning of the wetland systems.	3	2	2	2	2	28	Medium Low		1	1	1	1	1	6	Low	
Heritage Resources	The proposed project has the potential to impact on local graves within the area.	2	1	2	2	2	20	Low	Prior to the site establishment, a heritage impact assessment must be undertaken and mitigation and /or management measure for the protection of such resources must be implemented; No construction activities may be undertaken within 50 m of the heritage and/or cultural sites; If archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.	1	1	1	1	1	6	Low	
	The proposed project has the potential to impact on sites of archaeological importance.	2	1	2	2	2	20	Low		1	1	1	1	1	6	Low	
Palaeontological Resources	Drilling of exploratory boreholes has potential to impact on palaeontological resources	2	1	2	2	1	20	Low	Should fossils be exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.	1	1	1	1	1	6	Low	
Flora	Loss of localised biodiversity habitats within sensitive areas due to site clearance and establishment of drill	2	1	2	2	2	20	Low	The Contractor shall be on the lookout for SCC and any floral SCC encountered within the development footprint	1	1	1	1	2	9	Low	

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation						Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation									
		Consequence			Probability				Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating			
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance									Significance Rating		
	sites.																	
	Loss of localised floral species diversity including RDL and medicinal protected species due to site clearance and establishment of drill sites.	2	1	2	2	2	20	Low	are to be relocated to areas with suitable habitat, outside the disturbance footprint; Floral species of conservation concern, if encountered within the development footprint, are to be handled with care and the relocation of sensitive plant species to suitable similar habitat is to be overseen by a botanist;	1	1	1	1	2	9	Low		
	Potential spreading of alien invasive species as indigenous vegetation is removed and pioneer alien species are provided with a chance to flourish.	2	1	2	2	2	20	Low	The proposed development footprint shall be kept to the minimum; All disturbed areas must be concurrently rehabilitated during construction; Prohibit the collection of any plant material for firewood or medicinal purposes; The existing integrity of flora surrounding the study area shall be upheld and no activities shall be carried out outside the footprint of the construction areas; Edge effect control shall be implemented to avoid further habitat degradation outside of the proposed footprint area; All sensitive open space areas will be demarcated and access into these areas shall be prohibited; Protected floral species occurring within the vicinity of the study area, but outside the disturbance footprint shall be fenced for the duration of the construction activities; Monitoring of relocation success will be conducted during the operational phase; Construction related activities shall be kept strictly within the development footprint; Construction vehicles shall only be allowed on designated roadways to limit the ecological footprint of the project. Alien Invasive Plant Species Management plan to be implemented; Edge effects of activities including erosion and alien/weed control will be strictly managed in the riparian area; All sites disturbed by construction activities shall be monitored for colonisation by exotic or invasive plants; Exotic or invasive plants shall be controlled as they emerge; An alien vegetation control program must be developed and implemented within all disturbed areas. After removal of alien vegetation, the affected areas must be re-assessed to determine the success of the program and any follow up measures that may be required; The eradicated plant material must be disposed of at an approved solid waste disposal site; During post-construction, an alien vegetation removal and monitoring plan must be compiled for those areas which were not effectively rehabilitated; The extent of invasion must be established through investigation to identify priority areas; Priority species shall be identified to control and develop protocols for the removal of all alien species e.g. mechanical removal, herbicidal treatment etc. Mechanical, methods must be favoured for the removal of alien invasive species. Chemical removal shall only be	1	1	1	1	2	9	Low		

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation							
		Consequence			Probability					Consequence			Probability				
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating	
									Management and Mitigation Measures								
									undertaken by a suitably qualified and approved person; and As much vegetation growth as possible must be promoted in order to protect soils. In this regard, special mention is made of the need to use indigenous vegetation species where hydro seeding, rehabilitation planting (where applicable) are to be implemented.								
Fauna	Vegetation clearance may result in loss of faunal habitat ecological structure, species diversity and loss of species of conservation concern.	2	1	2	2	2	20	Low	The proposed development footprint areas shall remain as small as possible and where possible be confined to already disturbed areas;	1	1	1	1	2	9	Low	
	Habitat fragmentation as a result of construction activities of the access roads leading to loss of floral diversity.	2	1	2	2	2	20	Low	No trapping or hunting of fauna shall be permitted; Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, need to be strictly managed;	1	1	1	1	2	9	Low	
	Loss of faunal diversity and ecological integrity as a result of construction activities, erosion, poaching and faunal specie trapping.	2	2	2	2	2	24	Low	Should any SCC be encountered within the study area, these species will be relocated to similar habitat within or in the vicinity of the study area with the assistance of a suitably qualified specialist;	1	1	1	1	2	9	Low	
	Movement of construction vehicles and machinery may result in collision with fauna, resulting in loss of fauna.	2	2	2	2	2	24	Low	No informal fires in the vicinity of construction areas shall be permitted; An alien vegetation control plan must be developed and implemented in order to manage alien plant species occurring within the study area, and to prevent further faunal habitat loss.	1	1	1	1	1	6	Low	
Air Quality	Possible increase in dust generation, PM ₁₀ and PM _{2.5} as a result of bulk earthworks, operation of heavy machinery, and material movement.	2	2	2	2	2	24	Low	Dust suppression measures shall be implemented on dry weather days and periods of high wind velocities; Appropriate dust suppression measures may include spraying with water;	1	2	1	1	2	12	Low	
	Increase in carbon emissions and ambient air pollutants (NO ₂ and SO ₂) as a result of movement of vehicles and operation of machinery/equipment.	2	2	2	2	2	24	Low	Where practical rehabilitation should be undertaken in tandem with the construction activities; A speed limit of 40 km/hr shall apply to limit vehicle entrained dust from the unpaved road; All construction equipment must be scheduled for preventative maintenance to ensure the functioning of the exhaust systems to reduce excessive emissions and limit air pollution; Dust control suppression shall be implemented on dry weather days and periods of high wind velocities; Appropriate dust suppression measures may include limiting the extent of open areas, reducing the frequency of disturbance and spraying with water; Where practical rehabilitation should be undertaken progressively; Materials transported on public roads must be covered; Odours: Putrescible waste must be handled, stored and disposed of before the probability of it generating odours; and Chemical toilets must be emptied / serviced on a regular basis. Proof of this must be provided to the Engineer.	1	2	1	1	2	12	Low	

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability					Consequence			Probability			
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating
Visual	Scaring of the landscape as a result of the clearance of vegetation.	2	1	2	2	2	20	Low	The number of construction vehicles and machinery to be used shall be kept to a minimum; Movement of vehicles shall be kept to outside busy hours to minimise the visual impacts on the residents; Materials transported on public roads must be covered; and Where possible, rehabilitation of the work areas shall be undertaken in tandem with construction to ensure that areas stripped of vegetation are kept to a minimum.	1	1	1	1	2	9	Low
	Visual intrusion as a result of the movement of machinery and the establishment of the required infrastructure.	2	1	2	2	2	20	Low		1	1	1	1	2	9	Low
	Indirect visual impact due to dust generation as a result of the movement of vehicles and materials, to and from the site area.	2	1	2	2	2	20	Low		1	1	1	1	2	9	Low
Noise	The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity.	2	2	2	2	2	24	Low	Adjacent landowners must be advised of any work that will take place outside of normal working hours, that may be disruptive (e.gw. noise) in advance; Surrounding communities must be notified in advance of noisy construction activities; All equipment should be provided with standard mufflers; Muffling units on vehicles and equipment must be kept in good working order. Construction staff working in areas where the 8-hour ambient noise levels exceed 85 Dba should wear ear protection equipment; Where possible, operation of several equipment and machinery simultaneously must be avoided; All equipment must be kept in good working order, with immediate attention being paid to defective silencers, slipping fan-belts, worn bearings and other sources of noise; Equipment must be operated within specifications and capacity (e.g. no overloading of machines); Regular maintenance of equipment must be undertaken, particularly with regard to lubrication; Equipment shall be switched off when not in operation; Appropriate directional and intensity settings must be maintained on all hooters and sirens; The Contractor must ensure that the employees conduct themselves in an appropriate manner while on site; and Noise/vibration producing activities shall be limited to daylight hours (Monday to Friday 07H00 to 17H30 and Saturday 07H00 -14H00). No noise/vibration producing activities shall be undertaken on Saturdays on farms unless this has been agreed to by the farmer.	1	1	1	2	1	9	Low
Soil, Land use and Land Capability	Localised chemical pollution of soils as a result of vehicle hydrocarbon spillages and compaction.	2	1	2	2	2	20	Low	Contaminated soil shall be removed and disposed of to an appropriate licensed landfill site in terms of NEM: WA, or can be removed by a service provider that is qualified to clean the soil; The time in which soils are exposed during construction activities should remain as short as possible;	1	1	1	2	1	9	Low
	Localised clearing of vegetation and compaction of the construction footprint will result in the soils being particularly more vulnerable to soil erosion.	2	1	2	2	2	20	Low		1	1	1	1	2	9	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability					Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating								
	Localised loss of resource and its utilisation potential due to compaction over unprotected ground/soil.	2	1	2	2	2	20	Low	Erosion control measures shall be implemented where deemed necessary; In general all steep slopes steeper than 1:3 or where the soils are more prone to erosion must be stabilised; If stockpiles are not going to be used immediately the stockpiles shall be rehabilitated to prevent erosion; Runoff from stockpiles shall be detained in order to support growth of vegetation; Runoff from the stockpiles shall be suitably managed to ensure that the runoff volumes and velocities are similar to pre disturbed levels; Vegetation shall be used to promote infiltration of water into the stockpile instead of increasing runoff; A monitoring programme will be implemented if the stockpiles are not used within the first year whereby the vegetation of the stockpiles is monitored in terms of basal cover and species diversity; If it is noticed that the vegetation on the stockpiles is not sustainable, appropriate corrective actions shall be taken to rectify the situation; Stockpiles shall be maintained until the topsoil is required for rehabilitation purposes; Topsoil stockpiles shall be monitored regularly to identify alien vegetation, which shall be removed as soon as possible to prevent further distribution of any alien vegetation.	1	1	1	1	2	9	Low
	Localised loss of soil and land capability due to reduction in nutrient status - de-nitrification and leaching due to stripping and stockpiling footprint areas.	2	1	2	2	2	20	Low		1	1	1	1	2	9	Low
Traffic	Increase in traffic volumes as a result of pre-construction activities which may lead to an increase in traffic congestion along the R82 and R723 roads as well as the farm roads around the prospecting area.	2	3	2	2	2	28	Medium Low	Local speed limits and traffic laws shall apply at all times to minimise the occurrences of accidents on public roads; The number of construction vehicles and trips shall be kept to a minimum; and Where possible the transportation of construction materials and rubbish shall be undertaken outside traffic peak hours to minimise inconveniencing residents.	2	2	2	1	2	18	Low
Climate	Emissions of Green House Gases as a result of the use of plant, heavy moving machinery, generators etc.	2	2	2	2	2	24	Low	All the construction vehicles shall undergo maintenance on a regular basis to improve on the combustion engine vehicle efficiency.	1	2	1	1	1	8	Low
Waste Management	Potential water and soil pollution as a result of inappropriate waste management practices.	2	3	2	2	2	28	Medium Low	Separation of waste: All waste shall be separated into general waste and hazardous waste; Hazardous waste shall not be mixed with general waste and in doing so increase the quantities of hazardous waste to be managed; General waste can further be separated into waste that can be recycled and or reused; No littering shall be allowed in and around the site, a sufficient number of bins shall be provided for the disposal of waste; Where necessary dedicate a storage area on site for collection of construction waste. Storage of waste: No stockpiling of debris shall be permitted within 100 m of any water courses and drainage lines, or within 500 m of wetland and riparian areas;	2	2	2	1	2	18	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation						Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation					
		Consequence			Probability				Consequence			Probability		
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance		Significance Rating	Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact
								<p>General waste will be collected in an adequate number of litter bins located throughout the construction site; Bins must have lids in order to keep rain water out; Bins shall be emptied regularly to prevent them from overflowing; All work areas shall be kept clean and tidy at all times; All waste management facilities will be maintained in good working order; Waste shall be stored in demarcated areas according to type of waste; Runoff from any area demarcated for waste will be contained, treated and reused; Flammable substances must be kept away from sources of ignition and from oxidizing agents; No construction rubble shall be disposed of to the riparian area; If construction rubble is not removed immediately it shall be stockpiled outside the 1:100 year floodline and outside the sensitive wetland and riparian areas; Demolition waste and surplus concrete shall be disposed of responsibly; Waste shall not be buried or burned on site; and The maximum retention time for temporary storage of waste generated shall not exceed 30 days, provided the waste does not present a health hazard or risk of odour.</p> <p>Disposal of hazardous waste: No dumping shall be allowed in or near the construction site; Hazardous containers shall be disposed of at an appropriate licensed site; Hazardous waste will be removed and managed by an approved service provider; A safe disposal certificate will be provided by the approved service provider as proof of responsible disposal of hazardous waste; and The safe disposal certificate shall be stored and provided on request.</p> <p>Disposal of general waste: No dumping shall take place in or near the construction site; All general waste shall be disposed of to the nearest licensed landfill site; Demolition waste and builders rubble shall be disposed of to an appropriate licensed landfill site; and The necessary permissions must be obtained to dispose of builders' rubble to the landfill site.</p>						

Operational Phase

The operation phase of the project will include 5 bulk sampling trenches, RC drilling at 40 boreholes sites, core drilling at 10 sites.

- **Social-Economic:** It is expected that during the operation phase the project will not result in the creation of employment as prospecting requires highly specialised personnel. The applicant will make use of qualified contractors for the drilling and sampling of the sites. The community will however continue to benefit as a result of the continued boost in small local businesses. The socio-impacts expected during the operation phase include: Impact on the day to day operation by landowners in the area, which may have an impact on their livelihoods;
 - Negative impacts on health and safety of the local communities as a result of additional vehicles on the roads;
 - Negative impact on, local community health and safety due to influx of employees, the presence of job seekers, which may lead to prostitution and conflict with the local communities. Illegal informal settlement of job seekers in the area may exacerbate the situation; and
 - Potential damage to adjacent landowners'/occupiers' infrastructure as a result of drilling activities.
- **Groundwater:** The use of vehicles during the drilling of the exploration boreholes and bulk sampling activities may result in the spillages of hydrocarbons from vehicles and machinery. This will result in the contamination of soils and groundwater. The prospecting operations will require the drilling of boreholes, which may result in the drawdown, which may affect the yield to the surrounding groundwater users. Material used for backfilling boreholes may leach pollutants, which will result in the contamination of surrounding groundwater regime. This may spread beyond the backfilling site via plume migration. Incorrect management and disposal of drill muds and cuttings may result in contamination of groundwater should water containing carbonaceous material percolate into the groundwater. The drilling of boreholes may also result in potential contamination of the aquifer from drill mud, cuttings etc.
- **Surface water:** Drilling operations may result in the generation of surface water runoff contaminated with drill muds and cuttings, should spillage occur. The sedimentation and possible contamination with carbonaceous material will have negative impacts on the water quality due to increase turbidity and an increase in acidity of the water in the streams. This will also have an impact on aquatic habitats. The drilling of boreholes has potential for contamination of water courses from drill mud and cuttings.
- **Wetlands and Aquatic Ecology:** In addition to the impacts on aquatic habitats as explained above, the operation phase of the project is expected to have the following impacts on wetlands and aquatic ecosystems:
 - Loss of habitat and wetland ecological structure as a result of continual wetland disturbance and uncontrolled wetland degradation;
 - Impact on the wetlands systems as a result of changes to the sociocultural service provisions through continued uncontrolled vegetation clearance, waste management and wetland disturbance; and
 - Impact on the hydrological functioning of the wetland systems as a result of reduced wetland footprints and uncontrolled disturbance.
- **Flora:** The project may result in the following impacts on the floral environment during the operation phase:

- Destruction of potential floral habitats as a result of continual disturbance of soil, leading to altered floral habitats, erosion and sedimentation;
- Impact on floral diversity as a result of possible uncontrolled fires;
- Potential spreading of alien invasive species as a result of floral disturbance; and
- Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase.
- Fauna: The project may result in the following impacts on the faunal environment during the operation phase:
 - Migration of fauna from the prospecting area due to noise as a resulting of drilling activities;
 - Loss of faunal species due to collisions with vehicles and machinery;
 - Loss of faunal diversity and ecological integrity as a result of poaching and faunal species trapping;
 - Failure to initiate a rehabilitation plan and alien control plan during the operation phase may lead to further impacts during the operation phase.
- Soils, Land Use and Land Capability: The use of vehicles during the drilling of the exploration boreholes may result in the spillages of hydrocarbons from the vehicles and machinery. This will result in the contamination of soils. The materials removed from the drilling sites will contain carbonaceous material, which has potential for contamination should it not be managed properly. The material from the drilling site may result in the contamination of soils, which may render the land not usable after backfilling operation.
- Air Quality: The movement of vehicles and drilling machinery will likely result in an increase in nuisance dust, PM10 and PM2.5. There is also potential for increase in carbon emissions and ambient air pollution due to the movement of vehicles and construction machinery. It is expected that the implementation of dust suppressing mitigation measures will result in the reduction in nuisance dust.
- Visual: The drill rigs and towers used during the drilling operation phase will be visible from nearby locations, and will have visual impact on the local communities in close proximity to the prospecting area.
- Heritage, Archaeological Resources: The drilling operations may result in the destruction of graves and other heritage resources.
- Palaeontology Impacts: Earth moving activities may result in the destruction of fossils (if any).
- Ambient Noise: The use of vehicles and machinery may result in an increase in noise in the immediate vicinity of the project. The drilling activities will also result in an increase in noise in the vicinity of the project.
- Traffic: The movement of vehicles in the project area will result in an increase in traffic on the roads.
- Climate: The movement of vehicles and machinery may result in the production of carbon dioxide (Green House **Gas**), which may have an impact on the climate in the area.
- Vibrations: Drilling ground vibrations may result in possible damage to infrastructure and private property.

The summary of the impact assessment during the operation phase is provided in Table 17.

Table 17: Impact Assessment Table for the Operation Phase

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation								
		Consequence			Probability					Consequence			Probability					
		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating		Severity	Spatial	Duration	Frequency: Activity	Frequency: Impact	Significance	Significance Rating		
Socio-Economic	Operation may affect the day to day operation of the land owners hence result in direct impact on their livelihood.	2	1	2	2	3	25	Low	<p>Random and regular alcohol and drug testing shall be conducted on all personnel responsible for operating machinery and driving construction vehicles to ensure the safety of the public;</p> <p>Drill sites shall be kept to a minimum;</p> <p>Landowners shall be informed of the exact location of the drill sites and shall be privy to the drilling programme, indicating the days on which each site will be drilled; and</p> <p>The time spent at each drill site shall be kept to a minimum.</p>	1	1	2	1	1	8	Low		
	Uncontrolled access of private property during operation may result in conflict with affected landowners and occupiers.	2	1	1	2	2	16	Low		<p>Security and safety should be emphasized;</p> <p>No construction workers shall be allowed to access private properties without the owner's knowledge and consent;</p> <p>Access to private property and areas outside the designated operation areas shall be strictly prohibited.</p>	1	1	1	1	1	6	Low	
	Negative impact as a result of additional trucks on the roads, impacting on local communities' health and safety.	3	3	2	1	2	24	Low		<p>Local speed limits and traffic laws shall apply at all times to minimise the occurrences of accidents on public roads;</p> <p>Where possible the transportation of materials and rubbish shall be undertaken outside traffic peak hours to minimise inconveniencing residents;</p> <p>The number of vehicles on the roads shall be kept to a minimum;</p> <p>Materials transported on public roads must be covered.</p>	1	2	1	1	1	8	Low	
	Negative impact on, local community health and safety due to potential influx of employees, the presence of job seekers, which may lead to prostitution and conflict with the local communities. Illegal informal settlement of job seekers in the area may exacerbate the situation.	3	3	2	1	2	24	Low		<p>Liaise with the SAPD and existing forums in order to implement effective crime prevention strategies; and</p> <p>The applicant will ensure that as far as possible locals will be used during the operation of the prospecting project.</p> <p>Recruitment will not be undertaken on site.</p>	1	2	1	1	1	8	Low	
	As a result of drilling activities during operation, potential damage to adjacent landowner's/occupiers infrastructure	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	<p>Drill sites shall be located as far from private property as is possible to minimise damage to infrastructure;</p> <p>Should private property be damaged due to operation activities, property owners shall be appropriately compensated.</p>	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	As a result of drilling, there is potential for the occurrence of subsidence, impacting on the safety surface land dwellers and users.	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A
Groundwater	The use of vehicles during the drilling of the exploration boreholes may result in the spillages of hydrocarbon liquids from the vehicles and machinery. This will result in the contamination of the vegetation cover and soils. The material removed from the drilling exercises will contain carbonaceous material, which has a potential for pollution should it be allowed stay for a prolonged period at the drilling site.	3	2	2	2	2	28	Medium Low	<p>Ensure that the drilling of the exploration boreholes is conducted in such a manner that the environment is protected from probable spillages and contamination by carbonaceous material.</p> <p>All boreholes and sumps will be rehabilitated to pre-drilling conditions.</p> <p>Tarpaulins will be placed on the ground to prevent oil, grease, hydraulic fluid and diesel spills during emergency repairs.</p> <p>All oil spills will be remedied using approved methodologies. The contaminated soils will be removed and disposed of at a licensed waste disposal facility.</p> <p>All waste generated from the drilling sites and the campsite will be collected in proper receptacles and removed to a registered disposal facilities e.g., sewage treatment plant, solid waste disposal site or hydrocarbon recycling or treatment facilities.</p>	2	1	2	1	2	15	Low		
	Storage of samples may result in the contamination the soil, groundwater and nearby water courses	3	2	2	2	2	28	Medium Low		<p>All oil spills will be remedied using approved methodologies. The contaminated soils will be removed and disposed of at a licensed waste disposal facility.</p> <p>All waste generated from the drilling sites and the campsite will be collected in proper receptacles and removed to a registered disposal facilities e.g., sewage treatment plant, solid waste disposal site or hydrocarbon recycling or treatment facilities.</p>	2	1	2	1	2	15	Low	

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation								
		Consequence			Probability		Frequency	Significance		Significance Rating	Consequence			Probability		Frequency	Significance	Significance
		Severity	Spatial	Duration	Frequency	Activity					Severity	Spatial	Duration	Frequency	Activity			
	The prospecting operations will require the drilling of boreholes. The boreholes may result in the drawdown, which may affect the yield to the surrounding groundwater users. Material used for backfilling may leach pollutants that will result in the pollution of the surrounding groundwater regime. This may even spread beyond the backfilling site via plume migration.	2	2	2	2	2	24	Low	Ensure that the land owners' borehole yields are monitored during the drilling operation. 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.	2	1	2	1	2	15	Low		
Surface Water	The drilling operations may result in the generation of surface water runoff contaminated with drilling muds and cuttings should spillages occur. The sedimentation and possible contamination with carbonaceous material will have negative impacts on the surrounding clean water environment. These will cause an increase in the turbidity and will decrease acidity of the water in the streams, which will affect the aquatic habitat of the wetland, hence important habitats may be lost.	2	2	2	2	2	24	Low	No prospecting operations will be undertaken within 100 metres from the nearby streams and 500 meters from the wetland and/or riparian areas without consent from the DWS; The sumps will be excavated for the collection mud and excess water from the drilling sites; The sumps will be sized such that they will be able to contain the water and mud that will be generated during the prospecting operation; Storm water generated around the drilling site will be diverted away to the clean water environment; No concrete mixing and vehicle maintenance will be allowed on site. All hydrocarbons will be stored on protected storage areas away from the streams.	2	1	2	1	2	15	Low		
Biodiversity	Continued destruction of potential floral habitats for species of conservational concern as a result continual disturbance of soils leading to altered floral habitats, erosion and sedimentation.	2	1	3	2	2	24	Low	All disturbed areas must be rehabilitated in tandem with construction activities. The collection of any plant material for firewood or medicinal purposes shall be strictly prohibited.	2	1	1	1	1	8	Low		
	Impact on floral species of conservational concern as a result of an increased in alien species proliferation and ineffective rehabilitation of exposed areas	2	1	3	2	2	24	Low	The existing integrity of flora surrounding the study area shall be upheld and no activities shall be carried out outside the footprint of the demarcated drill sites.	2	1	1	1	1	8	Low		
	The use of vehicles during the siting, pegging and drilling of the exploration boreholes may result in the spillages of hydrocarbon liquids from the vehicles and machinery. This will result in the contamination of the vegetation cover and soils. The material removed from the drilling exercises will contain carbonaceous material, which has a potential for pollution should it be allowed stay for a prolonged period at the drilling site. The above material, if not properly managed, may result in the contamination of the surrounding soils and vegetation cover, which may render the land not usable after the backfilling operation.	3	2	3	2	2	32	Medium Low	Ensure that the drilling of the exploration boreholes are done in such a manner that the environment is protected from probable spillages and contamination by carbonaceous material. All boreholes and sumps will be rehabilitated to pre-drilling conditions. Tarpaulins will be placed on the ground to prevent oil, grease, hydraulic fluid and diesel spills during emergency repairs. All oil spills will be remedied using approved methodologies. The contaminated soils will be removed and disposed of at a licensed waste disposal facility. All waste generated from the drilling sites and the campsite will be collected in proper receptacles and removed to registered disposal facilities e.g., sewage treatment plant, solid waste disposal site or hydrocarbon recycling or treatment facilities.	N/A	N/A	N/A	N/A	N/A	N/A	N/A		

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability		Frequency	Significance		Significance Rating	Consequence			Frequency: Impact	Significance	Significance
		Severity	Spatial	Duration	Frequency: Activity	Severity					Spatial	Duration	Frequency: Activity			
	Loss of faunal habitat and ecological structure as a result of increased fires during operation and introduction of alien species, leading to transformation of the natural habitat	2	1	3	2	2	24	Low	<p>The rehabilitation of the disturbed areas must be conducted such that the rehabilitated areas will encourage the migration of animals back into the rehabilitated areas.</p> <p>The proposed development footprint areas shall remain as small as possible and where possible be confined to already disturbed areas.</p> <p>No trapping or hunting of fauna shall be permitted.</p> <p>Edge effects of all operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat shall be strictly managed.</p> <p>No informal fires in the vicinity of drill sites shall be permitted.</p> <p>An alien vegetation control plan must be implemented in order to manage alien plant species occurring within the study area, and to prevent further faunal habitat loss.</p> <p>Poaching of wild animals and livestock will be prohibited.</p>	1	1	1	1	1	6	Low
Geology	Removal of geological bulk samples for testing may result in changes in geology and loss of soils	2	3	2	2	2	28	Medium Low	<p>Ensure that topsoil is properly stored, away from the streams and drainage areas.</p> <p>The soils must be used for the backfilling and rehabilitation of the sumps.</p>	1	1	1	1	1	6	Low
Soils Land use and Land Capability	Topsoil removal, storage and replacement during the excavation of the sumps will result. This will result in the disruption of the soils profile.	2	1	2	2	2	20	Low	<p>The rehabilitated sump must be seeded with recommended seed mix consisting of indigenous species.</p>	1	1	1	1	1	6	Low
	Soil contamination as a result of operational activities can be as a result of a number of activities (i.e. hazardous substance storage, incidental hydrocarbon leakages from construction vehicles).	3	1	2	2	2	24	Low	<p>Tarpaulins will be placed on the ground to prevent oil, grease, hydraulic fluid and diesel spills during emergency repairs.</p> <p>Soil disturbance within the drill sites shall be kept to a minimum.</p>	2	1	1	1	1	8	Low
Air Quality	The prospecting operation will require vehicular movement which may result in Possible increase in dust generation, PM10 and PM2.5 as a result of stockpiling material, use of heavy machinery, and material movement.	2	3	2	2	2	28	Medium Low	<p>Dust suppression must be conducted during the operational phase of the project.</p> <p>Correct speed will be maintained at the proposed project site.</p> <p>Vehicle maintenance must be conducted regularly to avoid excessive diesel fumes.</p>	1	1	1	1	1	6	Low
	Increase in carbon emissions and ambient air pollutants (NO2 and SO2) as a result of movement of vehicles and operation of machinery/equipment.	2	3	2	2	2	28	Medium Low	<p>Where practical possibly rehabilitation should be undertaken progressively.</p> <p>A speed limit of 40 km/hr shall apply to limit vehicle entrained dust from the unpaved roads.</p> <p>All construction equipment must be scheduled for preventative maintenance to ensure the functioning of the exhaust systems to reduce excessive emissions and limit air pollution.</p> <p>Dust control suppression shall be implemented on dry weather days and periods of high wind velocities;</p> <p>Appropriate dust suppression measures may include limiting the extent of open areas, reducing the frequency of disturbance and spraying with water;</p> <p>Materials transported on public roads must be covered; and</p> <p>Where practical rehabilitation should be undertaken progressively.</p> <p>Odours</p> <p>Putrescible waste must be handled, stored and disposed of before the probability of it generating odours; and</p> <p>Chemical toilets must be emptied / serviced on a regular basis. Proof of this must be provided to the Engineer.</p>	1	1	1	1	1	6	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation						
		Consequence			Probability		Frequency	Significance		Significance Rating	Consequence			Frequency: Impact	Significance	Significance
		Severity	Spatial	Duration	Frequency: Activity	Severity					Spatial	Duration	Frequency: Activity			
Visual	The drill rigs and towers used during the drilling operations will be visible from the nearby residents and properties.	2	2	3	2	3	35	Medium Low	Ensure that the time period used for the drill rigs is optimised to ensure that the drill rigs are moved from one site to another over short periods Materials transported on public roads must be covered.	1	1	1	1	1	6	Low
Heritage Resources	The drilling operation may result in the destruction of graves and any other heritage sites during operational phase of the project.	3	2	2	1	2	21	Low	Locate exploration borehole more than 50 m from the identified heritage sites.	1	1	1	1	1	6	Low
Noise	The use of vehicles and machinery during the construction phase may generate noise in the immediate vicinity	2	2	2	2	2	24	Low	Ensure that proper management measures as well as technical changes are undertaken to reduce the impacts on surrounding residents and employees. This include ensuring that less noisy equipment is used, that equipment is kept in good working order and that the equipment must be fitted with correct and appropriate noise abatement measures and where possible use white-noise generators instead of tonal reverse alarms on heavy vehicles operating on roads. Adjacent landowners must be advised of any work that will take place outside of normal working hours, that may be disruptive (e.gw. noise) in advance. Surrounding communities must be notified in advance of noisy construction activities. All equipment should be provided with standard mufflers. Muffling units on vehicles and equipment must be kept in good working order. Construction staff working in areas where the 8-hour ambient noise levels exceed 85 Dba should wear ear protection equipment. Where possible, operation of several equipment and machinery must be avoided; All equipment must be kept in good working order, with immediate attention being paid to defective silencers, slipping fan-belts, worn bearings and other sources of noise; Equipment must be operated within specifications and capacity (e.g. no overloading of machines); Regular maintenance of equipment must be undertaken, particularly with regard to lubrication; Equipment shall be switched off when not in operation; Appropriate directional and intensity settings must be maintained on all hooters and sirens; The Contractor must ensure that the employees conduct themselves in an appropriate manner while on site; Adjacent landowners shall be notified in writing if work needs to be carried out after hours or if any blasting will be required; and Noise/vibration producing activities shall be limited to daylight hours (Monday to Friday 07H00 to 17H30 and Saturday 07H00 -14H00). No noise/vibration producing activities shall be undertaken on Saturdays on farms unless this has been agreed to by the farmer.	1	1	1	1	1	6	Low
	Increase in ambient noise levels during drilling,trenching and bulksampling where noise will be generated from use of drilling and excavation machinery,	2	2	2	2	2	24	Low		1	1	1	1	1	6	Low
Traffic	Increase in traffic volumes as a result of pre-construction activities which may lead to an increase in traffic congestion along the R82 and R723 roads as well as the farm roads around the prospecting area.	2	3	1	2	2	24	Low	Local speed limits and traffic laws shall apply at all times to minimise the occurrences of accidents on public roads; and Where possible the transportation of construction materials and rubbish shall be undertaken outside traffic peak hours to minimise inconveniencing residents.	1	2	1	1	1	8	Low

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation								
		Consequence			Probability		Frequency	Significance		Significance Rating	Consequence			Probability		Frequency: Impact	Significance	Significance
		Severity	Spatial	Duration	Frequency: Activity	Severity					Spatial	Duration	Frequency: Activity					
Climate	Emissions of Green House Gases as a result of the use of plant, heavy moving machinery, generators etc.	2	2	2	2	2	24	Low	The number of construction vehicles and trips shall be kept to a minimum All the vehicles shall undergo maintenance on a regular basis to improve on the combustion engine vehicle efficiency.	1	1	1	1	1	6	Low		
Drilling and Vibrations	Impact of drilling ground vibration on houses, boreholes and roads, resulting in possible damage to infrastructure	2	1	1	2	2	16	Low	Drill sites shall be located as far from private property as is possible. Affected property owners shall be notified of any drilling activities before commencement of the activities.	1	1	1	1	1	6	Low		
	Fly rock impact on houses, boreholes and roads, resulting in possible damage to infrastructure;	2	1	1	2	2	16	Low	Should there be damage to private property as a result of drilling activities, property owners shall be appropriately compensated.	1	1	1	1	1	6	Low		
Waste Management	Inadequate waste management may result in contamination of water resources and the environment in general.	2	1	1	2	2	16	Low	<p>Storage of waste</p> <p>General waste will be collected in an adequate number of litter bins located throughout the construction site; Bins must have lids in order to keep rain water out; Bins shall be emptied regularly to prevent the bins from overflowing; All work areas shall be kept clean and tidy at all times; All waste management facilities will be maintained in good working order; Waste shall be stored in demarcated areas according to type of waste; Runoff from drill sites will be contained, treated and reused; Flammable substances must be kept away from sources of ignition and from oxidizing agents; No storage of waste shall be permitted within 100 m of the water courses or within 500 m of wetlands and riparian areas; Demolition waste and surplus concrete shall be disposed of responsibly; Waste shall not be buried or burned on site; and The maximum retention time for temporary storage of waste generated shall not exceed 30 days, provided the waste does not present a health hazard or risk of odour.</p> <p>Disposal of hazardous waste</p> <p>No dumping shall be allowed in or near the construction site; Hazardous containers shall be disposed of at an appropriate licensed site; Hazardous waste will be removed and managed by an approved service provider; A safe disposal certificate will be provided by the approved service provider as proof of responsible disposal of hazardous waste; and The safe disposal certificate shall be stored and provided on request.</p> <p>Disposal of general waste</p> <p>No dumping shall take place in or near the drill sites; and All general waste shall be disposed of to the nearest licensed landfill site.</p>	1	1	1	1	1	6	Low		

Decommissioning and Closure

It is expected that the impacts for the decommissioning and closure phases will be similar to the impacts during the construction phase and have not been assessed in details (please refer to the construction phase assessment). The most significant impacts will be:

- **Soils and Land Capability:** The removal of the campsite equipment and the rehabilitation of the drilling sites and associated access infrastructure will result in the affected soil and land use being restored. This will also result in the resumption of the use of the land since the infrastructure would have been removed. However, should the rehabilitation of affected sites not be conducted properly, it may result in loss of usable soils and agricultural land, resulting in reduced land capability.
- **Land Use:** Positive impacts will result due to the reduction in areas of disturbance and the return of land use of the affected areas and making available an area that was covered by the campsite and drilling sites.
- **Soils and Vegetation:** The use of vehicles/machinery during the rehabilitation of the exploration sites may result in the compaction of soils and in the spillages of hydrocarbon liquids from the vehicles and machinery. This will result in the contamination and destruction of the vegetation cover, soils and groundwater.
- **Surface Water and Wetlands:** During the decommissioning and closure phases equipment will be removed, stockpiled soils will be used for rehabilitation, remaining sumps will be backfilled, levelled, top soiled and the area re-seeded. During the process of rehabilitation surface water runoff from the rehabilitation site may have elevated silt load, which may cause pollution of the nearby water courses.
- **Air Quality:** Rehabilitation and removal of the prospecting sites and equipment will require vehicular movement. This will result in the generation of dust by movement of vehicles and due to blowing winds. Vehicles and machinery will also generate diesel or petrol fumes. Generated dust will migrate towards the predominant wind direction and may settle on surrounding properties including nearby vegetation.
- **Noise:** Noise will be generated during the removal of equipment and rehabilitation of the sites. The noise is not expected to exceed occupational noise limits and will be short lived.

The summary of the impact assessment during the decommissioning and closure phase is provided in Table 18.

Table 18: Impact Assessment Table for the Decommissioning and Closure Phase

Environmental Aspect	Nature of potential impact/risk	Environmental Impact Significance Before Mitigation							Impact Management Actions (Proposed Mitigation Measures)	Environmental Impact Significance After Mitigation								
		Consequence			Likelihood (Probability)		Frequency: Impact	Significance		Significance Rating	Consequence			Likelihood (Probability)		Frequency: Impact	Significance	Significance Rating
		Severity	Spatial	Duration	Frequency: Activity	Severity					Spatial	Duration	Frequency: Activity	Severity	Spatial			
Soils, Land Capability and Land Use	The removal of the campsite equipment and the rehabilitation of the drilling sites and associated access infrastructure will result in the affected soil and land use being restored. This will also result in the resumption of the use of the land since the infrastructure would have been removed.	N/A	N/A	N/A	N/A	N/A	0	N/A	<p>Ensure that contamination of the rehabilitate area by carbonaceous material and hydrocarbon liquids are prevented.</p> <p>Ensure that the rehabilitation work is done in such a manner that the environment is protected from probable spillages and contamination by carbonaceous material.</p> <p>All boreholes and sumps will be rehabilitated to pre-drilling conditions.</p> <p>Tarpaulins will be placed on the ground to prevent oil, grease, hydraulic fluid and diesel spills during emergency repairs.</p> <p>All oil spills will be remedied using approved methodologies. The contaminated soils will be removed and disposed of at a licensed waste disposal facility.</p> <p>All waste generated from the rehabilitation sites will be collected in proper receptacles and removed to registered disposal facilities e.g., sewage treatment plant, sold waste disposal site or hydrocarbon recycling or treatment facilities.</p>	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Land Use	Positive impacts will result due to the reduction in areas of disturbance and the return of land use of the affected areas and making available an area that was covered by the campsite and drilling sites.	N/A	N/A	N/A	N/A	N/A	0	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Soils and Vegetation	The use of vehicles/machinery during the rehabilitation of the exploration sites may result compaction of soils and in the spillages of hydrocarbon liquids from the vehicles and machinery. This will result in the contamination and destruction of the vegetation cover and soils.	2	1	2	2	2	20	Low		1	1	2	1	2	12	Low		
Surface Water	During the decommissioning and closure phases equipment will be removed, stockpiled soils will be used for rehabilitation, remaining sumps will be backfilled, levelled, top soiled and the area re-seeded. During the process of rehabilitation, surface water runoff from the rehabilitation site may have elevated silt load, which may cause pollution of the nearby water environment.	2	3	2	2	2	28	Medium Low		2	1	2	2	2	20	Low		
Air Quality	Rehabilitation including removal of drill rig and backfilling of trenches and removal of the prospecting sites, and equipment will require vehicular movement. This will result in the generation of dust by movement of vehicles and due to blowing winds. Vehicles and machinery will also generated diesel or petrol fumes. Generated dust will migrate towards the predominant wind direction and may settle on surrounding properties including nearby vegetation.	1	3	2	2	2	24	Low		1	1	1	1	2	9	Low		
Noise	Noise will be generated during the removal of equipment and rehabilitation of the sites. This noise is not expected to exceed occupational noise limits and will be short lived.	2	1	2	2	2	20	Low		1	1	1	1	2	9	Low		

vi. Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs.)

All the identified potential impact were assessed according to the following Impact Assessment Methodology as described below. This methodology has been utilised for the assessment of environmental impacts where the consequence (severity of impact, spatial scope of impact and duration of impact) and likelihood (frequency of activity and frequency of impact) have been considered in parallel to provide an impact rating and hence an interpretation in terms of the level of environmental management required for each impact.

The first stage of any impact assessment is the identification of potential environmental activities¹, aspects² and impacts which may occur during the commencement and implementation of a project. This is supported by the identification of receptors³ and resources⁴, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. Environmental impacts⁵ (social and biophysical) are then identified based on the potential interaction between the aspects and the receptors/resources.

The significance of the impact is then assessed by rating each variable numerically according to defined criteria as outlined in Table 9. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity⁶, spatial scope⁷ and duration⁸ of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity⁹ and the frequency of the impact¹⁰ together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance rating matrix table as shown in Table 19. This matrix thus provides a rating on a scale of 1 to 150 (low, medium low, medium high or high) based on the consequence and likelihood of an environmental impact occurring.

Natural and existing mitigation measures, including built-in engineering designs, are included in the pre-mitigation assessment of significance. Measures such as demolishing of infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

¹An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or pieces of infrastructure that are possessed by an organisation.

²An **environmental aspect** is an 'element of an organisations activities, products and services which can interact with the environment'. The interaction of an aspect with the environment may result in an impact.

³**Receptors** comprise, but are not limited to people or man-made structures.

⁴**Resources** include components of the biophysical environment.

⁵**Environmental impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. Receptors can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as aquifers, flora and palaeontology. In the case where the impact is on human health or well-being, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is.

⁶**Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.

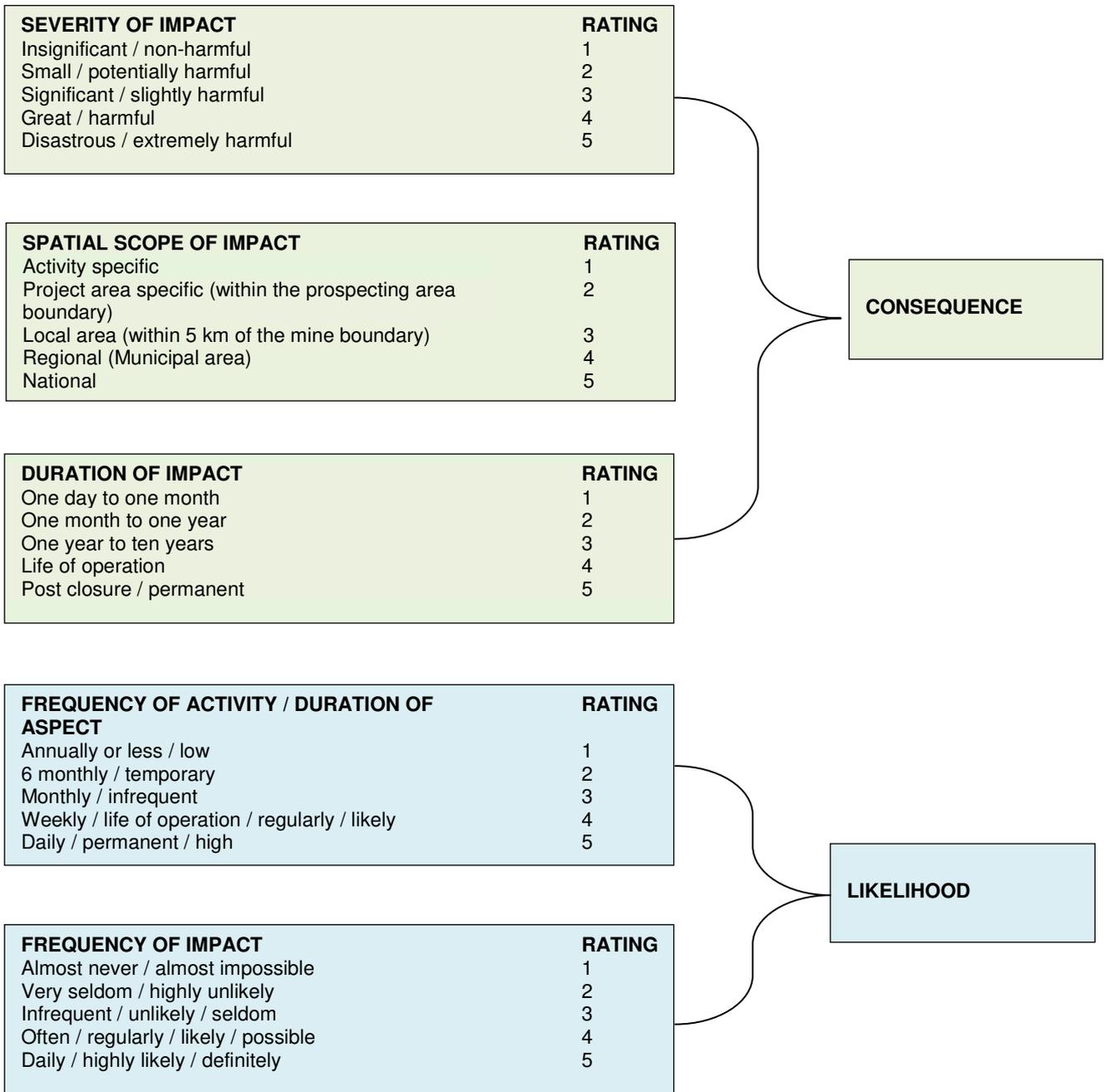
⁷**Spatial scope** refers to the geographical scale of the impact.

⁸**Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

⁹**Frequency of activity** refers to how often the proposed activity will take place.

¹⁰**Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.

Table 19: Criteria for Assessing Significance of Impacts



Determination of Significance

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

	High	76 to 150	Improve current management
	Medium High	40 to 75	Maintain current management
	Medium Low	26 to 39	
	Low	1 to 25	No management required

SIGNIFICANCE = CONSEQUENCE x LIKELIHOOD

vii. The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

The impacts of the proposed site layout will be the same as those of the alternative sites that may be identified during the prospecting exercise. The alternative sites will be identified based on the location of sensitive environments such as heritage sites (graves etc.), wetlands, riparian zones, and areas with Red Data Species. Changes in the layout plan will be discussed and agreed on with the affected landowners. The specialist studies conducted for the project found that there are no fatal flaws associated with the project and project location.

The positive impacts of the activities are the creation of employment, which is required in the region. Should Sillimanite and quartz be found in the project area, Hle Services and Supplies will be able to mine the available reserves. This will result in job creation and support to local businesses is continued. Hle Services and Supplies expects that substantial benefits from the project (should Sillimanite and quartz be found) will accrue to the immediate project area, the sub-region and the Northern Cape Province. This prospecting activity has a potential to decrease level of unemployment rate in proposed areas and surroundings. This prospecting activity will bring revenue into the Khai Ma LM and the NC province which will in turn boost the economy of the country.

The proposed activities have medium to low significance impacts, which will be short term activities in nature. The probability of occurrence of an impact was determined and most of the activities can be controlled and impacts can be reduced or avoided. The probability was also determined based on other prospecting activities of similar nature. It was found that generally prospecting activities have low impact on the environment.

Please refer to Section v for a comprehensive impact assessment.

viii. The possible mitigation measures that could be applied and the level of risk.

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

Please refer to Section v for the management and mitigation measures.

ix. Motivation where no alternative sites were considered.

As discussed in the previously, the site was selected based on its potential to host the sillimanite and quartz orebody since it falls geologically under the Bushmanland Group which hosts the schist associated with sillimanite mineralisation. The area is also highly characterised by sandy soil and sandstone which implies the presence of quartz. The site is therefore regarded as the preferred site and alternative sites are not considered. The alternative drill sites and trenching sites will be identified based on the location of sensitive environments such as heritage sites (graves etc.), wetlands, riparian zones, and areas with Red Data Species. Changes in the layout plan will be discussed and agreed on with the affected landowners.

x. Statement motivating the alternative development location within the overall site. (Provide a statement motivating the final site layout that is proposed)

The site was selected based on its potential to host the sillimanite and quartz orebody since it falls geologically under the Bushmanland Group which hosts the schist associated with sillimanite mineralisation. The area is also highly characterised by sandy soil and sandstone which implies the presence of quartz. The site is therefore regarded as the preferred site and alternative sites are not considered. The alternative drill sites and trenching sites will be identified based on the location of sensitive environments such as heritage sites (graves etc.), wetlands, riparian zones, and areas with Red Data Species. Changes in the layout plan will be discussed and agreed on with the affected landowners.

h) Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity.

(Including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

In order to identify the potential impacts associated with the proposed prospecting activities, the following steps were undertaken:

The stakeholder consultant process is currently being undertaken in a manner to be interactive, providing the landowners and identified stakeholders with an opportunity to provide input into the project. This is considered a key focus as the local residents have capabilities of providing site-specific information, which may not be available in desktop research material. Stakeholders were requested, as part of the notification letter, to provide their views on the project, and to state any potential concerns they may have. All comments and responses provided will be collated into the Comments and Responses Register, which will be attached to the final EIAR/EMPr, and will also be incorporated into the final impact assessment.

A detailed desktop study was undertaken to determine the environmental setting in which the project is located. Based on the desktop investigations, various resources were used to determine the significance and sensitivity of the various environmental considerations. The desktop investigation involved the use of:

- The South African National Biodiversity Institute (SANBI) Biodiversity Geographic Database LUDS System;
- The Department of Environmental Affairs 2015 Landcover and Landuse Mapping Database;
- Department of Water and Sanitation information documents such as the Internal Strategic Perspective (ISP) for the Vaal River and Groundwater Vulnerability Reports;
- Municipal Integrated Development Plans for Khai Ma Local Municipalities; and
- The Provincial Spatial Development Framework for the Northern Cape Province.

Specialists were appointed to conduct specialist studies to determine the baseline characterisation of the project area and to identify and assess the potential impacts the project may have on the environment. The specialist studies included:

- Heritage Resources;
- Hydrology;
- Groundwater;
- Biodiversity; and
- Soils and Landuse.

The rating of the identified impacts was undertaken in a quantitative manner as provided in Section v (impact rating). The ratings were undertaken in a manner to calculate the significance of each of the impacts. The identification of management and mitigation measures was done based on the significance of the impacts and measures included are considered sufficient, appropriate and practical to protect the environment.

i) Assessment of each identified potentially significant impact and risk

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).

Table 20: Assessment of each identified potentially significant impact and risk

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE mitigated if
Data Collection and Assessment Geological Mapping Planning for Drilling Surveys Access Roads Drill Sites Trenching Temporary Soil Storage Area Fence Hydrocarbon storage area Mobile office Ablution Facility	Desktop Study	None	N/A	Planning	N/A	Control potential deviations from the approved EMPr through the effective implementation of the data acquisition and desktop study.	N/A
		None	N/A	Planning	N/A	Control potential deviations from the approved EMPr through the effective implementation of the data acquisition and desktop study.	N/A
		None	N/A	Planning	N/A	Control potential deviations from the approved EMPr through the effective implementation of the data acquisition and desktop study.	N/A
	Establishment of access roads, campsite, physical surveying of the site, identification of trench sites and pegging of drilling boreholes	Loss of soils, erosion of the soils and impacts on landowners' livelihood.	Soils, Land capability and Land use	Construction	Low	Rehabilitation of areas cleared of vegetation and dust control	Low
		Contamination of groundwater from hydrocarbon spillages	Groundwater	Construction	Medium Low	Control through management and monitoring of spillages. Where spillages occur, the soil must be stripped and disposed of as stipulated in the EMPr.	Low
		Contamination of surface water due to erosion of soils which will lead to increased turbidity as well as contamination from hydrocarbon spillages	Surface water	Construction	Medium Low	Monitoring through rehabilitation and management of spoil sites	Low
		Wetland contamination, destruction and loss of habitat	Wetlands and aquatic ecosystems	Construction	Medium Low	Control of access to wetland areas and within the regulated 500 m buffer.	Low
		Destruction of graves and cultural heritage sites	Heritage and archaeological resources	Construction	Low	Control through clear demarcation of prospecting areas to ensure avoidance of graves and other heritage sites	Low
		Destruction of fossils	Palaeontological resources	Construction	Low	Management of drill sites. Should any fossils be discovered, operations must cease and SAHRA must be notified	Low
		Loss of natural vegetation in the affected areas	Flora	Construction	Low	Rehabilitation of areas cleared of vegetation. Control of alien invasive plant species	Low
		Migration of fauna due to disturbance caused by the proposed project	Fauna	Construction	Low	Relocation of affected species of conservation importance	Low
		Air pollution through nuisance dust, PM 10 and PM2.5 as well as emissions from construction vehicles and machinery.	Air Quality	Construction	Low	Dust control measures	Low
		Increase in ambient noise due to movement of construction vehicles and machinery	Noise	Construction	Low	Management and maintenance of construction vehicles. Management through the use of noise dissipating technologies eg noise mufflers Control through the limiting of the activities to the day time and the implementation of an open and transparent channel of communication	Low
Visual impacts as a result of	Visual	Construction	Low	Rehabilitation of areas cleared of vegetation	Low		

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	ASPECTS AFFECTED	PHASEIn which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		vegetation clearance					
		Increased traffic on the roads due to additional construction vehicles	Traffic, Socio-economic	Construction	Medium Low	Speed control and limitation of the times when construction vehicles may be on the roads	Low
		Impact of carbon dioxide (GHG) produced by construction vehicles on the local climate	Climate Change	Construction	Low	Control and keep to a minimal the number of vehicles used for construction. Vehicles must be maintained to ensure efficient use of fuel.	Low
RC Drilling Core Drilling Bulk Sampling	Drilling and Bulk Sampling	It is expected that during the operation phase the project will not result in the creation of employment as prospecting requires highly specialised personnel. The applicant will make use of qualified contractors for the drilling and sampling of the sites. The community will however continue to benefit as a result of the continued boost in small local businesses. Drilling has potential to affect the day to day operations by affected landowners	Socio-Economic	Operation	Low	Control of times during which operation activities will take place	Low
		The use of vehicles during the drilling of the exploration boreholes may result in the spillages of hydrocarbons from vehicles and machinery. This will result in the contamination of soils and groundwater. The prospecting operations will require the drilling of boreholes, which may result in the drawdown, which may affect the yield to the surrounding groundwater users. Material used for backfilling boreholes may leach pollutants, which will result in the contamination of surrounding groundwater regime. This may spread beyond the backfilling site via plume migration.	Groundwater	Operation	Medium Low	Rehabilitation of affected areas and control using bunds	Low
		Drilling operations may result in the generation of surface water runoff contaminated with drill muds and cuttings, should spillage occur. The sedimentation and possible contamination with carbonaceous material will have negative impacts on the water quality due to increase turbidity and an increase in acidity of the water in the streams. This will have an impact on aquatic habitats.	Surface Water	Operation	Low	Control through management and monitoring of surface runoff	Low
		Runoff from the bulk sampling area may result in the contamination of surface water resources.	Surface Water	Operation	Low	Control through management and monitoring of surface runoff	Low
		Continued loss of natural vegetation in the affected areas where ineffective rehabilitation has been done.	Flora	Operation	Low	Rehabilitation of affected areas Monitoring of rehabilitated areas to ensure success.	
		Migration of fauna due to disturbance caused by the proposed	Fauna	Operation	Low	Rehabilitation of affected areas Drill holes must be temporarily plugged	Low

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		project				immediately after drilling is completed and remain plugged until they are permanently plugged below ground to eliminate the risk posed to fauna by open drill holes. Drill holes must be permanently capped as soon as is practicable. Trenches must be backfilled as soon as possible to ensure that animals do not fall in.	
		The use of vehicles during the drilling of the exploration boreholes and bulk sampling may result in the spillages of hydrocarbons from the vehicles and machinery. This will result in the contamination of soils. The materials removed from the drilling sites will contain carbonaceous material, which has potential for contamination should it not be managed properly. The material from the drilling site may result in the contamination of soils, which may render the land not usable after backfilling operation.	Soils Land use and Land Capability	Operation	Low	Rehabilitation of affected areas	Low
		The movement of vehicles and drilling machinery will likely result in an increase in nuisance dust, PM10 and PM2.5. There is also potential for increase in carbon emissions and ambient air pollution due to the movement of vehicles and construction machinery. It in the reduction in nuisance dust.	Air Quality	Operation	Medium Low	Dust control measures	Low
		The drill rigs and towers used during the drilling operation phase will be visible from nearby locations, and will have visual impact on the local communities in close proximity to the prospecting area.	Visual	Operation	Medium Low	Strategic location of treches, rigs and towers to areas where there may be some tree cover, as far as practicable	Low
		The drilling operations and bulk sampling may result in the destruction of graves and other heritage resources.	Heritage Resources	Operation	Low	Control through clear demarcation of prospecting areas to ensure avoidance of graves and other heritage sites	Low
		Earth moving activities may result in the destruction of fossils (if any).	Palaeontological Resources	Operation	Low	Management of drill sites. Should any fossils be discovered, operations must cease and SAHRA must be notified	Low
		The use of vehicles and machinery may result in an increase in noise in the immediate vicinity of the project. The drilling activities will also result in an increase in noise in the vicinity of the project.	Noise	Operation	Low	Management and maintenance of construction vehicles. Management through the use of noise dissipating technologies e.g. noise mufflers	Low
		The movement of vehicles in the project area will result in an increase in traffic on the roads.	Traffic	Operation	Low	Speed control and limitation of the times when construction vehicles may be on the roads	Low

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	ASPECTS AFFECTED	PHASEIn which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		The movement of vehicles and machinery may result in the production of carbon dioxide (Green House Gas), which may have an impact on the climate in the area.	Climate	Operation	Low	Control and keep to a minimal the number of vehicles used for operations. Vehicles must be maintained to ensure efficient use of fuel.	Low
		Drilling ground vibrations may result in possible damage to infrastructure.	Drilling and Vibrations	Operation	Low	Drill sites must be located as far from infrastructure as is possible to avoid damage to infrastructure	Low
Data Analysis	Feasibility Studies	None	N/A	Operation	N/A	N/A	N/A
Feasibility Studies Report		None	N/A	Operation	N/A	N/A	N/A
Borehole capping Backfilling of trenches Removal of equipment and infrastructure	Closure and Rehabilitation of borehole, trenches and infrastructure sites	The removal of the campsite equipment and the rehabilitation of the drilling sites and associated access infrastructure will result in the affected soil and land use being restored. This will also result in the resumption of the use of the land since the infrastructure would have been removed.	Soils, Land Capability and Land Use	Decommissioning and Closure	N/A	N/A	N/A
		The backfilling of the trenches will result in the affected soil and land use being restored. This will also result in the resumption of the use of the land since the infrastructure would have been removed.	Soils, Land Capability and Land Use	Decommissioning and Closure	N/A	N/A	N/A
		Positive impacts will result due to the reduction in areas of disturbance and the return of land use of the affected areas and making available an area that was covered by the campsite and drilling sites.	Land Use	Decommissioning and Closure	N/A	N/A	N/A
		The use of vehicles/machinery during the rehabilitation of the exploration sites may result compaction of soils and in the spillages of hydrocarbon liquids from the vehicles and machinery. This will result in the contamination and destruction of the vegetation cover and soils.	Soils and Vegetation	Decommissioning and Closure	Low	Control and prohibit access of vehicles and machinery to areas outside of established access tracks Control through the clear delineation of the prospecting area. Control through the implementation of environmental induction and toolbox talks, as well as the implementation of a fine system. Control through the implementation of a soil management programme in terms of the correct tops oil removal, stockpiling and rehabilitation practices as discussed in the EMPr.	Low
		During the decommissioning and closure phases equipment will be removed, stockpiled soils will be used for rehabilitation, remaining sumps will be backfilled, levelled, top soiled and the area re-seeded. During the process of rehabilitation surface water runoff from the rehabilitation site may have elevated silt load, which may cause pollution of the nearby water environment.	Surface Water	Decommissioning and Closure	Medium Low	Control through the clear delineation of the prospecting area. Control through the implementation of environmental induction and toolbox talks, as well as the implementation of a fine system. Control through the implementation of the NWA GNR 704 water management principles.	Low

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	ASPECTS AFFECTED	PHASEIn which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE	SIGNIFICANCE if mitigated
		Rehabilitation and removal of the prospecting sites and equipment will require vehicular movement. This will result in the generation of dust by movement of vehicles and due to blowing winds. Vehicles and machinery will also generate diesel or petrol fumes. Generated dust will migrate towards the predominant wind direction and may settle on surrounding properties including nearby vegetation.	Air Quality	Decommissioning and Closure	Low	Dust control measures and rehabilitation of areas stripped of vegetation	Low
		Noise will be generated during the removal of equipment and rehabilitation of the sites. This noise is not expected to exceed occupational noise limits and will be short lived.	Noise	Decommissioning and Closure	Low	Management and maintenance of construction vehicles. Management through the use of noise dissipating technologies eg noise mufflers	Low

j) Summary of specialist reports.

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Heritage Resources	No heritage resources were identified during the assessment. The study however recommended that should any chance finds be recovered in the process of sand mining activities, work must be stopped immediately. A report must be made to the nearest heritage authority. Based on this assessment we recommend to the Provincial Heritage Resource Agency or South African Heritage Resource Agency to approve the project as planned.	X	PART A Section 3 (g) (d) (v) PART A Section 3 (h) (i) PART B Sections (e) and (f) Table 26
Geohydrology	<p>The groundwater study found that the proposed prospecting has a low potential for groundwater contamination. The study recommended that the following:</p> <ul style="list-style-type: none"> • Tarpaulin should be placed under drill, contaminated soils collected. Contractors and own staff trained re-spills and disposal. Core placed in boxes, removed regularly. Sumps lined. Sewage must be disposed at an approved wastewater treatment site and may under no circumstances be dumped at the bush. • If no further investigations in the drill hole are necessary, the upper 30 m of bedrock or the entire depth of the hole – whichever is less – should be grouted; grouting of mineralized sections is highly recommended. 	X	PART A Section 3 (g) (d) (v) PART A Section 3 (h) (i) PART B Sections (e) and (f) Table 26

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	<ul style="list-style-type: none"> • If significant ore is encountered, consider grouting the entire hole, so that if there is subsequent underground activity, there isn't an open hole into the workings. • After a drill hole is completed, monitor the residues (e.g., drill mud, cuttings, soils) using a gamma meter; when monitoring a site the gamma meter should be held 1 m away from the cuttings; any residues with a gamma reading greater than 1 µSv/hr at 1 m distance/height should be either covered with soil in a pit, or returned down the drill hole • Implement acceptable protection zones around drainage lines, riparian zones. Implement access control. Plan and regulate vehicle movement. Impellent erosion protection • Contractors and own staff trained re-spills and disposal, procedure for storage, use and disposal of oils and grease. Activities must be monitored daily. • Groundwater quality analysis is recommended after the prospecting activity to identify the impact of the activity on the groundwater 		
Soil and Land Capability	No agricultural activities were observed during soil survey, and therefore the proposed development will not directly impact on the agricultural production of the development area. However, the proposed development will inevitably render the land unavailable for agricultural land use during the construction and operation phase, until decommissioning and rehabilitation phases are complete. In addition, the soils will be exposed to erosion,	X	PART A Section 3 (g) (d) (v) PART A Section 3 (h) (i) PART B Sections (e) and (f)

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	<p>compaction, dust emission, and potential soil contamination.</p> <p>The study recommended that:</p> <ul style="list-style-type: none"> The prospecting area should preferably be demarcated into subsections within which vegetation clearance and soil stripping can be permitted for the current year according to the mining schedule, in order to minimise the exposure duration and cumulative impacts during stockpiling. Additional areas can then be cleared and stripped progressively in the following prospecting year when required. Soil stripping and stockpiling should be carried out according to the land capability map and in accordance with the respective diagnostic horizon sequence. <p>Based on the findings of this assessment, the proposed development activities can be considered favourably for the projected economic incentives provided that the recommendations of this assessment report are considered and implemented to the satisfactory of the regulating authorities.</p>		Table 26
Biodiversity	<p>There is a variety of highly sensitive ecological receptors in the area including the surrounding area, the current mining development components are restricted to areas of moderate to low sensitivity. A further characteristic is the low extent of habitat loss and ecological interference resulting from the prospecting development components.</p> <p>The specialist studies made the following recommendations:</p>	X	PART A Section 3 (g) (d) (v) PART A Section 3 (h) (i) PART B Sections (e) and (f) Table 26

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	<ul style="list-style-type: none"> • Ensuring that the disturbed footprint is kept to a minimum, • No development should take place within high sensitive areas as highlighted in the sensitivity map (Appendix C), • Ensure that no protected plant species is disturbed, removed or translocated without a permit for such, and • Ensuring compliance to the recommended mitigation measures by any contractors (project proponent) used on the project. 		
Hydrology	<p>The study found that due to the ephemeral nature of surface water flow at the site, it is not practical to undertake regular surface water sampling although this would be critical to ensuring baseline water quality can be quantified prior to prospecting with potential impact subsequently monitored and quantified over time. The study recommended that a discussion be held with the DWS as they are the ultimate custodians of the water resources.</p> <p>Due to the nature of the climate in the area, stream flow at the site and in the wider region is ephemeral by nature. As such, there does not seem to be any excess stream flows (even for the wet season) that would need to be appropriately managed. The study however recommends compilation and updating of a water balance once more specific information about the proposed prospecting project and its associated water uses are known and refined annually during the life of the project.</p>	X	PART A Section 3 (g) (d) (v) PART A Section 3 (h) (i) PART B Sections (e) and (f) Table 26

k) Environmental impact statement

i) Summary of the key findings of the environmental impact assessment;

During the proposed prospecting operation impacts may occur on soils, natural vegetation, surface water, groundwater, sensitive landscapes, air quality, noise, visual aspects, and sites of archaeological and cultural importance should the EMPr not be adhered to.

Hle Services and Supplies will undertake measures to ensure that the identified impacts are minimised. Assessment of the impacts with the proposed mitigation measures has shown the significance of the impacts on all affected environmental aspects to be reduced from medium and low to low and negligible significance.

Land use will not change. Several landowners and land occupiers within the proposed project area may be affected although on a temporary basis due to the need to access the sites and the establishment and use of the campsite. Measures such as safety along the roads and dust suppression will be undertaken to ensure that the impacts on the land owners and land occupiers are minimised.

Storm water runoff from the dirty water areas of the drilling sites, its associated surface infrastructure (campsite) may have a detrimental impact on the surrounding water environment should this water be released to the environment. In order to prevent the occurrence of the above-mentioned impacts, dirty water collection sump will be used to collect all dirty water from the drilling site. The water collected from the sump will be re-used, evaporated and the sump will be rehabilitated once the drilling is finished. Sediments will be created from the site during the construction, operational and decommissioning phase, which may impact negatively on the surrounding water environment. The sediments will be treated should they contain hydrocarbon waste.

The employees will undergo training and will be given strict instruction not to undertake activities that will affect the environment and that may have an impact on the landowners. Waste generated from the site will be collected in proper receptacles and disposed of in registered waste disposal sites.

Key findings of the environmental impact assessment include:

- All the identified impacts will be localised, short term and will have a medium and low significance. The significance of potential environmental impacts can be reduced to low and very low significance with implementation of mitigation measures and monitoring.
- Cumulative noise, visual and air quality (dust) impacts are deemed to not be significant (low) when proper mitigation measures are implemented.
- Vegetation loss is unavoidable during the construction phase of the project. This will however be limited to the footprint of the infrastructure (access road, camp, boreholes). Care must be taken to manage any species of special concern as well as the proliferation of alien invasive plant species.

ii) Final Site Map

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. Attach as **Appendix**

Please refer to **Appendix** for the locality map which includes the environmental sensitive areas. Where required, the final revised maps showing the layout of the proposed project will be submitted to the DMR on granting of the prospecting right. The map will be developed to superimpose the proposed prospecting project and associated infrastructure together with the environmentally sensitive areas located within the proposed project site.

iii) Summary of the positive and negative implications and risks of the proposed activity and identified alternatives;

The proposed activities have medium and low significance and will be short term activities. The probability of occurrence of an impact was determined and most of these activities can be controlled and impacts can be reduced or avoided. Generally prospecting activities have low impact on the

environment. The planned activities negative impacts can be controlled and avoided or minimised. Mitigation measures will be used to manage and control any potential impact. The main impacts will include:

- Increased ambient noise levels resulting from drilling activities and increased traffic movement;
- Potential water and soil pollution resulting from hydrocarbon spills and soil erosion which may impact on the water resources utilised by the communities and landowners;
- Potential water and soil pollution resulting from hydrocarbon spills and soil erosion which may impact on ecosystem functioning;
- Increased vehicle activity within the area resulting in potential destruction and disturbance of flora and fauna;
- Poor access control to farms may impact on cattle movement, breeding and grazing practices;
- Influx of job seekers to site may result in increased opportunistic crimes;
- Potential visual impacts by drilling activities as well as vegetation clearance;
- Prospecting will be undertaken by special sub-contractors and it is not anticipated that employment opportunities for local and/or regional communities will result from prospecting activities; and
- Short term boost for local businesses.

I) Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr

Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

The objectives of the EMPr will be to:

- Provide sufficient information to strategically plan the prospecting activities as to avoid unnecessary social and environmental impacts;
- Provide sufficient information and guidance to plan the prospecting activities in a manner that will reduce impacts (social, physical and biological) as far as is practically possible;
- Ensure an approach that will provide the necessary confidence in terms of environmental compliance; and
- Provide a management plan that is effective and practical for implementation.

Through the implementation of the identified proposed mitigation measures, it is anticipated that the identified impacts can be managed and mitigated effectively. All the impacts were assessed to have significance ranging between medium and low without the implementation of mitigation measures. All the identified impacts will have a reduced significance of low when the mitigation measures have been implemented.

m) Final proposed alternatives.

(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment)

Where required, the revised final maps showing the layout of the proposed project will be submitted to the DMR on granting of the prospecting right. The final layout map will be developed to superimpose the proposed prospecting project and associated infrastructure together with the environmentally sensitive areas located within the proposed project site. The specialist studies have shown that there are no sensitive landscapes, except for the CBAs located on the project site. The final project layout map will be in such a way that there will be no drill sites, infrastructure and trenches located within sensitive sites.

n) Aspects for inclusion as conditions of Authorisation.

Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorisation

The following conditions should be included in the Environmental Authorisation:

- A minimum distance of 500 m from any dwellings or infrastructure must be kept;
- Landowners as well as land occupiers must be re-consulted at least 30 days prior to any prospecting activities undertaken on their properties;
- A map detailing the drilling locations should be submitted to the relevant landowners, the DWS and DMR prior to the commencement of the prospecting activities;
- No activities may be undertaken within 500 m of wetlands and/or within 100 m of watercourses without approval from the DWS; and
- No relocation of heritage resources may be undertaken without the approval of SAHRA.

o) Description of any assumptions, uncertainties and gaps in knowledge.

(Which relate to the assessment and mitigation measures proposed)

The following assumptions, uncertainties and gaps are applicable to this project:

- The Stakeholder Consultation is not yet complete. The Draft EIAR/EMPR will be updated once the 30-day public review and comment period has lapsed. Comments from the stakeholders will be incorporated into the FinalEIAR/EMPR to be submitted to the DMR;
- Details on the Water Use Licence requirements are not available; and
- No wetland delineation was undertaken.

Specialists appointed to conduct assess the baseline information and in-depth studies for the Pella Mission Prospecting Project, were provided with (at least) the following information:

- Site layout plan
- Scoping Report
- Prospecting works program; and
- Specialist studies were also shared among specialist

A summary of the assumptions and limitations noted by specialists has been noted below:

Biodiversity

Ecological studies should be conducted during the growing season of all plant species that may potentially occur. This may require more than one season's survey with two visits undertaken preferably during November and February. However, this assessment was conducted at a time of year (summer period) when the majority of the flora species would be able to be identified, and in such a manner to ensure all representative communities are traversed and therefore is likely to have included the majority of the dominant and common species present. However, climatic conditions may affect the presence of plant species.

The entire site was walked on foot and sampled by the specialist. All species included in the plant species list (Appendix A) were observed and recorded in the study area and any comments or observations made in this regard are based on observations, literature review, the expert knowledge and relevant professional experience of the specialist.

The fauna survey data included species that were easily seen, heard or have distinctive signs, such as tracks, scats, diggings during field walk. Therefore, many nocturnal species would not have been identified during a reconnaissance survey.

Groundwater

None specified.

Heritage Resources

It must be pointed out that heritage resources can be found in the unexpected places, it must also be borne in mind that survey may not detect all the heritage resources in each project area. While some remains may simply be missed during surveys (observation) others may occur below the surface of the earth and may be exposed once development (such as the construction of the proposed facilities) commences. Part of the area was not investigated because it was not accessible. Notwithstanding these limitations, great effort was invested in surveying areas that could be yield archaeological material remains, such as drainage area, pans and bottom section of the slopes.

Hydrology

The non-perennial stream in close proximity to the project site was dry therefore water quality Assessment could not be done:

Soils and Land Use

None specified.

Notwithstanding the above, Ndi Geological Consultant Services is confident that these assumptions and limitations do not compromise the overall findings of this report. For the purpose of this application it has been deemed that studies undertaken are sufficient.

p) Reasoned opinion as to whether the proposed activity should or should not be authorised

i) Reasons why the activity should be authorized or not

It is the considered opinion of the EAP that the activity may be authorised. Initial desktop studies has indicated that the proposed prospecting area has potential for sillimanite and quartz. The geology of the area supports this theory. Prospecting therefore has to be carried out to verify this information. The prospecting will also determine if there are any features that may have an impact on the economic extraction of the sillimanite and quartz.

The option of not approving the activities will result in a significant loss of valuable information regarding the mineral status (in terms of sillimanite and quartz), present on the identified properties. In addition, should economical reserves be present and the applicant does not have the opportunity to prospect the opportunity to utilize these reserves and any benefits associated with mining of the minerals for future phases will be lost. The minerals are considered to be of economic importance.

According to the impact assessment undertaken for the proposed project, the impacts of the project are considered to be of medium and low significance. Specialist studies conducted for the project found no fatal flaws associated with the project and project area. The significance of the impacts can be reduced to low and very low when the mitigation measures are implemented.

The project will also have positive impacts due to the employment to be created although for a short term, as well as a short boost to local businesses.

The stakeholders will also be requested for their comments. All comments to be received during Public Participation Process will be included in this EIAR and EMPPr. These comments will be addressed the as far as possible to the satisfaction of the interested and affected parties.

The management of the impacts identified in the impact assessment for all phases of the proposed project will be undertaken through a range of programmes and plans contained in the EMPr. In consideration of the layout plan and the management and mitigation measures contained within the EMPr compiled for the project, which are expected to be effectively implemented, there will be significant reduction in the significance of potential impacts.

ii) Conditions that must be included in the authorisation

Please see Section O.

1) Specific conditions to be included into the compilation and approval of EMPr

The granting of an authorisation for the prospecting and bulk sampling activities should be subject to the following:

- A minimum distance of 500 m from any dwellings or infrastructure must be kept;
- Landowners as well as land occupiers must be re-consulted at least 30 days prior to any prospecting activities undertaken on their properties;
- A map detailing the drilling locations should be submitted to the relevant landowners, the DWS and DMR prior to the commencement of the prospecting activities;
- No activities may be undertaken within 500 m of wetlands and/or within 100 m of watercourses without approval from the DWS;
- A wetland delineation study must be conducted before commencement of the prospecting activities;
- No relocation of heritage resources may be undertaken without the approval of SAHRA
- Planning of prospecting sites including design and siting of access routes must avoid heritage sites.
- Graves must be avoided and protected insitu. Where not possible, they must be exhumed by qualified professionals;
- Any water abstracted from the water resources for the use in prospecting activities requires a General Authorisation/Water Use License in terms of the National Water Act 36 of 1998 from the Department of Water and Sanitation. The applicant must obtain an authorisation, either through a water use license or general authorisation, for the abstraction of water from a surface body for use in prospecting activities.
- The EMPr should be implemented by a senior qualified environmental practitioner credible to interpret the EIR & EMPr;
- The project must remain in full compliance with the requirements of the EMPr;
- Prospecting and bulk sampling may only commence on approval of the Prospecting Right; and
- Stakeholder engagement must be maintained throughout site planning and preparation, invasive prospecting and closure and rehabilitation phase.

2) Rehabilitation requirements

Rehabilitation actions for the proposed prospecting activities would be undertaken in two fold namely concurrent rehabilitation and afterwards final decommissioning and rehabilitation. Concurrent rehabilitation would include:

- Drill holes will be sealed with cement and surface cap/covered;
- All sumps, pits, trenches, excavations will be backfilled with overburden and topsoil and re-vegetated
- All disturbed areas and its direct surroundings will be cleaned up from pollution and waste materials
- Contaminated soil by fuel or oil will be removed to a depth of contamination and disposed of at a registered landfill site.
- Overburden and topsoil will be spread evenly over disturbed areas and re-vegetate to finalise the rehabilitation
- Areas prone to erosion will be appropriately shaped to mimic the surrounding landscape

- Rehabilitated areas will be inspected to monitor re-vegetation rate and alien invader species that may have establish in the area will be removed;

Final decommissioning and rehabilitation:

- All temporary infrastructure will be removed from the study site;
- Any access tracks created during prospecting (if any) will be rehabilitated;
- Disturbed areas will be ripped and seeded;
- Sheep will be kept out of the rehabilitated areas until suitable vegetation cover has established;
- Rehabilitated areas will be inspected to monitor re-vegetation rate and all alien invasive plant species will be removed if any established; and
- Areas where erosion has occurred soil will be sourced and replaced and shaped to reduce the reoccurrence of erosion.

q) Period for which the Environmental Authorisation is required.

The prospecting right has been applied for a period of five (5) years. The Environmental Authorisation should therefore allow for 5 year of prospecting.

r) Undertaking

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Environmental Impact Assessment Report and the Environmental Management Programme report.

An undertaking by the EAP and the client is provided in Section 2 of the EMPr and is applicable to both the EIAR and EMPr.

s) Financial Provision

State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation. The closure costs were calculated to be R 450 000.00 as shown in Table 21.

Table 21: Cost Estimate Expenditure

ACTIVITY	YEAR 1 Expenditure (R')	YEAR 2 Expenditure (R')	YEAR 3 Expenditure (R')	YEAR 4 Expenditure (R')	YEAR 5 Expenditure (R')
PHASE 1 (months 1-6)					
Desktop Study	R 70 000.00	R 100 000.00			
Geological mapping	R 200 000.00	R 100 000.00			
PHASE 2 (months 7-17)					
Boreholes Excavations		R 350 000.00	R 180 000.00		R 400 000.00
PHASE 3 (months 18-22)					
Bulk Sampling				R 300 000.00	R 300 000.00
PHASE 4 (months 23-24)					
Analytical desktop study				R 100 000.00	R 300 000.00
EMPr& REHABILITATION FEES		R 100 000.00	R 100 000.00	R 100 000.00	R 150 000.00

ACTIVITY	YEAR 1 Expenditure (R')	YEAR 2 Expenditure (R')	YEAR 3 Expenditure (R')	YEAR 4 Expenditure (R')	YEAR 5 Expenditure (R')
PROSPECTING FEES	R 1 079.00	R 1 089.00	R 1 099.00	R 1 119.00	R 1 129.00
CONSULTANT	R 100 000.00	R 100 000.00	R 100 000.00	R 100 000.00	R 100 000.00
LABOUR	Work will be carried out by the contractors and consultant included on estimate given above.				
Annual Total	R 371 079.00	R 751 089.00	R 381 099.00	R601 119.00	R 1 251 129.00
Total Budget					R 3 355 515.00

i) Explain how the aforesaid amount was derived.

The financial provision for the environmental rehabilitation and closure of any mine/prospecting and its associated operations forms an integral part of the MPRDA. Sections 41 (1) and, 41 (2), 41 (3) and 45 of the MPRDA deal with the financial provision for rehabilitation and closure. During 2012, the DMR made updated rate available for the calculation of the closure costs, where contractor's costs are not available, these apply.

The "Guideline Document for the Evaluation of Financial Provision made by the Mining Industry" was developed by the DMR in January 2005 in order to empower the personnel at Regional DMR offices to review the quantum determination for the rehabilitation and closure of mining sites.

With the determination of the quantum for closure, it must be assumed that the infrastructure had no salvage value (clean closure). The closure cost estimate (clean closure) was determined in accordance with the DMR guidelines.

ii) Confirm that this amount can be provided for from operating expenditure.

(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

The applicant hereby confirms that the amount is anticipated to be an operating cost and is provided for as such in the Prospecting Work Programme. The financial provision will be made available to the DMR on the date on which the Prospecting Right is issued.

t) Deviations from the approved scoping report and plan of study.

i) Deviations from the methodology used in determining the significance of potential environmental impacts and risks.

(Provide a list of activities in respect of which the approved scoping report was deviated from, the reference in this report identifying where the deviation was made, and a brief description of the extent of the deviation).

The deviation from the approved scoping report was made in terms of the impact assessment methodology. The aim of the deviation as to make use of a less subjective and use a more quantitative methodology that would allow for the calculation of the significance of the identified impacts. Where in the approved scoping report, the determination of the significance of the identified impacts was based on a pre-determined definition, in the current methodology the significance of the impacts is calculated based on the likelihood that the impact will occur and the consequence of the identified impact (i.e. Significance = Consequence X Likelihood). The current methodology allows for all the aspects of impact assessment to be included in the assessment of the significance of the impacts as follows:

Significance = Consequence X Likelihood

Where:

Likelihood = Sum of (Frequency of activity/duration of aspect and frequency of impact)

Consequence = Sum of (Duration of impact, Spatial extent of impact and severity of impact)

The determination of each aspect is defined in the methodology used.

ii) Motivation for the deviation.

The current methodology provides for a quantitative way for determining significance of potential environmental impacts and risks. This will reduce the subjectivity of the determination of significance of potential impacts.

The calculation of significance based on likelihood and consequence is a widely used and scientifically accepted way of calculating/determining significance of impacts and risks.

u) Other Information required by the competent Authority

i) Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the:-

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

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as **Appendix 2.19.1** and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6. and 2.12. herein).

No specific report was generated for the purposes of the socio-economic conditions. Current land uses inside the prospecting area, such as farming and grazing, may be temporarily impacted through the presence of the fenced areas that drill rigs will operate within. These will however, be small areas. These areas will be rehabilitated post drilling activities and the areas will once again become available for grazing. Other potential socio-economic impacts will include:

- Nuisance noise due to on site activities and drilling;
- Poor access control resulting in impacts on cattle movement, breeding and grazing practises;
- Influx of job-seekers to site, which may result in an increase in opportunistic crime;
- Uncontrolled access to private property outside of the demarcated boundaries; and
- Visual impact as a result of the vegetation clearance.

Prospecting will be undertaken by specialist sub-contractors and it is not anticipated that employment opportunities for local and/or regional communities will result from the prospecting activities during the drilling phases.

Management and mitigation measures must be implemented to prevent environmental pollution which may impact on environmental resources utilised by communities, landowners and other stakeholders. Measures to manage the potential impacts on communities, individuals or competing land uses in close proximity include;

Noise due to construction activities, bulk sampling and drilling:

- Directly affected and adjacent landowners and land occupiers must be informed of the planned dates of the drilling activities and a grievance lodging mechanism must be made available to the stakeholders.
- Site activities shall be concluded during daytime hours to avoid night time noise disturbances and night time collisions with fauna.

Poor access control resulting in impacts on livestock movement, breeding and grazing practices:

- Access control procedures must be agreed on with the farm owners and all on site personnel shall be trained on these procedures.

Influx of job seekers to the site which may result in increased opportunistic crime:

- Casual labour shall not be recruited at the site. This will eliminate the incentive for people to travel to site seeking employment. Where necessary, a recruitment centre may be established in the major town areas;
- The landowners shall be notified on unauthorised persons encountered on site; and
- Where necessary, the South African Police Service (SAPS) will be notified of unauthorised persons encountered on site.

Visual Impact:

- Wet dust suppression will be undertaken to manage nuisance dust from construction vehicle movements and other construction activities as and when necessary;
- The portable ablution facilities and any other infrastructure will be acquired with a consideration for colour. Natural earth, green and mat black options which blend with the surrounding must be favoured;
- A waste management system will be implemented and sufficient waste bins will be provided for on site. A fine system must be implemented to further prohibit littering and poor housekeeping practices; and
- Vegetation cover shall be used where drill rigs will be located to minimise visual impacts.

Mitigation measures have been included in Section d (v) of this report and will also be included in the accompanying EMPr.

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

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(j)(vi) and (vii) of that Act, attach the investigation report as **Appendix 2.19.2** and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6. and 2.12. herein).

In terms of section 38 of the National Heritage Resources Act, 1999 (Act no. 25 of 1999), a comprehensive heritage impact assessment (HIA) investigation in accordance with the provisions of Sections 38(1) and 38(3) of the said act and focuses on the survey results from a cultural heritage survey. The HIA study was undertaken in order to establish if any localities of heritage significance were present on the property.

No resources of cultural and/or heritage importance were identified. It must be noted however that during the assessment some sections of the affected property were not accessible. It is therefore recommended that prospecting contractors be on the lookout for any potential graves that may be encountered in the area. Should any graves or other cultural and heritage resources be encountered, the resources must be fenced and a suitably qualified specialist must be appointed to provide guidance on the process to be followed in order to mitigate against any potential impacts.

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

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. The EAP must attach such motivation as **Appendix 4**).

The specialist studies conducted for the project have indicated that there are no fatal flaws associated with the proposed project. Where required, a detailed revised layout plan will be submitted to the DMR and adjacent and affected landowners prior to commencement of prospecting activities.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1 Draft environmental management programme.

a) Details of the EAP

(Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

Details of the EAP are included in Part A Section 1 (a)

b) Description of the Aspects of the Activity

(Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1) (h) herein as required).

The EAP hereby confirms that the requirement to describe the aspects of the activity that are covered by the draft Environmental Management Programme is already included in Part A, Section (1)(h) of this report as required.

c) Composite Map

(Provide a map (Attached as an Appendix) at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

Please refer to Appendix F for the composite map. The composite map was created as follows:

- Red Zones (no go areas):
 - Wetlands with the 500 m buffer;
 - Rivers with the 100m buffer;
 - Sensitive landscapes (ridges etc.);
 - Dolomitic areas (if any);
 - Heritage Areas with 50 m buffer (if any);
 - Protected areas; and
 - Critical Biodiversity Areas (CBAs).
- Orange Zones (requiring special attention):
 - Ecological Support Areas

The specialist studies found that there are no fatal flaws associated with the project and project site. However, especially with heritage resources such as graves, there is a chance that some important environmental features that were not identified during the studies may be encountered during prospecting. The composite map will be updated once all the sensitive environmental sites have been identified as part of the next phases of the project.

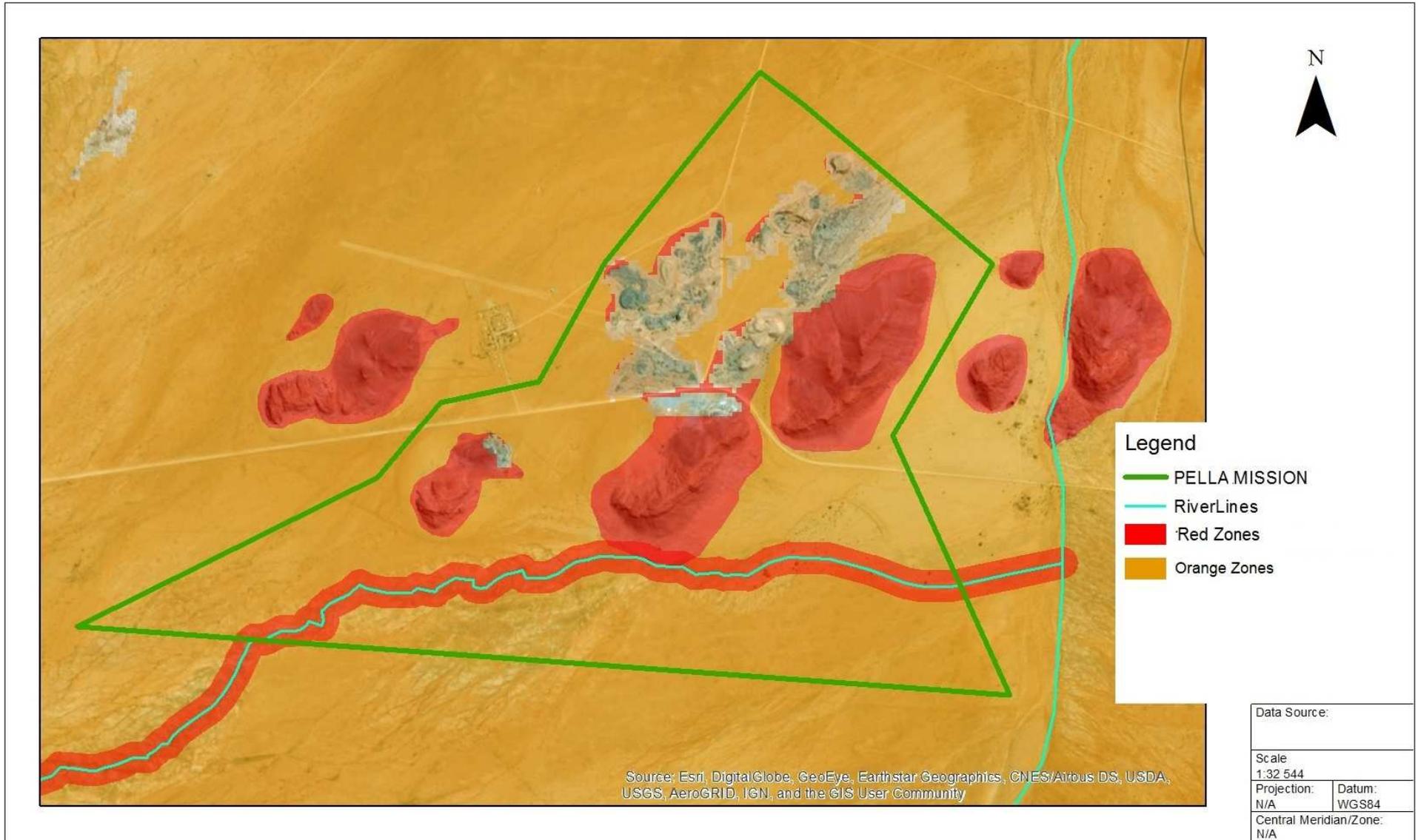


Figure 23: Composite

Map

d) Description of Impact management objectives including management statements

i. Determination of closure objectives.

(ensure that the closure objectives are informed by the type of environment described)

Each phase of the prospecting activities is dependent on the success of the preceding phase. Depending on the findings from Phase 1, Phase 2 will be initiated etc. The location and extent of the soil drill sites can therefore not be determined at this stage of the process.

The rehabilitation plan was developed on the basis that the rehabilitated areas will be made safe, stable, non-polluting and will be able to support self-sustaining ecosystems, similar to surrounding natural ecosystems.

To ensure that the rehabilitation plan is aligned with the closure objective, high-level risk assessment of the prospecting components was undertaken to establish the potential risks associated with therewith.

The closure objectives are to:

- Eliminate any safety risks associated with drill holes and sump through adequate drill hole capping and backfilling;
- Remove and/or rehabilitate all pollution and pollution sources such as waste materials and spills;
- To establish rehabilitated areas to a state which with no susceptible to soil erosion which may result in loss of soil, pollution of water resources;
- Restore disturbed areas and re-vegetate these areas with plant species naturally occurring in the area to restore the ecological function of the affected areas as far as practicable; and
- Eliminate all alien invasive plant species from the disturbed areas.

ii. The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity.

In addition to mitigation measure to manage impact on the project site, the monitoring program and remediation measures should be complied with. The monitoring program should focus on the following aspects but not limited to:

- Groundwater;
- Flora and Fauna;
- Noise and Air quality; and
- Surface water.

The following aspects should be monitored regularly:

- Oil and water Spillages;
- Fugitive Dust and sedimentation;
- Waste management areas;
- Trenches;
- Stockpiles.

In addition to monitoring the emergency response and remediation procedure must be developed and implemented. The purpose of this procedure is to anticipate the occurrence of environmental crises, which may occur due to unforeseen circumstances. Since these events cannot be accurately predicted or prevented, a procedure has been prepared that must be followed should such an incident

occur, which will assist in the mitigation, remediation and conservation of the environment and contribute to the safety of workers and the surrounding communities.

iii. Potential risk of Acid Mine Drainage.

(Indicate whether or not the mining can result in acid mine drainage).

Acid Mine Drainage (AMD) is currently the main pollutant of surface water in mining areas. AMD is caused when water flows over or through sulphur-bearing materials forming solutions of net acidity. AMD comes mainly from abandoned coalmines and currently active mining. Sillimanite is a naturally occurring anhydrous aluminium silicate mineral with which has a chemical formula, Al_2SiO_5 . Quartz is a mineral composed of silicon and oxygen atoms in a continuous framework of SiO_4 silicon–oxygen tetrahedra, with each oxygen being shared between two tetrahedra, giving an overall chemical formula of SiO_2 . The prospecting and/or mining of Sillimanite and quartz will therefore not result in the formation of acid mine drainage as the compound does not contain Sulphur, a pre-requisite for the formation of AMD.

iv. Steps taken to investigate, assess, and evaluate the impact of acid mine drainage.

N/A. No acid mine drainage will form as a result of the prospecting activities and bulk sampling.

v. Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage.

N/A. No acid mine drainage will form as a result of the prospecting activities and bulk sampling.

vi. Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.

N/A. No acid mine drainage will form as a result of the prospecting activities and bulk sampling.

vii. Volumes and rate of water use required for the operation.

The rates and volumes of water to be used are not available at this stage. It is expected that approximately 225 litres of water per person will be required for potable use.

viii. Has a water use licence has been applied for?

The source of water has not yet been determined. It is anticipated that discussions will be held with the DWS to determine whether or not abstraction of water will be required. Based on the outcomes of the discussions with the DWS, any potential abstraction of water due to drilling activities will be clarified. At this stage it is not anticipated that abstraction will be required.

Furthermore, depending on the DWS opinion of the sampling, potentially in the river beds, Section 21 (c) and (i) WUL may be required. This will also be clarified with the DWS. Should it be deemed necessary, on instruction by the DWS, the applicant will submit a water use licence application.

ix. Impacts to be mitigated in their respective phases

Table 22: Environmental Management Programme for the proposed Pella 39 Prospecting project

NAME OF ACTIVITY		PHASE	SIZE AND SCALE OF DISTURBANCE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Data Collection and Assessment	Desktop Study	Planning	N/A	N/A	Control potential deviations from the approved EMPr through the effective implementation of the data acquisition and desktop study.	Throughout the planning phase
Geological Mapping			N/A	N/A		
Planning for Drilling Surveys			N/A	N/A		
Access Roads	Establishment of access roads, campsite, physical surveying of the site and pegging of drilling boreholes	Construction	0.1 ha	<u>Loss of soils, erosion of the soils and impacts on land owner's livelihood:</u> No soil stripping will be allowed during site establishment;	Implementation of mitigation measures will ensure that the activities in the development of the prospecting sites and associated infrastructure do not have detrimental impacts on the soils, land use and land capability.	During the construction phase
Fencing			2 000m	Should it be necessary to conduct geophysical surveys and geological mapping, ensure minimal disturbance of soil;		
Drill Sites			Total 50 sites (40 RC drilling sites and 10 core drilling sites with a total footprint of 0.5 ha)	Any activity that may result into the disturbance of the soils must be rehabilitated immediately on discovery; No gates shall be left open and none of the fences must be damaged. Where private property is damaged, the property owners shall be appropriately compensated; Machinery to be used for the operation will be of good working conditions;		
Temporary cam site			0.04 ha	Any hydrocarbon spill from the site establishment will be remediated as soon as possible;		
Parking			0.02 ha	Use sites that are unused and that are in the degraded state for the proposed development. This must be done in agreement with the land owner. The siting of the boreholes must be conducted such that rocky ridges, sensitive grass lands, indigenous trees and shrubs, sites of geological importance and farmlands actively used for crop farming are avoided;		
Bulk Sampling Trenches			5 (100m X 50m X 20m) trenches (2.5 ha)	Contaminated soil shall be removed and disposed of to an appropriate licensed landfill site in terms of NEMWA, or can be removed by a service provider that is qualified to clean the soil;		
Residual Deposit Area			0.5 ha	The time in which soils are exposed during construction activities should remain as short as possible;		
Storage of hazardous substances (Diesel storage tanks, chemical storage containers)			0.025 ha	Erosion control measures shall be implemented where deemed necessary; In general all steep slopes steeper than 1:3 or where the soils are more prone to erosion must be stabilised;		
Domestic Waste Facility			0.025 ha	Institute adequate sedimentation control measures where necessary when excavation or disturbance of the river banks takes place;		
Topsoil			0.1 ha	The time in which soils are exposed during construction activities; If stockpiles are not going to be used immediately the stockpiles shall be rehabilitated to prevent erosion and resulting in the increase in turbidity;		
Stockpiles			0.05 ha	Runoff from stockpiles shall be detained in order to support growth of vegetation; Runoff from the stockpiles shall be suitably managed to ensure that the runoff volumes and velocities are similar to pre disturbed levels;		
Overburden storage area			0.1 ha	Vegetation shall be used to promote infiltration of water into the stockpile instead of increasing runoff;		
Site office	0.002 ha	A monitoring programme will be implemented if the stockpiles are not used within the first year whereby the vegetation of the stockpiles is monitored in terms of basal cover and species diversity; If it is noticed that the vegetation on the stockpiles is not sustainable, appropriate corrective actions shall be taken to rectify the situation;				

			<p><u>Deterioration of water quality in in the nearby streams and within the groundwater regime:</u> No site establishment shall be permitted within sensitive landscapes; No construction activities shall be permitted within 100 meters of water courses and/or drainage lines and within 500 m of wetlands and/or riparian zones without consent from the DWS; Avoid stripping of areas within the construction sites; Rehabilitate areas that may have been mistakenly stripped; Storm water upslope of the campsite and drill sites should be diverted around these sites; Proper waste management facilities will be put in place at the campsite and drilling site. Any hydrocarbon spill from the site establishment will be remediated as soon as possible; No washing of vehicles shall be allowed outside demarcated areas. Washing bays for vehicles and other equipment shall be provided with appropriate soak always, will be clearly demarcated and will not be allowed to contaminate any surface runoff; Sufficient areas shall be provided for the maintenance and washing of vehicles; Refuelling of vehicles will only be allowed in designated areas; All construction equipment shall be parked in a demarcated area Drip trays shall be used when equipment is used for some time; On surface bulk storage of hydrocarbons must be situated in a dedicated area which will include a bund or a drain where necessary to contain any spillages during the use, loading and off-loading of the material; Bunded areas shall contain 110% of the stored volume; Bund areas must be impermeable; Bund area must have a facility such as a valve/sump to drain or remove clean stormwater, Contaminated water shall be pumped into a container for removal by an approved service provider; Regular inspections shall be carried out to ensure the integrity of the bundwalls; All preventative servicing of earth moving equipment and construction vehicles shall be conducted off site; Runoff from this area shall be contained; Spill kits shall be made available and all personnel shall be trained and training records shall be made available on request; Ensure that topsoil is properly stored, away from the streams and drainage areas; Vehicle and personnel movement within watercourses and wetland areas shall be strictly prohibited; Adequate stormwater management must be incorporated into the design of the project in order to prevent contamination of water courses and wetlands from dirty water;</p> <p><u>Water abstraction:</u> Any abstraction of water for construction purposes must be approved by DWS;</p> <p><u>Wetland destruction and loss of habitat:</u> Construction activities will be limited to be more than 500 m from the edge of the wetlands and riparian zones without consent from the DWS; Adequate stormwater management must be incorporated into the design of the project in order to prevent erosion and the associated sedimentation of the aquatic system; No vehicles may be allowed to indiscriminately drive through the riparian areas or within the active stream channels; All disturbed areas shall be re-vegetated with indigenous species; All construction materials shall be kept out of the wetlands and riparian areas; All vehicles shall be regularly inspected for leaks. Re-fuelling must take place outside the project area, on a sealed surface area to prevent ingress of hydrocarbons into topsoil and aquatic ecosystem;</p> <p><u>Air pollution through air pollutants' emissions, from the construction site:</u> Wet suppression using will be conducted at areas with excessive dust emissions; Dust suppression measures shall be implemented on dry weather days and periods of high</p>	<p>Implementation of the mitigation measures will ensure that the quality of streams and groundwater within the site will comply with the target DWS target water quality objective and construction will be in Compliance with the regulations under the GN704.</p> <p>Water abstraction will not be permitted unless authorisation is granted by DWS. Obtain all necessary authorisations in terms of Section 21 of the National Water Act (No.36 of 1998).</p> <p>Implementation of mitigation measures will assist with maintaining the current state of the sensitive landscapes within the project area and will enable the project to comply with the requirements of the NWA</p> <p>With the implementation of the mitigation measures, the construction will be undertaken such that the ambient air quality does not exceed the National</p>	
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RC Drilling	Drilling and Soil Sampling	Soil	40 Boreholes	<p><u>Soil profile disruption, contamination of soils, destruction of natural vegetation and loss of land use:</u> The drilling of the exploration boreholes will be undertaken in such a manner that the environment is protected from probable spillages and contamination by carbonaceous material.</p> <p>All boreholes and sumps will be rehabilitated to pre-drilling conditions.</p> <p>Tarpaulins will be placed on the ground to prevent oil, grease, hydraulic fluid and diesel spills during emergency repairs.</p> <p>All oil spills will be remedied using approved methodologies.</p> <p>The contaminated soils will be removed and disposed of at a licensed waste disposal facility.</p> <p>All waste generated from the drilling sites and the campsite will be collected in proper receptacles and removed to registered disposal facilities e.g., sewage treatment plant, solid waste disposal site or hydrocarbon recycling or treatment facilities.</p> <p>No topsoil shall be stored within 100 m of water courses and drainage lines or within 500 m of wetlands and riparian areas.</p> <p>The soils must be used for the backfilling and rehabilitation of the sumps.</p> <p>The rehabilitated sump must be seeded with recommended seed mix.</p> <p><u>Migration of animal life due to disturbance caused proposed project:</u> Where possible drill sites shall be located within degraded environments.</p> <p>Poaching will be prohibited at the prospecting sites.</p> <p><u>The drilling operation and use of campsite may result in the generation of surface water runoff contaminated with silt (sedimentation) and possibly hydrocarbon fluids should</u></p>	<p>The implementation of the mitigation measures will ensure that the land use and capability of the sites where the operations will be undertaken will continue after the proposed project.</p> <p>Maintenance of the current status on animal life within the project area.</p> <p>The mitigation measures will ensure that the drilling operation does not have detrimental impacts on the surface and</p>	<p>Upon cessation of the individual activity Throughout the operation phase</p>
Core Drilling			10 Boreholes			
		Operation				

<p>Bulk Sampling</p>			<p>5 Sampling trenches (100MX50MX20M) (2.5 ha)</p>	<p><u>spillages occur:</u> No prospecting operations will be undertaken within 100 metres from the nearby streams and 500 meters from the nearby steams and 500 meters from the nearby wetland areas. Sumps will be excavated for the collection mud and excess water from the drilling sites. The sump will be sized such that it will be able to contain the water and mud that will be generated during the prospecting operation. Storm water generated around the drilling site will be diverted away to the clean water environment. No vehicle maintenance will be allowed on site. All hydrocarbons will be stored on protected storage areas away from the streams. The drilling of the exploration boreholes will be undertaken done in such a manner that the environment is protected from probable spillages and contamination by carbonaceous material. Tarpaulins will be placed on the ground to prevent oil, grease, hydraulic fluid and diesel spills during emergency repairs. All oil spills will be remedied using approved methodologies. The contaminated soils will be removed and disposed of at a licensed waste disposal facility. The land owners' borehole water quality and yield will be closely monitored during the drilling operation. Should it be proven that the operation is affecting the quantity and quality of groundwater available to users and surrounding water resources, the affected parties must be compensated. All boreholes and sumps will be rehabilitated to pre-drilling conditions. All waste generated from the drilling sires and the campsite will be collected in proper receptacles and removed to a registered disposal facilities e.g., sewage treatment plant, sold waste disposal site or hydrocarbon recycling or treatment facilities. The contaminated soils will be removed and disposed of at a licensed waste disposal facility. All waste generated from the drilling sires and the campsite will be collected in proper receptacles and removed top registered disposal facilities e.g., sewage treatment plant, sold waste disposal site or hydrocarbon recycling or treatment facilities. <u>Generation of dust and fuel fumes by vehicular movement:</u> Dust suppression must be conducted during the operational phase of the project. Vehicle maintenance must be conducted regularly to avoid excessive diesel fumes. Maintain a speed limit of 20km/hr during the dry season and or when the wind velocity is likely to result in an increased nuisance dust. Materials transported on public roads must be covered.</p>	<p>ground water environment, and that the activities will comply with the provisions of the NWA.</p>	
				<p><u>Increased noise levels:</u> Limit the maximum speed to 40 km/h or less, subject to risk assessment. Less noisy equipment will be used, the equipment will be kept in good working order and the equipment will be fitted with correct and appropriate noise abatement measures. Ensure that the employees are issued with earplugs and that they are instructed to use them. Educate employees on the dangers of hearing loss due to mine machinery noise. Drill sites shall be located as far from private property as is possible to minimise noise impacts <u>Visual impacts on the surrounding communities and road users from the construction:</u> The landowners will be informed on the type of machinery and equipment to be used at the prospecting sites. Lighting will be conducted in manner that will reduce the impacts on visual aspects at night times. Materials transported on public roads must be covered. The number of construction vehicles and machinery to be used shall be kept to a minimum. Movement of vehicles shall be kept to outside busy hours to minimise the visual impacts on the residents. All lighting shall be kept to a minimum within the requirements of safety and efficiency.</p>	<p>The air quality in the vicinity of the drilling sites and sites' access routes will be maintained to stay within the national air quality standards.</p> <p>The mitigation measures will ensure that the noise levels from the sites will be managed and measures will be taken to ensure that noise levels are below the National Noise Control Regulations, SANS10103:2008 guidelines.</p> <p>Measures will be undertaken by the mine to ensure that the visual aspects from the site are complying with the relevant visual standards and objectives.</p>	

			<p>Where such lighting is deemed necessary, low-level lighting, which is shielded to reduce light spillage and pollution, shall be used.</p> <p>No naked light sources shall be directly visible from a distance. Only reflected light shall be visible from outside the site.</p> <p>External lighting shall use down-lighters shielded in such a way as to minimise light spillage and pollution beyond the extent of the area that needs to be lit.</p> <p>Security and perimeter lighting shall be shielded so that no light falls outside the area needing to be lit</p> <p>Drill rigs shall be located in areas with adequate tree and bush cover to minimise the visual impact on residents.</p> <p>Where no adequate vegetation cover is available for the drill rigs, shade cloths can be used to screen off the drill rigs.</p> <p>Where possible, rehabilitation of the work areas shall be undertaken in tandem with construction to ensure that areas stripped of vegetation are kept to a minimum</p> <p><u>Damage or destruction of sites with archaeological and cultural significance:</u></p> <p>The drilling sites will be situated away from any identified grave site or heritage sites. A 50 m buffer will be created between the sites and the proposed camp and drilling sites.</p> <p><u>Safety, intrusion livelihood impacts on the landowners and occupiers:</u></p> <p>Residents shall be informed of any road closures and other disruptions and maintain roads used for the operation in good order. Clear signage shall be installed around the project area indicating the type of disruption and the time during which the disruptions will occur.</p> <p>Communication with land owners and land occupiers shall be kept open during the operational phase of the project. A record of such communication shall be kept on site.</p> <p>Ensure that negotiations on compensation are undertaken before the drilling programme can commence. This will include any other conditions that the landowners may deem necessary for the prospecting operation. The outcomes of the negotiations shall be recorded and kept in a file on site.</p> <p>Ensure that safety measures are implemented to prevent impacts on land owners and occupiers.</p> <p>Access to private property, outside of the demarcated drill sites, without landowner consent shall be strictly prohibited.</p> <p><u>Traffic:</u></p> <p>Local speed limits and traffic laws shall apply at all times to minimise the occurrences of accidents on public roads;</p> <p>Where possible the transportation of materials and rubbish shall be undertaken outside traffic peak hours to minimise inconveniencing residents;</p> <p>The number of construction vehicles and trips shall be kept to a minimum</p> <p>All the construction vehicles shall undergo maintenance on a regular basis to improve on the combustion engine vehicle efficiency.</p> <p><u>Flora:</u></p> <p>All disturbed areas must be concurrently rehabilitated.</p> <p>Prohibit the collection of any plant material for firewood or medicinal purposes.</p> <p>The existing integrity of flora surrounding the study area shall be upheld and no activities shall be carried out outside the footprint of the construction areas</p> <p>Edge effect control shall be implemented to avoid further habitat degradation outside of the proposed footprint area.</p> <p>All sensitive open space areas will be demarcated and access into these areas shall be prohibited.</p> <p>Protected floral species occurring within the vicinity of the study area, but outside the disturbance footprint shall be fenced for the duration of the drilling activities.</p> <p>Monitoring of relocation success will be conducted during the operational phase.</p> <p>Monitoring of relocation success shall continue during and beyond the decommissioning and closure phase.</p> <p>All disturbed areas shall be re-vegetated with indigenous riparian species.</p>	<p>With the implementation of the mitigation measures, the drilling operations will be undertaken in compliance with the requirements of the National Heritage Resources Act, 1999 (Act 25 of 1999) and recommendations from the specialist.</p> <p>The mine will ensure that all safety standards are met and that access to landowners and occupiers are not detrimentally affected</p> <p>The objective is to warn the general public of construction traffic, and to manage traffic on site and implementing the mitigation measures will ensure road safety along the public roads and onsite and to increase awareness of slow moving vehicles</p> <p>The implementation of mitigation measures will ensure that the drilling and sampling activities do not have detrimental impact on the area's flora.</p>	
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Data Analysis	Feasibility Studies		N/A	N/A	N/A	N/A
Feasibility Studies Report			N/A	N/A	N/A	N/A
Trench Backfilling Borehole capping Removal of equipment and infrastructure	Closure and Rehabilitation of borehole and infrastructure sites	Decommissioning and Closure	All the affected sites	<p><u>Compaction and contamination of soils within the rehabilitation site:</u> All vehicles and machinery used at the rehabilitation site will be kept in good working order. No repairs of vehicles or machinery will be conducted at the rehabilitation site unless it is emergency repairs, which will be conducted on protected ground.</p> <p>Movement of mine vehicles and machinery will be limited to demarcated routes, which will be rehabilitated when no longer in use.</p> <p><u>Re-instatement of soil productivity, land capability and land use:</u> All infrastructure will be removed from the site in accordance to the rehabilitation plan. Contaminated soils shall be cleaned or disposed of at a registered landfill site in terms of the requirements of the NEM: WA.</p> <p><u>Pollution of surface water environment:</u> The site area will be rehabilitated to be free draining.</p> <p>Erosion protection measures such as the use of contour berms and repair of gullies will be undertaken until such time that the rehabilitated surfaces can be shown to be sustainable.</p> <p>Existing roads should be used where possible and new disturbed areas should be minimised.</p> <p><u>Air pollution from rehabilitation site:</u> Where necessary, wet suppression will be conducted at areas with excessive dust emissions.</p> <p>Vehicles and machinery will be well maintained.</p> <p>The traffic volumes and speed within the rehabilitation site will be controlled.</p> <p><u>Nuisance Noise:</u> Smaller or less noisy equipment should where possible be used when working near receptors.</p> <p>Equipment will be well maintained and fitted with the correct and appropriate noise abatement measures.</p> <p><u>Damage or destruction of sites with Archaeological and cultural significance:</u> A 50m buffer will be maintained between any site and the archaeological site.</p>	<p>Rehabilitated areas will be maintained to comply with the closure objectives.</p> <p>Rehabilitated areas will be maintained to comply with the closure objectives.</p> <p>The surface water leaving the rehabilitation site will comply with the DWS target water quality parameters.</p> <p>Decommissioning and rehabilitation of the site will be conducted in such a manner that the ambient air quality does not exceed the air quality standards</p> <p>Ensure that the noise from the rehabilitation activities do not exceed the SANS 10103 Rating Level.</p> <p>Should heritage sites be identified, rehabilitation in close proximity to the sites will not be damaged or destroyed by the rehabilitation activities</p>	Upon cessation of prospecting activities

e) Impact Management Outcomes

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph ());

Table 23: Impact Management

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	ASPECTS AFFECTED	PHASE In which impact is anticipated	MITIGATION TYPE	Standard to be achieved
Data Collection and Assessment	Desktop Study	None	N/A	Planning	Control potential deviations from the approved EMPr through the effective implementation of the data acquisition and desktop study.	Remain within the ambits of the EMPr and Environmental Authorisation.
Geological Mapping		None	N/A	Planning	Control potential deviations from the approved EMPr through the effective implementation of the data acquisition and desktop study.	Remain within the ambits of the EMPr and Environmental Authorisation.
Planning for Drilling Surveys		None	N/A	Planning	Control potential deviations from the approved EMPr through the effective implementation of the data acquisition and desktop study.	Remain within the ambits of the EMPr and Environmental Authorisation.
Access Roads Drill and trenching Sites Temporary Soil Storage Area Fence Hydrocarbon storage area Mobile office Ablution Facility	Establishment of access roads, campsite, physical surveying of the site and pegging of drilling boreholes	Loss of soils, erosion of the soils and impacts on landowners' livelihood.	Soils, Land capability and Land use	Construction	Rehabilitation of areas cleared of vegetation and dust control	Retain topsoil integrity for the reuse in rehabilitation Vegetation clearance shall be kept to a minimum. No clearance of vegetation outside demarcated areas
		Contamination of groundwater from hydrocarbon spillages	Groundwater	Construction	Control through management and monitoring of spillages. Where spillages occur, the soil must be stripped and disposed of as stipulated in the EMPr.	Comply with the EMPr. Retain topsoil integrity for the reuse in rehabilitation. Where required, disposal of contaminated soils shall be undertaken in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM: WA)
		Contamination of surface water due to erosion of soils which will lead to increased turbidity as well as contamination from hydrocarbon spillages	Surface water	Construction	Monitoring through rehabilitation and management of spoil sites	Retain topsoil integrity for the reuse in rehabilitation Comply with the requirements of the NWA: no construction activities within 100 m of water courses and 500m of wetlands and riparian zones without consent from the DWS.
		Wetland contamination, destruction and loss of habitat	Wetlands and aquatic ecosystems	Construction	Control of access to wetland areas and within the regulated 500 m buffer.	National Water Act, 1998 (Act 36 of 1998) No construction activities may be conducted within 500 m of wetlands and riparian zones without approval from the DWS.
		Destruction of graves and cultural heritage sites	Heritage and archaeological resources	Construction	Control through clear demarcation of prospecting areas to ensure avoidance of graves and other heritage sites	No destruction/loss of heritage resources
		Destruction of fossils	Palaeontological resources	Construction	Management of drill sites. Should any fossils be discovered, operations must cease and SAHRA must be notified	No destruction/loss of fossils
		Loss of natural vegetation in the affected areas	Flora	Construction	Rehabilitation of areas cleared of vegetation. Control of alien invasive plant species	Comply with existing legislation National Environmental Management: Biodiversity Act 2004 (Act No 10 of 2004) and Alien and Invasive Species Regulations, 2014. No vegetation clearance outside of demarcated areas
		Migration of fauna due to disturbance caused by the proposed project	Fauna	Construction	Relocation of affected species of conservation importance	Remain within the designated area demarcated for prospecting activities. Ensure minimal clearance of vegetation

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	ASPECTS AFFECTED	PHASE In which impact is anticipated	MITIGATION TYPE	Standard to be achieved
		Air pollution through nuisance dust, PM 10 and PM2.5 as well as emissions from construction vehicles and machinery.	Air Quality	Construction	Dust control measures	Comply with the requirements of the National Environmental Management: Air Quality Act, 2004: Dust Regulation guidelines for rural communities. Comply with the requirements of the Minimum Emission Standards
		Increase in ambient noise due to movement of construction vehicles and machinery	Noise	Construction	Management and maintenance of construction vehicles. Management through the use of noise dissipating technologies e.g. noise mufflers Control through the limiting of the activities to the day time and the implementation of an open and transparent channel of communication	Remain within the Noise Regulation Standards for Rural Areas.
		Visual impacts as a result of vegetation clearance	Visual	Construction	Rehabilitation of areas cleared of vegetation	Vegetation clearance must be limited to demarcated areas only
		Increased traffic on the roads due to additional construction vehicles	Traffic, Socio-economic	Construction	Speed control and limitation of the times when construction vehicles may be on the roads	Minimise the number of vehicles used during construction Movement of construction vehicles shall be limited to outside of busy hours
		Impact of carbon dioxide (GHG) produced by construction vehicles on the local climate	Climate Change	Construction	Control and keep to a minimal the number of vehicles used for construction. Vehicles must be maintained to ensure efficient use of fuel.	Comply with the EMPr Minimise the number of vehicles used during construction Regular maintenance of vehicles and machinery to improve fuel efficiency Comply with requirements of the National Environmental Management: Air Quality Act, 2004
RC Drilling Core Drilling Bulk Sampling	Drilling and bulk sampling	It is expected that during the operation phase the project will not result in the creation of employment as prospecting requires highly specialised personnel. The applicant will make use of qualified contractors for the drilling and sampling of the sites. The community will however continue to benefit as a result of the continued boost in small local businesses. Drilling has potential to affect the day to day operations by affected landowners	Socio-Economic	Operation	Control of times during which operation activities will take place	Maintain a 100% crime free area within the control of the prospecting No complaints fro landowners due to prospecting activities. Should there be conflicts, these must be resolved
		The use of vehicles during the drilling of the exploration boreholes may result in the spillages of hydrocarbons from vehicles and machinery. This will result in the contamination of soils and groundwater. The prospecting operations will require the drilling of boreholes, which may result in the drawdown, which may affect the yield to the surrounding groundwater users. Material used for backfilling boreholes may leach pollutants, which will result in the contamination of surrounding groundwater regime. This may spread beyond the backfilling site via plume migration.	Groundwater	Operation	Rehabilitation of affected areas and control using bunds	No soil contamination as a result of hydrocarbon spillages Rehabilitation and disposal of contaminated soils conducted in terms of the NEM:WA
		Drilling operations may result in the generation of surface water runoff contaminated with drill muds and cuttings, should spillage occur. The sedimentation and possible contamination with carbonaceous material will have negative impacts on the water quality due to increase turbidity and an increase in acidity of the water in the streams. This will have an impact on aquatic habitats.	Surface Water	Operation	Control through management and monitoring of surface runoff	Retain topsoil integrity for the reuse in rehabilitation. No dirty runoff/stormwater entering water courses. The NWA: No activities within 100 m of watercourses and drainage without consent from the DWS. No soil contamination as a result of hydrocarbon spillages Rehabilitation and disposal of contaminated

NAME OF ACTIVITY	POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	ASPECTS AFFECTED	PHASE In which impact is anticipated	MITIGATION TYPE	Standard to be achieved
					soils conducted in terms of the NEM:WA
	Uncontrolled movement within wetland areas may have an impact on the wetland habitat, ecological functioning and structure.	Wetlands	Operation	Avoidance of wetland and riparian areas	NWA: No activities shall be permitted within 500 m of wetland and/or riparian areas without prior approval from the DWS Comply with requirements of the NWA
	The project may result in the following impacts on the floral environment during the operation phase: Destruction of potential floral habitats as a result of continual disturbance of soil, leading to altered floral habitats, erosion and sedimentation; Impact on floral diversity as a result of possible uncontrolled fires; Potential spreading of alien invasive species as a result of floral disturbance; and Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase	Flora	Operation	Rehabilitation of affected areas Monitoring of rehabilitated areas to ensure success.	No invasive plant species in rehabilitated areas No removal of vegetation outside of demarcated areas. Ensure successful rehabilitation and/or removal of contaminated soils
	The project may result in the following impacts on the faunal environment during the operation phase: Migration of fauna from the prospecting area due to noise as a resulting of drilling activities; Loss of faunal due to collisions with vehicles and machinery; Loss of faunal diversity and ecological integrity as a result of poaching and faunal species trapping; Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase.	Fauna	Operation	Rehabilitation of affected areas Drill holes must be temporarily plugged immediately after drilling is completed and remain plugged until they are permanently plugged below ground to eliminate the risk posed to fauna by open drill holes. Drill holes must be permanently capped as soon as is practicable	No removal of vegetation outside of demarcated areas. Successful plugging of drill holes, with no faunal casualties as a result of holes being left open
	The use of vehicles during the drilling of the exploration boreholes may result in the spillages of hydrocarbons from the vehicles and machinery. This will result in the contamination of soils. The materials removed from the drilling sites will contain carbonaceous material, which has potential for contamination should it not be managed properly. The material from the drilling site may result in the contamination of soils, which may render the land not usable after backfilling operation.	Soils Land use and Land Capability	Operation	Rehabilitation of affected areas	Retain topsoil integrity for the reuse in rehabilitation.
	The movement of vehicles and drilling machinery will likely result in an increase in nuisance dust, PM10 and PM2.5. There is also potential for increase in carbon emissions and ambient air pollution due to the movement of vehicles and construction machinery.	Air Quality	Operation	Dust control measures	Remain within the National Environmental Management: Air Quality Act, 2004: Dust Regulation guidelines for rural as well as Minimum Air Emissions Standards
	The drill rigs and towers used during the drilling operation phase will be visible from nearby locations, and will have visual impact on the local communities in close proximity to the prospecting area.	Visual	Operation	Strategic location of rigs and towers to areas where there may be some tree cover, as far as practicable	No removal of vegetation outside de of demarcated area to ensure as much vegetation cover for the rigs, as possible Make use of rigs that have earthy cover to minimise the visual impact

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	ASPECTS AFFECTED	PHASE In which impact is anticipated	MITIGATION TYPE	Standard to be achieved
		The drilling operations may result in the destruction of graves and other heritage resources.	Heritage Resources	Operation	Control through clear demarcation of prospecting areas to ensure avoidance of graves and other heritage sites	No destruction/loss of heritage resources Comply with requirements of the SAHRA
		Earth moving activities may result in the destruction of fossils (if any).	Palaeontological Resources	Operation	Management of drill sites. Should any fossils be discovered, operations must cease and SAHRA must be notified	No destruction/loss of fossils Comply with requirements of the SAHRA
		The use of vehicles and machinery may result in an increase in noise in the immediate vicinity of the project. The drilling activities will also result in an increase in noise in the vicinity of the project.	Noise	Operation	Management and maintenance of construction vehicles. Management through the use of noise dissipating technologies eg noise mufflers	Remain within the Noise Regulation Standards for Rural Areas. National Noise Control Regulations, SANS10103:2008guidelines.
		The movement of vehicles in the project area will result in an increase in traffic on the roads.	Traffic	Operation	Speed control and limitation of the times when construction vehicles may be on the roads	Minimise the number of vehicles on the roads and movement of vehicles shall be kept to outside busy times
		The movement of vehicles and machinery may result in the production of carbon dioxide (Green House Gas), which may have an impact on the climate in the area.	Climate	Operation	Control and keep to a minimal the number of vehicles used for operations. Vehicles must be maintained to ensure efficient use of fuel.	Remain within the National Environmental Management: Air Quality Act, 2004: Dust Regulation guidelines for rural as well as Minimum Air Emissions Standards Minimise the number of vehicles
		Drilling ground vibrations may result in possible damage to infrastructure.	Drilling and Vibrations	Operation	Drill sites must be located as far from infrastructure as is possible to avoid damage to infrastructure	No private infrastructure shall be damaged/lost due to drilling vibrations
Data Analysis	Feasibility Studies	None	N/A	Operation	N/A	N/A
Feasibility Studies Report		None	N/A	Operation	N/A	N/A
Borehole capping	Closure and Rehabilitation of borehole and infrastructure sites	The removal of the campsite equipment and the rehabilitation of the drilling sites and associated access infrastructure will result in the affected soil and land use being restored. This will also result in the resumption of the use of the land since the infrastructure would have been removed.	Soils, Land Capability and Land Use	Decommissioning and Closure	N/A	No removal of vegetation outside of demarcated areas. Ensure successful rehabilitation of contaminated soils Rehabilitation of land to a state it was before prospecting activities
Removal of equipment and infrastructure		Positive impacts will result due to the reduction in areas of disturbance and the return of land use of the affected areas and making available an area that was covered by the campsite and drilling sites.	Land Use	Decommissioning and Closure	N/A	No removal of vegetation outside of demarcated areas. Ensure successful rehabilitation of contaminated soils Rehabilitation of land to a state it was before prospecting activities
		The use of vehicles/machinery during the rehabilitation of the exploration sites may result in compaction of soils and in the spillages of hydrocarbon liquids from the vehicles and machinery. This will result in the contamination and destruction of the vegetation cover and soils.	Soils and Vegetation	Decommissioning and Closure	Control and prohibit access of vehicles and machinery to areas outside of established access tracks Control through the clear delineation of the prospecting area. Control through the implementation of environmental induction and toolbox talks, as well as the implementation of a fine system. Control through the implementation of a soil management programme in terms of the correct tops oil removal, stockpiling and rehabilitation practices as discussed in the EMPr.	Vehicle movement shall be limited to areas demarcated as access tracks Comply with the requirements of the EMPr
		During the decommissioning and closure phases equipment will be removed, stockpiled soils will be used for rehabilitation, remaining sumps will be backfilled, levelled, top soiled and the area re-seeded. During the process of rehabilitation surface water runoff from the rehabilitation site may have elevated silt load, which may cause pollution of the nearby water environment.	Surface Water	Decommissioning and Closure	Control through the clear delineation of the prospecting area. Control through the implementation of environmental induction and toolbox talks, as well as the implementation of a fine system. Control through the implementation of the NWA GN 704 water management principles.	Maintain the water quality of water course in the project area Ensure that dirty stormwater and runoff is diverted from the water courses and wetland areas Comply with the requirements of GN704

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	ASPECTS AFFECTED	PHASE In which impact is anticipated	MITIGATION TYPE	Standard to be achieved
		Rehabilitation and removal of the prospecting sites and equipment will require vehicular movement. This will result in the generation of dust by movement of vehicles and due to blowing winds. Vehicles and machinery will also generate diesel or petrol fumes. Generated dust will migrate towards the predominant wind direction and may settle on surrounding properties including nearby vegetation.	Air Quality	Decommissioning and Closure	Dust control measures and rehabilitation of areas stripped of vegetation	Comply with the requirements of the National Environmental Management Air Quality Act, 2004 Dust Regulation guidelines for rural communities.
		Noise will be generated during the removal of equipment and rehabilitation of the sites. This noise is not expected to exceed occupational noise limits and will be short lived.	Noise	Decommissioning and Closure	Management and maintenance of construction vehicles. Management through the use of noise dissipating technologies eg noise mufflers	Comply with the Noise Regulation Standards for Rural Areas.

f) Impact Management Actions

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved)

Table 24: Impact management actions

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	MITIGATION TYPE	Time Period for Implementation	Compliance with standards
Data Collection and Assessment Geological Mapping Planning for Drilling Surveys	Desktop Study	None	Control potential deviations from the approved Prospecting Works Programme through the effective implementation of the data acquisition and desktop study.	Planning	Remain within the ambits of the EMPr and Environmental Authorisation.
		None	Control potential deviations from the approved Prospecting Works Programme through the effective implementation of the data acquisition and desktop study.	Planning	Remain within the ambits of the EMPr and Environmental Authorisation.
		None	Control potential deviations from the approved Prospecting Works Programme through the effective implementation of the data acquisition and desktop study.	Planning	Remain within the ambits of the EMPr and Environmental Authorisation.
Access Roads Drill and trenching Sites Temporary Soil Storage Area Fence Hydrocarbon storage area Mobile office Ablution Facility	Establishment of access roads, trenching areas, campsite, physical surveying of the site and pegging of drilling boreholes	Loss of soils, erosion of the soils and impacts on landowners' livelihood.	Rehabilitation of areas cleared of vegetation and dust control	Construction	Retain topsoil integrity for the reuse in rehabilitation Vegetation clearance shall be kept to a minimum. No clearance of vegetation outside demarcated areas
		Contamination of groundwater from hydrocarbon spillages	Control through management and monitoring of spillages. Where spillages occur, the soil must be stripped and disposed of as stipulated in the EMPr.	Construction	Comply with the EMPr. Retain topsoil integrity for the reuse in rehabilitation. Where required, disposal of contaminated soils shall be undertaken in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM: WA)
		Contamination of surface water due to erosion of soils which will lead to increased turbidity as well as contamination from hydrocarbon spillages	Monitoring through rehabilitation and management of spoil sites	Construction	Retain topsoil integrity for the reuse in rehabilitation Comply with the requirements of the NWA: no construction activities within 100 m of water courses and 500m of wetlands and riparian zones without consent from the DWS.
		Wetland contamination, destruction and loss of habitat	Control of access to wetland areas and within the regulated 500 m buffer.	Construction	National Water Act, 1998 (Act 36 of 1998) No construction activities may be conducted within 500 m of wetlands and riparian zones without approval from the DWS.
		Destruction of graves and cultural heritage sites	Control through clear demarcation of prospecting areas to ensure avoidance of graves and other heritage sites	Construction	No destruction/loss of heritage resources
		Destruction of fossils	Management of drill sites. Should any fossils be discovered, operations must cease and SAHRA must be notified	Construction	No destruction/loss of fossils
		Loss of natural vegetation in the affected areas	Rehabilitation of areas cleared of vegetation. Control of alien invasive plant species	Construction	Comply with existing legislation National Environmental Management: Biodiversity Act 2004 (Act No 10 of 2004) and Alien and Invasive Species Regulations, 2014. No vegetation clearance outside of demarcated areas
		Migration of fauna due to disturbance caused by the proposed project	Relocation of affected species of conservation importance	Construction	Remain within the designated area demarcated for prospecting activities. Ensure minimal clearance of vegetation
		Air pollution through nuisance dust, PM 10 and PM2.5 as well as emissions from construction vehicles and machinery.	Dust control measures	Construction	Comply with the requirements of the National Environmental Management: Air Quality Act, 2004: Dust Regulation guidelines for rural communities. Comply with the requirements of the Minimum Emission Standards
		Increase in ambient noise due to movement of construction vehicles and machinery	Management and maintenance of construction vehicles. Management through the use of noise dissipating technologies e.g. noise mufflers Control through the limiting of the activities to the day time and the implementation of an open and transparent channel of communication	Construction	Remain within the Noise Regulation Standards for Rural Areas. Comply with the EMPr
Visual impacts as a result of vegetation clearance	Rehabilitation of areas cleared of vegetation	Construction	Vegetation clearance must be limited to demarcated areas only		

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	MITIGATION TYPE	Time Period for Implementation	Compliance with standards
		Increased traffic on the roads due to additional construction vehicles	Speed control and limitation of the times when construction vehicles may be on the roads	Construction	Minimise the number of vehicles used during construction Movement of construction vehicles shall be limited to outside of busy hours
		Impact of carbon dioxide (GHG) produced by construction vehicles on the local climate	Control and keep to a minimal the number of vehicles used for construction. Vehicles must be maintained to ensure efficient use of fuel.	Construction	Comply with the EMPr Minimise the number of vehicles used during construction Regular maintenance of vehicles and machinery to improve fuel efficiency Comply with requirements of the National Environmental Management: Air Quality Act, 2004
RC Drilling Core Drilling Bulk Sampling	Drilling and bulk Sampling	It is expected that during the operation phase the project will not result in the creation of employment as prospecting requires highly specialised personnel. The applicant will make use of qualified contractors for the drilling and sampling of the sites. The community will however continue to benefit as a result of the continued boost in small local businesses. Drilling has potential to affect the day to day operations by affected landowners	Control of times during which operation activities will take place	Operation	Maintain a 100% crime free area within the control of the prospecting No complaints from landowners due to prospecting activities. Should there be conflicts, these must be resolved
		The use of vehicles during the drilling of the exploration boreholes may result in the spillages of hydrocarbons from vehicles and machinery. This will result in the contamination of soils and groundwater. The prospecting operations will require the drilling of boreholes, which may result in the drawdown, which may affect the yield to the surrounding groundwater users. Material used for backfilling boreholes may leach pollutants, which will result in the contamination of surrounding groundwater regime. This may spread beyond the backfilling site via plume migration.	Rehabilitation of affected areas and control using bunds Monitoring of residues	Operation	No soil contamination as a result of hydrocarbon spillages Rehabilitation and disposal of contaminated soils conducted in terms of the NEM:WA
		Drilling operations may result in the generation of surface water runoff contaminated with drill muds and cuttings, should spillage occur. The sedimentation and possible contamination with carbonaceous material will have negative impacts on the water quality due to increase turbidity and an increase in acidity of the water in the streams. This will have an impact on aquatic habitats.	Control through management and monitoring of surface runoff	Operation	Retain topsoil integrity for the reuse in rehabilitation. No dirty runoff/stormwater entering water courses. The NWA: No activities within 100 m of watercourses and drainage without consent from the DWS. No soil contamination as a result of hydrocarbon spillages Rehabilitation and disposal of contaminated soils conducted in terms of the NEM:WA
		The project may result in the following impacts on the floral environment during the operation phase: Destruction of potential floral habitats as a result of continual disturbance of soil, leading to altered floral habitats, erosion and sedimentation; Impact on floral diversity as a result of possible uncontrolled fires; Potential spreading of alien invasive species as a result of floral disturbance; and Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase	Avoidance of wetland and riparian areas	Operation	NWA: No activities shall be permitted within 500 m of wetland and/or riparian areas without prior approval from the DWS Comply with requirements of the NWA
		The project may result in the following impacts on the faunal environment during the operation phase: Migration of fauna from the prospecting area due to noise as a result of drilling activities; Loss of faunal due to collisions with vehicles and machinery; Loss of faunal diversity and ecological integrity as a result of poaching and faunal species trapping; Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase.	Rehabilitation of affected areas Monitoring of rehabilitated areas to ensure success.	Operation	No invasive plant species in rehabilitated areas No removal of vegetation outside of demarcated areas. Ensure successful rehabilitation and/or removal of contaminated soils

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	MITIGATION TYPE	Time Period for Implementation	Compliance with standards
		The project may result in the following impacts on the faunal environment during the operation phase: Migration of fauna from the prospecting area due to noise as a resulting of drilling activities; Loss of faunal due to collisions with vehicles and machinery; Loss of faunal diversity and ecological integrity as a result of poaching and faunal species trapping; Failure to initiate a rehabilitation plan and alien control plan during the construction phase may lead to further impacts during the operation phase.	Rehabilitation of affected areas Drill holes must be temporarily plugged immediately after drilling is completed and remain plugged until they are permanently plugged below ground to eliminate the risk posed to fauna by open drill holes. Drill holes must be permanently capped as soon as is practicable	Operation	No removal of vegetation outside of demarcated areas. Successful plugging of drill holes, with no faunal casualties as a result of holes being left open
		The use of vehicles during the drilling of the exploration boreholes may result in the spillages of hydrocarbons from the vehicles and machinery. This will result in the contamination of soils. The materials removed from the drilling sites will contain carbonaceous material, which has potential for contamination should it not be managed properly. The material from the drilling site may result in the contamination of soils, which may render the land not usable after backfilling operation.	Rehabilitation of affected areas	Operation	Retain topsoil integrity for the reuse in rehabilitation.
		The movement of vehicles and drilling machinery will likely result in an increase in nuisance dust, PM10 and PM2.5. There is also potential for increase in carbon emissions and ambient air pollution due to the movement of vehicles and construction machinery.	Dust control measures	Operation	Remain within the National Environmental Management: Air Quality Act, 2004: Dust Regulation guidelines for rural as well as Minimum Air Emissions Standards
		The drill rigs and towers used during the drilling operation phase will be visible from nearby locations, and will have visual impact on the local communities in close proximity to the prospecting area.	Strategic location of rigs and towers to areas where there may be some tree cover, as far as practicable	Operation	No removal of vegetation outside de of demarcated area to ensure as much vegetation cover for the rigs, as possible Make use of rigs that have earthy cover to minimise the visual impact
		The drilling operations may result in the destruction of graves and other heritage resources.	Control through clear demarcation of prospecting areas to ensure avoidance of graves and other heritage sites	Operation	No destruction/loss of heritage resources Comply with requirements of the SAHRA
		Earth moving activities may result in the destruction of fossils (if any).	Management of drill sites. Should any fossils be discovered, operations must cease and SAHRA must be notified	Operation	No destruction/loss of fossils Comply with requirements of the SAHRA
		The use of vehicles and machinery may result in an increase in noise in the immediate vicinity of the project. The drilling activities will also result in an increase in noise in the vicinity of the project.	Management and maintenance of construction vehicles. Management through the use of noise dissipating technologies eg noise mufflers	Operation	Remain within the Noise Regulation Standards for Rural Areas. National Noise Control Regulations, SANS10103:2008 guidelines.
		The movement of vehicles in the project area will result in an increase in traffic on the roads.	Speed control and limitation of the times when construction vehicles may be on the roads	Operation	Minimise the number of vehicles on the roads and movement of vehicles shall be kept to outside busy times
		The movement of vehicles and machinery may result in the production of carbon dioxide (Green House Gas), which may have an impact on the climate in the area.	Control and keep to a minimal the number of vehicles used for operations. Vehicles must be maintained to ensure efficient use of fuel.	Operation	Remain within the National Environmental Management: Air Quality Act, 2004: Dust Regulation guidelines for rural as well as Minimum Air Emissions Standards Minimise the number of vehicles
		Drilling ground vibrations may result in possible damage to infrastructure.	Drill sites must be located as far from infrastructure as is possible to avoid damage to infrastructure	Operation	No private infrastructure shall be damaged/lost due to drilling vibrations
Data Analysis	Feasibility Studies	None	N/A	Operation	N/A
Feasibility Report	Studies	None	N/A	Operation	N/A

NAME OF ACTIVITY		POTENTIAL IMPACT (Including the potential impacts for cumulative impacts)	MITIGATION TYPE	Time Period for Implementation	Compliance with standards
Borehole capping Trench backfilling Removal of equipment and infrastructure	Closure and Rehabilitation of borehole and infrastructure sites	The removal of the campsite equipment and the rehabilitation of the drilling and trench sites and associated access infrastructure will result in the affected soil and land use being restored. This will also result in the resumption of the use of the land since the infrastructure would have been removed.	N/A	Decommissioning and Closure	No removal of vegetation outside of demarcated areas. Ensure successful rehabilitation of contaminated soils Rehabilitation of land to a state it was before prospecting activities
		Positive impacts will result due to the reduction in areas of disturbance and the return of land use of the affected areas and making available an area that was covered by the campsite and drilling sites.	N/A	Decommissioning and Closure	No removal of vegetation outside of demarcated areas. Ensure successful rehabilitation of contaminated soils Rehabilitation of land to a state it was before prospecting activities
		The use of vehicles/machinery during the rehabilitation of the exploration sites may result compaction of soils and in the spillages of hydrocarbon liquids from the vehicles and machinery. This will result in the contamination and destruction of the vegetation cover and soils.	Control and prohibit access of vehicles and machinery to areas outside of established access tracks Control through the clear delineation of the prospecting area. Control through the implementation of environmental induction and toolbox talks, as well as the implementation of a fine system. Control through the implementation of a soil management programme in terms of the correct tops oil removal, stockpiling and rehabilitation practices as discussed in the EMPr.	Decommissioning and Closure	Vehicle movement shall be limited to areas demarcated as access tracks Comply with the requirements of the EMPr
		During the decommissioning and closure phases equipment will be removed, stockpiled soils will be used for rehabilitation, remaining sumps will be backfilled, levelled, top soiled and the area re-seeded. During the process of rehabilitation surface water runoff from the rehabilitation site may have elevated silt load, which may cause pollution of the nearby water environment.	Control through the clear delineation of the prospecting area. Control through the implementation of environmental induction and toolbox talks, as well as the implementation of a fine system. Control through the implementation of the NWA GN 704 water management principles.	Decommissioning and Closure	Maintain the water quality of water course in the project area Ensure that dirty stormwater and runoff is diverted from the water courses and wetland areas Comply with the requirements of GN704
		Rehabilitation and removal of the prospecting sites and equipment will require vehicular movement. This will result in the generation of dust by movement of vehicles and due to blowing winds. Vehicles and machinery will also generated diesel or petrol fumes. Generated dust will migrate towards the predominant wind direction and may settle on surrounding properties including nearby vegetation.	Dust control measures and rehabilitation of areas stripped of vegetation	Decommissioning and Closure	Comply with the requirements of the National Environmental Management Air Quality Act, 2004 Dust Regulation guidelines for rural communities.
		Noise will be generated during the removal of equipment and rehabilitation of the sites. This noise is not expected to exceed occupational noise limits and will be short lived.	Management and maintenance of construction vehicles. Management through the use of noise dissipating technologies e.g. noise mufflers	Decommissioning and Closure	Comply with the Noise Regulation Standards for Rural Areas.

i) Financial Provision**(1) Determination of the amount of Financial Provision.****a) Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under the Regulation.**

Each phase of the prospecting activities is dependent on the success of the preceding phase. Depending on the outcome of the Desktop and geological mapping phase, the prospecting drilling will be initiated. The location and extent of the drill and infrastructure sites cannot be determined at this stage. Mapping of the actual prospecting activities cannot be undertaken.

The rehabilitation plan was developed on the basis that the rehabilitated areas will be left safe, stable, non-polluting and able to support a self-sustaining ecosystem similar to the surrounding natural environment. To ensure that the rehabilitation plan is aligned with the closure objective, a high level risk assessment of the prospecting components was undertaken to establish the potential risks associated therewith.

The closure objectives are to:

- Eliminate any safety risks associated with drill hole and sumps through adequate drill hole capping and backfilling;
- Remove and/or rehabilitate all pollution and pollution sources such as waste materials and spills;
- To establish a rehabilitated area that is not susceptible to soil erosion which may result in the loss of soil, degradation of water resources and aquatic environments;
- Restore disturbed areas and re-vegetate these areas with plant species naturally occurring the area to restore the ecological function of such areas, as far as is practicable; and
- To eradicate all alien invasive plant species that may colonise the areas that have been cleared of vegetation.

b) Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

The draft EAIR and EMPr will be made available to all registered I&APs for a 30 day review and comment period. All comments received and responses provided to the stakeholders will be incorporated into the final EIAR and EMPr.

c) Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.

Each phase of the prospecting activities is dependent on the success of the preceding phase. Depending on the outcome of the desktop and geological mapping phase, the prospecting drilling will be initiated. The location and extent of the trenches, drill and infrastructure sites cannot be determined at this stage. Mapping of the actual prospecting activities cannot be undertaken.

Due to the nature of the activities, the potential impacts will be limited in spatial extent and will be of short duration. The management plan is provided in such a manner as to ensure concurrent rehabilitation. The areas for drilling purposes will be the main area experiencing impacts. The impacts will be temporary in nature, and a detailed management plan has been provided to address the potential impacts associated with these activities.

The only rehabilitation that will specifically be required is borehole capping, trench backfilling and revegetation:

- Borehole Capping: Drill holes will be permanently capped as soon as is practicable.
- Trench Backfilling: All trenches will be backfilled and rehabilitated to a state where the original landuse can be reinstated.
- Re-vegetation: A suitably qualified ecologist will be appointed to determine the appropriate species that may be used for re-vegetating the area.
- Re-vegetation efforts will be monitored every second month for a period of 6 months after the initial seeding. An effective vegetation cover of 45% must be achieved. Re-seeding will be undertaken if the vegetation cover has not been achieved after 6 months.

d) Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

Due to the nature of the activities, the impacts will be very limited and of short duration. The management plan is in such a manner as to ensure concurrent rehabilitation. The areas for drilling purposes and trenches will be the main areas that will require rehabilitation at the end of the prospecting activities. The impacts of the drilling activities will be temporary in nature and a detailed management plan has been provided to address potential impacts.

e) Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

The financial provision for the environmental rehabilitation and closure of any mine/prospecting and its associated operations forms an integral part of the MPRDA. Sections 41 (1) and, 41 (2), 41 (3) and 45 of the MPRDA deal with the financial provision for rehabilitation and closure. During 2012, the DMR made updated rate available for the calculation of the closure costs, where contractor's costs are not available, these apply.

The "Guideline Document for the Evaluation of Financial Provision made by the Mining Industry" was developed by the DMR in January 2005 in order to empower the personnel at Regional DMR offices to review the quantum determination for the rehabilitation and closure for mining sites.

With the determination of the quantum for closure, it must be assumed that the infrastructure had no salvage value (clean closure). The closure cost estimate (clean closure) was determined in accordance with the DMR guidelines. The closure costs were calculated to be R 450 000.00 as shown in Table 25.

Table 25: Cost Estimate Expenditure

ACTIVITY	YEAR 1 Expenditure (R')	YEAR 2 Expenditure (R')	YEAR 3 Expenditure (R')	YEAR 4 Expenditure (R')	YEAR 5 Expenditure (R')
PHASE 1 (months 1-6)					
Desktop Study	R 70 000.00	R 100 000.00			
Geological mapping	R 200 000.00	R 100 000.00			
PHASE 2 (months 7-17)					
Boreholes Excavations		R 350 000.00	R 180 000.00		R 400 000.00
PHASE 3 (months 18-22)					
Bulk Sampling				R 300 000.00	R 300 000.00
PHASE 4 (months					

ACTIVITY	YEAR 1 Expenditure (R')	YEAR 2 Expenditure (R')	YEAR 3 Expenditure (R')	YEAR 4 Expenditure (R')	YEAR 5 Expenditure (R')
23-24)					
Analytical desktop study				R 100 000.00	R 300 000.00
EMPr& REHABILITATION FEES		R 100 000.00	R 100 000.00	R 100 000.00	R 150 000.00
PROSPECTING FEES	R 1 079.00	R 1 089.00	R 1 099.00	R 1 119.00	R 1 129.00
CONSULTANT	R 100 000.00	R 100 000.00	R 100 000.00	R 100 000.00	R 100 000.00
LABOUR	Work will be carried out by the contractors and consultant included on estimate given above.				
Annual Total	R 371 079.00	R 751 089.00	R 381 099.00	R601 119.00	R 1 251 129.00
Total Budget					R 3 355 515.00

f) Confirm that the financial provision will be provided as determined.

The amount required to cover the prospecting operation, including rehabilitation and closure is estimated to be R 3 355 515.00 at this stage, of which R 450 000.00 will be for rehabilitation and closure. Work will be carried out by the contractors and consultant and the costs are included in the estimate provided in Table 25.

Hle Services and Supplies will fund the operation and hereby undertakes to fund the operations and to manage the operations. The applicant (Hle Services and Supplies hereby confirms that the financial provision will be provided as determined in Table 25.

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

g) Monitoring of Impact Management Actions

Please refer to Table 26.

h) Monitoring and Reporting Frequency

Please refer to Table 26.

i) Responsible Persons (Roles and Responsibilities)

Generic roles that require to be defined for the project include:

- Project Developer;
- Environmental Control Officer;
- Environmental Health and Safety (EHS) Manager; and
- Site Manager.

The typical requirements of each of the roles are provided in the following sections.

- **Project Developer:** The Project Developer (Hle Services and Supplies) is the 'owner' of the project and as such is responsible for ensuring that the conditions of the Environmental Authorisation issued in terms of NEMA (should the project receive such authorisation) are fully complied with, as well as ensuring that any other necessary permits or licenses are obtained and complied with. It is expected that Hle Services and Supplies will appoint the Environmental Control Officer, EHS Manager and Site Manager.
- **Environmental Control Officer:** An independent Environmental Control Officer (ECO) must be appointed to monitor the compliance of the proposed project with the conditions of Environmental Authorisation (should such authorisation be granted by DMR) during the construction phase (and possibly the operational phase, depending on the requirements of DMR). The ECO must also monitor compliance of the proposed project with environmental legislation and conditions of the EMPr. The roles and responsibilities of the ECO should include the following:
 - The ECO must undertake periodic environmental audits during the relevant phases of the proposed project in order to monitor and record environmental impacts and non-conformances. It is recommended that weekly or bi-weekly environmental audits be undertaken by the ECO during the construction phase.
 - Environmental compliance reports must be submitted by the ECO to the DMR on an annual basis or as stipulated by the DMR.
 - The ECO must maintain a diary of site visits and audits, a copy of the Environmental Authorisation (should such authorisation be granted by DMR) and relevant permits for reference purposes, a non-conformance register, a public complaint register, and a copy of previous environmental audits undertaken.
 - Prior to the commencement of construction, the ECO must meet on site with the Site Manager to confirm the construction procedure and designated construction areas.
- **EHS Manager:** The EHS Manager will be appointed to fulfil the roles of the Environmental Officer during the construction phase and the Environmental Manager during the operational phase. The responsibility of the EHS Manager include overseeing the implementation of the EMPr during the construction and operational phases, monitoring environmental impacts, record-keeping and updating of the EMPr as and when necessary. The EHS Manager is also responsible for monitoring compliance with the conditions of the Environmental Authorisation that may be issued to Hle Services and Supplies. The lead contractor and sub-contractors may have their own Environmental Officers, or designate Environmental Officer functions to certain personnel. During construction, the EHS Manager will be responsible for the following:
 - Meeting on site with the Site Manager prior to the commencement of construction activities to confirm the construction procedure and sites allocated for the drill sites and infrastructure required for the project.
 - Daily or weekly monitoring of site activities during construction to ensure adherence to the specifications contained in the EMPr and Environmental Authorisation (should such authorisation be granted by DMR), using a monitoring checklist that is to be prepared at the start of the construction phase.
- **Site Manager:** The site manager will be responsible for the following:
 - Overall construction programme, project delivery and quality control for the construction of the facility.
 - Overseeing compliance with the Health, Safety and Environmental Responsibilities specific to the project construction.
 - Promoting total job safety and environmental awareness by employees, contractors and sub-contractors and ensuring that all employees and contractors and sub-contractors are aware of the importance that the project proponent attaches to safety and the environment.
 - Ensuring that each subcontractor employ an Environmental Officer (or have a designated Environmental Officer function) to monitor and report on the daily activities on-site during the construction period.
 - Ensuring that safe, environmentally acceptable working methods and practices are

implemented and that sufficient plant and equipment is made available, is properly operated and maintained in order to facilitate proper access and enable any operation to be carried out safely.

- Meeting on site with the EHS Manager prior to the commencement of construction activities to confirm the construction procedure and designated activity zones.
- Ensuring that all appointed contractors and sub-contractors are aware of this EMPr and their responsibilities in relation to the programme.
- Ensuring that all appointed contractors and sub-contractors repair, at their own cost, any environmental damage as a result of a contravention of the specifications contained in the EMPr, to the satisfaction of the EHS Manager.

j) Time Period for Implementing Impact Management Actions

Please refer to Table 26.

k) Mechanism for Monitoring Compliance

Please refer to Table 26.

Table 26: Mechanisms for Monitoring

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Site Clearance and removal of vegetation Drilling of prospecting boreholes (RC and Core) Bulk Sampling Stockpiling material from site clearance Discarding material from drill sites Discard material from bulk sampling Excavation of trenches Construction of temp/mobile site infrastructure and access routes Stormwater management Storage of diesel and vehicle/machinery maintenance equipment. Water extraction from borehole and/or tank. Waste generation and management. Demolition and/or removal of temporary infrastructure/equipment Rehabilitation and restoration of disturbed areas	Soil Erosion	Management and monitoring of soil stockpiles. Soils must be stored properly and revegetated to prevent erosion and to enable re-use during rehabilitation. Stockpiles must be visually inspected daily to ensure that no erosion is taking place	ECO, Site Manager	Daily Monitoring and Monthly Reporting
	Loss of Indigenous plant Species	A suitably ecologist or horticulturist will be required to make recommendations regarding the collection, propagation/storage and transplantation of plants is advised.	ECO, Site Manager	Monthly monitoring and reporting. Monitoring will be required at all the construction and operational activities until such time that rehabilitation is completed and sustainability of vegetation cover is achieved.
	Faunal Habitat Loss	Adhere to law and best practice guidelines regarding the displacement and relocation of CI fauna Where required fauna shall be relocated to an area with a similar habitat as the project area Time construction activities to minimise fauna mortality Poaching of fauna shall be prohibited Uncontrolled fires shall not be permitted on site and persecution or hunting of fauna	ECO, Site Manager	Monthly monitoring and reporting. Monitoring will be required at all the construction and operational activities until such time that rehabilitation is completed and sustainability of vegetation cover is achieved.
	Proliferation of alien invasive species	Declared weeds and alien invasive species must be eradicated. Management of alien invasive plant shall be undertaken throughout the	ECO, Site Manager	Monthly monitoring and reporting Monitoring will be required at all the construction and operational activities until such time that rehabilitation is completed and sustainable.
	Nuisance dust and air emissions generation	During dry seasons, ensure that cleared(excavated) are as an unpaved surfaces are sprayed with water obtained from an approved source to minimise dust generation. Setup PM 2.5 and PM10 Monitoring sites in the area at monitor dust fall.	ECO, Site Manager	Monthly monitoring and reporting
	Loss of arable land/land for grazing	Ensure proper rehabilitation measures area adhered to in order to return the soil quality to its natural state.	ECO, Site Manager	Monitor monthly and report on an annual basis. Monitoring will be required until such time that rehabilitation is completed.
	Soil and groundwater contamination	Manage through the EMPr and develop a groundwater management programme. Collection of baseline hydro chemistry samples for analysis.	ECO, Site Manager	Monthly monitoring and reporting
	Groundwater extractions	Ensure that no groundwater extraction is undertaken without approval from the DWS Monitoring water levels of the boreholes found in close proximity to the proposed mining site, through a flow meter and water level data logger.	ECO, Site Manager	Monthly monitoring and reporting
	Visual Intrusion and loss of sense of place	Ensure that infrastructure is kept to its most "natural" state and keep a tidy visually ordered site. Rubble/litter/waste removal and disposal to be monitored throughout construction. Complaints about night lights should be investigated and documented in a register	ECO, Site Manager	Monthly monitoring and reporting
	Increased pressure on the road network	Speed control and limitation of the times when construction vehicles may be on the roads	ECO, Site Manager	Monthly monitoring and reporting
	Soil disturbance resulting in the spread of alien	Alien invasive vegetation monitoring and control through Alien Invasive Management Plan	ECO, Site Manager	Monthly monitoring and reporting
	Surface water contamination	Monitor surface water quality upstream and downstream of the prospecting area to ensure that the prospecting activities are not contamination water resources	ECO, Site Manager	Monthly monitoring and reporting
Wetland Loss	Ensure that there are construction activities that will be located within any wetland areas.	ECO, Site Manager	Monthly monitoring and reporting	

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
	Destruction of graves and cultural resources	No drilling sites shall impact graves and sites of heritage or cultural importance	ECO, Site Manager	Monthly monitoring and reporting
	Water Use	No water may be sources from rivers and streams without approval from the DWS. No clean water shall be used for dust suppression		
	Nuisance Noise	Measure noise levels routinely to ensure the noise levels are being kept within the acceptable ISO standards.	ECO, Site Manager	Monthly monitoring and reporting
	Health and safety of personnel	Rout in safety checks, safety training and Inspections to be carried out during the construction and operation phase to enforce the use of Personnel Protective Equipment (PPE). This must also be included in the safety requirements of the Contract.	ECO, Site Manager	Routine inspection and Quarterly reporting
	Waste Management	Maintain a waste manifest book to record volumes of waste leaving the site, including recyclables. Keep safe disposal certificates on file on site for Hazardous waste. Way Bridge slips must be obtained for all other waste streams and kept on file on site	ECO, Site Manager	Monthly daily and report on a monthly basis
	Stormwater Management	Visual monitoring based on sediment Clean water must be kept separate from contaminated water emanating from the project sites	ECO, Site Manager	Monthly daily and report on a monthly basis
	Rehabilitation	Monitoring of the following: <ul style="list-style-type: none"> Basal Cover Arial Cover Species diversity 	ECO, Site Manager	Rehabilitation will be undertake throughout all the project phases. The final rehabilitation will be undertaken when the prospecting activities have been finalised. The ECO shall inspect the affected areas 6 month after finalisation of rehabilitation to assess the success of the rehabilitation.

l) Indicate the frequency of the submission of the performance assessment/ environmental audit report.

Annual environmental audits must be undertaken to ensure compliance with the EMPr and EA. The environmental audit reports must also include the financial provision. The reports must be submitted to the DMR.

m) Environmental Awareness Plan

(1) Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.

Hle Services and Supplies will perform environmental training to reduce exposure to liability for environmental degradation caused by errant employees.

Environmental Control Officer (ECO) / responsible person which are to ensure that environmental awareness is carried out at the proposed prospecting site and the environmental awareness plan's objectives are met on an ongoing basis.

The prospecting crew shall be informed about the environment and need to be informed of key elements that the EMPr strives to manage:

- Description of the environment and sensitive features;
- Explain simple key concepts;
- Provide examples of environmental degradation and pollution sources
- Explain the roles and responsibilities of the contractors, employees in managing the environment;
- Devise basic principles to manage the environment
- Indicate laws applicable to the management and protection of the environment; and
- Indicate day to day preventative measures to assist elimination of pollution and degradation.

Particular training shall be provided in terms of the environmental features, sensitivities, heritage sites (if any are encountered during the prospecting process) and safety risks present on the study site. The EMPr and Composite Map of the study site would be presented to employees to highlight specific requirements and sensitivities.

The appointed person / ECO at the prospecting activities will be responsible to re-evaluate the need for environmental awareness training based on recorded incidents, developing issues and need to improve skills to manage environmental impacts.

A preliminary Environmental Awareness and Risk Assessment Schedule has been developed and is outlined in Table 27. The purpose of this schedule is to ensure that onsite employees are not only trained, but that the principles are continuously re-enforced.

Table 27: Environmental Training and Awareness Schedule

Frequency	Time allocation	Objective
Induction (all staff and workers)	1 hour training on environmental awareness training as part of site induction	Develop an understanding of what is meant by the natural environmental and social environment and establish a common language as it relates to environmental, health, safety and community aspects. Establish a basic knowledge of the environmental legal framework and consequences of non-compliance. Clarify the content and required actions for the implementation of the Environmental Management Plan. Confirm the spatial extent of areas regarded as sensitive and clarify restrictions. Provide a detailed understanding of the definition, the method for identification and required response to emergency incidents.
Monthly Awareness Talks (all staff and workers)	30 minute awareness talks	Based on actual identified risks and incidents (if occurred) reinforce legal requirements, appropriate responses and measures for the adaptation of mitigation and/or management practices.
Risk Assessments (supervisor and workers involved in task)	Daily task based risk assessment	Establish an understanding of the risks associated with a specific task and the required mitigation and management measures on a daily basis as part of daily toolbox talks.

(2) Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

As prescribed in Table 27, Task/Issue based Risk Assessments must be undertaken with all workers involved in the specific tasks in order to establish an understanding of the risks associated with a specific task and the required mitigation and management measures contained in this report.

Environmental Awareness Training Content- Induction Training: The following environmental awareness training will be provided to all staff and workers who will be involved in prospecting activities:

- Description of the approved prospecting activities and content of the prospecting right;
- An overview of the applicable legislation and regulations as they relate to environmental, health, safety and community;

Content and implementation of the approved EMPr specifically:

- Allocated roles and responsibilities;
- Management and mitigation measures; and
- Identification of risks and requirements adaptation.

Sensitive environments and features:

- Description of environmentally sensitive areas and features; and
- Prohibitions as it relates to activities in or in proximity to such areas.

Emergency Situations and Remediation:

- Methodology for the identification of areas where accidents and emergencies may occur, communities and individuals that may be affected;
- An overview of the response procedure;
- Equipment and resources;
- Designate of responsibilities;
- Communication, including communication with the potentially affected communities and responsible authorities; and

- Training schedule to ensure effective response.

Development of procedures and checklists

The following procedures will be developed and all staff and workers will be adequately trained on the content and implementation thereof:

Emergency Preparedness and Response

The procedure will be developed to specifically include risk identification, preparedness, response measures and reporting. The procedure will specifically include spill and fire risk, preparedness and response measures. The appropriate emergency control centres (fire department, hospitals etc.) will be identified and the contact numbers obtained and made available on site. The procedure must be developed in consultation with potentially affected landowners.

In the event that risks are identified, which may affect adjacent landowners (or other persons), the procedure will include appropriate communication strategy to inform such persons and provide response measures to minimize the impact.

Incident Reporting Procedure: Incident reporting will be undertaken in accordance with an established incident reporting procedure to:

- Provide details of the responsible person, including any person who
- Is responsible for the incident;
- Owns any hazardous substance involved in the incident;
- Was in control when the incident occurred.
- Provide details of the incident (time, date, location);
- The details of the cause of incident;
- Identify aspects of the environment affected;
- The details of corrective action taken; and
- The identification of any potential residual or secondary risks that must be monitored and corrected or managed.

Environmental and Social Audit Checklist

An environmental audit checklist will be established to include the environmental and social mitigation and management measures as developed and approved as part of the EMP. Non-conformances will be identified and corrective action taken where required.

n) Specific information required by the Competent Authority

(Among others, confirm that the financial provision will be reviewed annually).

No specific information was required by the Competent Authority.

2 UNDERTAKING

The EAP herewith confirms

- a) the correctness of the information provided in the reports;
- b) the inclusion of comments and inputs from stakeholders and I&APs ;
- c) the inclusion of inputs and recommendations from the specialist reports where relevant;
and
- d) 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.

Signature of the environmental assessment practitioner:

NDI Geological Consulting Services-Sole Proprietary

Name of company:

2018/03/08

Date:

-END-

Appendices

Appendix A: Environmental Assessment Practitioner Declaration of Interest

Appendix B: The Qualifications of the Environmental Assessment Practitioner

Appendix C: Location Map indicating Proposed Area

Appendix D: Public Participation Process

Appendix E: Impact Assessment

Appendix F: Composite Map

Appendix G: Specialist Studies Reports

Appendix G1: Biodiversity Specialist Studies Reports

Appendix G2: Heritage Resources Studies Reports

Appendix G3: Hydrology Specialist Studies Report

Appendix G4: Soils and Land Capability Specialist Studies Reports

Appendix G5: Geohydrological Specialist Studies Reports