Karoo Uranium Project

Noise Baseline Assessment

Prepared by
Ferret Mining & Environmental Services (Pty) Ltd

for

The TASPAC & TLJVCO
Karoo Uranium Project
16 Stanbridge Street
Beaufort West
Western Cape
South Africa

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Glossary of terms

A – Weighting	An internationally standardised frequency weighting which approximates the frequency response of the human ear and gives an objective reading, which therefore agrees with the subjective human response to that sound.
Air Absorption	The phenomena of attenuation of sound waves with distance propagated in air, due to dissipative interaction within the gas molecules.
Alternatives	A possible course of action, in place of another, that would meet the same purpose and need. Alternatives can refer to any of the following but are not limited hereto: alternative sites for development, alternative site layouts, alternative designs, alternative processes and materials. In Integrated Environmental Management the so-called "no go" alternative refers to the option of not allowing the development and may also require investigation in certain circumstances.
Ambient	The conditions surrounding an organism or area.
Ambient Sound	The all-encompassing sound at a point being composite of sounds from near and far.
Ambient Sound Level	Means the reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such a meter was put into operation.
Applicant	Any person who applies for an authorisation to undertake a listed activity or to cause such activity in terms of the relevant environmental legislation.
Assessment	The process of collecting, organising, analysing, interpreting and communicating data that is relevant to some decision.
Background Noise Level	The level of the ambient sound indicated on a sound level meter in the absence of the sound under investigation (e.g. sound from a particular noise source or sound generated for test purposes). Ambient sound level as per Noise Control Regulations.
dB(A)	A decibel value which has been A-weighted, or filtered, to match the response of the human ear.
Decibel (db)	A logarithmic scale for sound corresponding to a multiple of 10 of the threshold of hearing. Decibels for sound levels in air are referenced to an atmospheric pressure of 20 μ Pa.
Diffraction	Modification of the progressive wave distribution due to the presence of obstacles in the field. Reflection and refraction are special cases of diffraction.
Direction of Propagation	The direction of flow of energy associated with a wave.
Disturbing noise	Means 'n noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.
Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group; these circumstances include biophysical, social, economic, historical, cultural and political aspects.
Environmental Control Officer	Independent officer employed by the applicant to ensure the implementation of the Environmental Management Plan (EMP) and manage any further environmental issues that may arise.
Environmental Impact	A change resulting from the effect of an activity on the environment, whether desirable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them.
Environmental Impact Assessment	An Environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of any proposed project, plan, programme or policy which requires authorisation of permission by law and which may significantly affect the environment. The EIA includes an evaluation of alternatives, as well as recommendations for appropriate mitigation measures for minimising or avoiding negative impacts, measures for enhancing the positive aspects of the proposal, and environmental management and monitoring measures.
Environmental Issue	A concern felt by one or more parties about some existing, potential or perceived environmental impact.
Equivalent continuous A-weighted sound exposure level	The value of the average A-weighted sound pressure level measured continuously within a reference time interval *T*, which have the same mean-square sound pressure as a sound under consideration whose level varies with time.

(LAeq, T) Equivalent continuous A-weighted rating level (LReq, T)	The Equivalent continuous A-weighted sound exposure level *(LAeq, T)* to which various adjustments has been added. More commonly used as (LReq,d) over a time interval 06:00 – 22:00 (T=16 hours) and (LReq,n) over a time interval of 22:00 – 06:00 (T=8 hours).
Footprint area	Area that will be impacted by the proposed mining, which does not include the total study area.
Green field	A parcel of land not previously developed beyond that of agriculture or forestry use; virgin land. The opposite of Greenfield is brownfield, which is a site previously developed and used by an enterprise, especially for a manufacturing or processing operation. The term brown field suggests that an investigation should be made to determine if environmental damage exists.
Integrated Development Plan	A participatory planning process aimed at developing a strategic development plan to guide and inform all planning, budgeting, management and decision-making in a Local Authority, in terms of the requirements of Chapter 5 of the Municipal Systems Act, 2000 (Act 32 of 2000).
Integrated Environmental Management	IEM provides an integrated approach for environmental assessment, management, and decision-making and to promote sustainable development and the equitable use of resources. Principles underlying IEM provide for a democratic, participatory, holistic, sustainable, equitable and accountable approach.
Interested and affected parties	Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.
Listed activities	Development actions that is likely to result in significant environmental impacts as identified by the delegated authority (formerly the Minister of Environmental Affairs and Tourism) in terms of Section 21 of the Environment Conservation Act.
Loudness	The attribute of an auditory sensation which describes the listener's ranking of sound in terms of its audibility.
Magnitude of impact	Magnitude of impact means the combination of the intensity, duration and extent of an impact occurring.
Masking	The raising of a listener's threshold of hearing for a given sound due to the presence of another sound.
Mitigation	To cause to become less harsh or hostile.
Negative impact	A change that reduces the quality of the environment (for example, by reducing species diversity and the reproductive capacity of the ecosystem, by damaging health, or by causing nuisance).
Noise	a. Sound which a listener does not wish to hear (unwanted sounds). b. Sound from sources other than the one emitting the sound it is desired to receive, measure or record. c. A class of sound of an erratic, intermittent or statistically random nature.
Noise Level	The term used in lieu of sound level when the sound concerned is being measured or ranked for its undesirability in the contextual circumstances.
Positive impact	A change which improves the quality of life of affected people or the quality of the environment.
Reverberant Sound	The sound in an enclosure excluding that which is received directly from the source.
Reverberation	The persistence, after emission of a sound has stopped, of a sound field within an enclosure.
Sensitive Receptor	Noise-sensitive receptors can best be defined as those locations or areas where dwelling units or other fixed, developed sites of frequent human use occur.
Significant Impact	An impact can be deemed significant if consultation with the relevant authorities and other interested and affected parties, on the context and intensity of its effects, provide reasonable grounds for mitigating measures to be included in the environmental management report. The onus shall be on the applicant to include the relevant authorities and other interested and affected parties in the consultation process. Present and potential future, cumulative and synergistic effects should all be taken into account.
Sound Level	The level of the frequency weighted and time weighted sound pressure as determined by a sound level meter.
Sound Power	Of a source, the total sound energy radiated per unit time.
Sound Pressure Level (SPL)	Of a sound, 20 times the logarithm to the base 10 of the ratio of the RMS sound pressure level to the reference sound pressure level. International and Australian values for the reference sound pressure level are 20 micropascals in air and 100 millipascals in water.
Zone of Potential Influence	The area defined as the radius about an object beyond which the visual impact of its most visible features will be insignificant.
Zone Sound	Means a derived dBA value determined indirectly by means of a series of measurements,

Level calculations or table readings and designated by a local authority for an area.

Glossary of abbreviations

CPP	Central Processing Plant
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act (Act 78 of 1989)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
FEL	Front End Loader
IAPs	Interested and Affected Parties
km	kilometres
LAeq,I dB(A)	A-weighted equivalent sound level using the 'I' (Impulse) dynamic response characteristic as recommended in SANS 10103:2008
LAMin dB(A)	The minimum A-weighted sound level recorded during the period of measurement
LHD	Load Haul Dumper
m	Meters (measurement of distance)
m^2	Square meter
m^3	Cubic meter
mamsl	Meters above mean sea level
NCR	Noise Control Regulations (under section 25 of the ECA)
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
PPE	Personal Protective Equipment
PPP	Public Participation Process
SABS	South African Bureau of Standards
SANS	South African National Standard
SHEQ	Safety Health Environment and Quality
T°C	Temperature in degrees Celsius
R%	Relative humidity
W m/s	Maximum wind speed measured
WHO	World Health Organisation

Project Proponents

Name of the Project: Karoo Uranium Project ("KUP"): Noise Baseline Assessment
Name of applicants: Tasman Lukisa JVCo (TLJVCO) & Tasman Pacific Minerals Limited (TASPAC)
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Declaration of independence and objectivity

I, Tim van Stormbroek (ID 7908295233081), hereby declare that I have no conflict of interest related to the work of this report. Specially, I declare that I have no personal financial interests in the property and/or development being assessed in this report, and that I have no personal or financial connections to the relevant property owners, developers, planners, financiers or consultants of the development. I declare that the opinions expressed in this report are my own and a true reflection of my professional expertise.

T van Stormbroek

1. Project Background

Tasman Lukisa JV Company (Pty) Ltd (TLJVCO) and Tasman Pacific Minerals Limited (TASPAC) are the applicants for three mining rights applications submitted in terms of Section 22 of the Mineral and Petroleum Resources Development Act, 2002 (MPRDA) for uranium (U) and molybdenum (Mo) in the Karoo. Two of these applications, Ryst Kuil (TLJVCO) and Quaggasfontein (TASPAC), are located in the Western Cape Province while one, Kareepoort (TLJVCO), is located in the Eastern Cape province.

This noise baseline assessment report has been compiled as a specialist contribution to the Environmental Impact Assessment and Environmental Management Plan Reports for the three mining right applications.

1.1. Description of the study area

The project area falls within the Nama-Karoo Biome and all are characterised by the Gamka Karoo regional vegetation type. The predominant land use type for this region is sheep and goat farming with some areas also dedicated specifically to game farming. The main reason for this is that the annual rainfall and soil conditions are not suitable for intensive agriculture. Although not without their ecological impacts, livestock and game farming in general does not cause severe transformation to the landscape in comparison to intensive agricultural practices.

The study area has a low population density with some historical homesteads no longer occupied and falling into ruin. The topography is in many parts of the study area flat, punctuated with low ridges and small hills. In the northern and north western parts of the study area the topography changes with the plateau as the altitude increases.

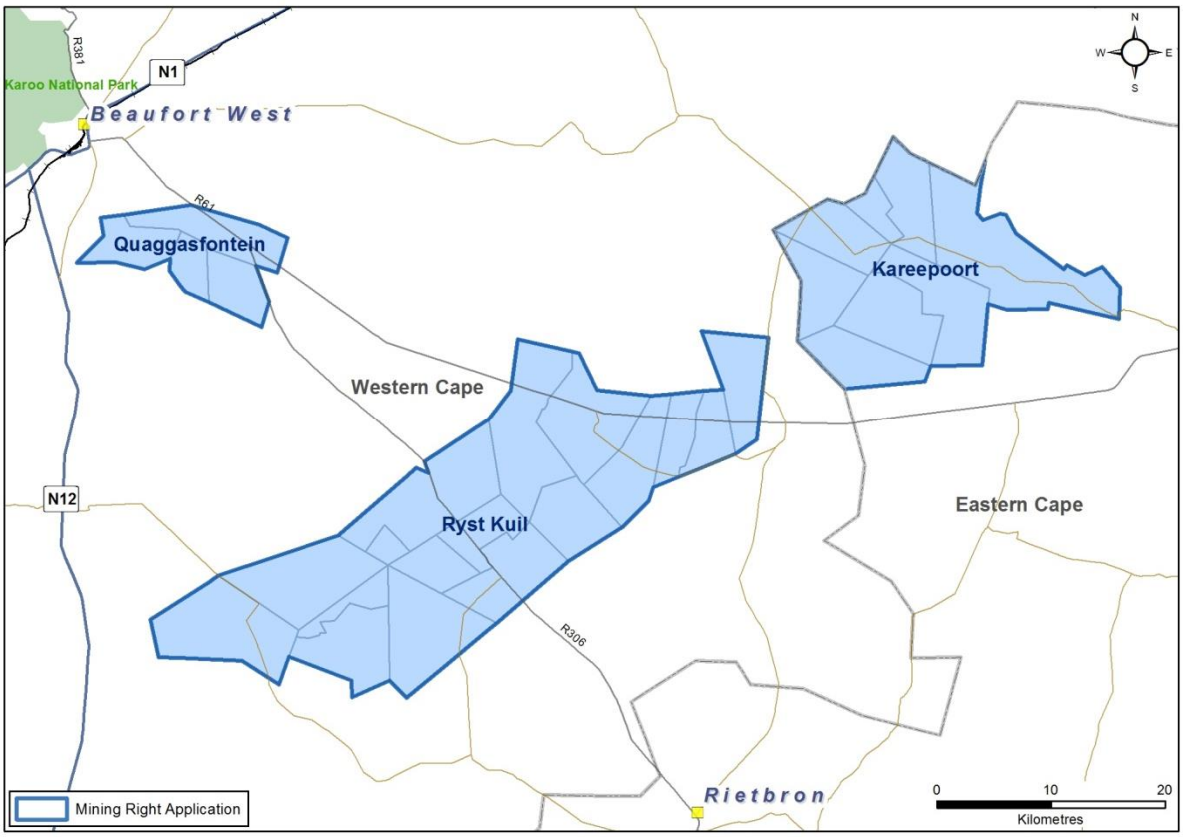

Figure 1-1. Karoo Uranium Project map.

1.2. Description of the proposed activity

The Central Processing Plant (CPP) is proposed to be located in the Ryst Kuil application area approximately 40 km SE of Beaufort West. The main product to be produced is uranium oxide (U_3O_8) in the form of yellowcake with the main by-product being molybdenum.

It is planned that the yellowcake product will be road freighted to either Cape Town or Port Elizabeth from where it will be shipped to overseas converters. TLJVCO will apply to Eskom for <33KV grid connection for electricity supply to the CPP. Locally available ground water will be used to provide for the water needs of the mining and mineral processing operation Water Use Licenses (WUL) for the Eastern Cape and Western Cape operations are in process.

1.1.1 Open cast mining methodology

The open cast surface mining will be standard open cast pit structures with access roads to the pit floor. Pit depths will vary from a minimum of 10 m at Quaggasfontein to a maximum of 112 m at Ryst Kuil with an average depth of around 50 m. The mining method will be traditional drill, blast, load and haul using 30 ton trucks to deliver the material to the CPP.

Topsoil (where available) will be removed to its maximum in-situ depth from all open pit and dump areas. This will be done by dozing the material into clean berms which will provide high wall protection as well as deflection of clear storm water runoff. All vegetation and the existing seed bank as well as surface rocks is planned to be stockpiled together with the topsoil in these berms.

The hard overburden will be mined in benches of 4 m wide by 10 m high (65° pit-slope angle). These benches will be drilled and blasted prior to an excavator and truck fleet loading and hauling to the rock dump initially but once backfill capacity is available, rock will be used immediately for backfilling. Overburden on the last bench above the ore will only be drilled and blasted down to the ore/waste contact. Ore and overburden will not be drilled and blasted together.

Due to the thin tabular nature of the ore deposit and the relative small size of the various open pits, virtually all the overburden will have to be mined before any ore production from any given pit will be possible. Because no clear visual distinctions have been identified between the ore and waste material, strict grade control measures will need to be implemented by the production geological department. All mined ore will be loaded by an excavator or front-end loader onto a truck and transported directly to the processing plant run of mine tip.

1.1.2 Underground mining methodology

Where applicable, the underground development layout will consist of the following:

- Highwall access roadways from the floor of mined out open pits;
- A twin access roadway with a conveyor that will act as a ventilation return airway; and
- Vertical ventilation shafts.

Production sections will be established off the twin roadway system as development progresses. A development section consists of two roadways which are 5 metres wide by a minimum of 2 meters high.

Once the development section has completed the on-reef development through, the stoping method will be selected based on the seam width as to ensure the least amount of dilution is maintained.
The mining methods will consist of the following:

- Bord and pillar stoping
- Hybrid stoping

1.3. Terms of Reference

SANS 10328:2003 (Edition 2) specifies the methodology to assess the noise impacts on the environment due to a proposed activity that might impact on the environment. The standard also stipulates the minimum requirements to be investigated for EIA. These minimum requirements are:

- the purpose of the investigation;
- a description of the planned development or the changes that are being considered;
- a description of the existing environment including, where relevant, the topography, surface conditions and meteorological conditions during measurements;
- the location of measuring or calculating points in a sketch or on a map;
- the identified noise sources together with their respective sound pressure levels or sound power levels (or both) and, where applicable, operating cycles, nature of sound emission, spectral composition and directional characteristics;
- the identified noise sources that were not taken into account and the reasons why they were not investigated;
- the identified noise-sensitive developments and the noise impact on them;
- where applicable, any assumptions, with references, made with regard to and calculations or determination of source and propagation characteristics;
- an explanation, either by description or by reference, of all calculation and measuring procedures that were followed, as well as any possible adjustments to existing measuring methods that had to be made, together with the results of calculations;
- an explanation, either by description or reference, of all measuring or calculation methods (or both) that were used to determine existing and predicted rating levels, as well as other relevant information, including a statement of how the data were obtained and applied to determine the rating level for the area in question;
- quantification of the noise impact with, where relevant, reference to the literature consulted and the assumptions made;
- alternatives that were considered and the results of those that were investigated;
- conclusions that were reached; and
- recommendations.

2. Regulatory Framework

Noise is specifically listed at various levels of the South African regulatory framework. The Constitution of South Africa includes noise pollution in Schedule 5, Part B which delegates noise pollution control to the local authority should the local authority in question have the necessary resources to carry out this function.

The following legislation provides for the control of noise pollutions within various contexts:

Environmental Conservation Act (Act 73 of 1989) (ECA)	Empowers the Minister to make regulations regarding noise. In terms of Section 25 of ECA, the Noise Control Regulations were promulgated (GNR154 in Government Gazette 13717 10 Jan 1992).
National Environmental Management Act (Act 107 of 1998) (NEMA)	Defines "pollution" and expressly includes noise. It provides measures for the reasonable control of noise pollution.
National Environmental Management: Air Quality Act (Act 39 of 2004) (AQA)	This act makes provision for the Minister to prescribe national noise standards however such national standards have not yet been promulgated.
South African National Standards	SANS 10103:2008 Measurement and Rating of Environmental noise SANS 10210:2004 Calculating and predicting road traffic noise SANS 10328:2008 Methods for Environmental Noise Impact Assessment SANS 10357:2004 Calculation of Sound propagation by the Concave method

3. Current Environmental Noise Character

3.1 District Acoustic Character

The noise character of the rural Karoo has been assessed and documented by various studies. Under South African standards, various types of districts are classified according to their acoustic character. This acoustic character is provided in SANS 10103:2008 as provided in Table 3-1 below. The SANS 10103:2008 document also provides the anticipated Categories of Community Group Responses when noise levels increase within such an environment. The rural nature of the proposed mining sites and central processing plant has a well understood and documented acoustic character.

Table 3-1. District Noise Rating levels

Type of District	**Equivalent Continuous Rating Level for Noise ($L_{Req,T}$) dBA**					
	Outdoors			**Indoors with Windows open**		
	Day-night	Daytime	Night-time	Day-night	Daytime	Night-time
Residential						
a) Rural district	45	45	35	35	35	25
b) Suburban district	50	50	40	40	40	30
c) Urban district	55	55	45	45	45	35
Non-Residential Districts						
d) Urban districts (some workshops, business premises and main roads)	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

3.2 Desktop Assessment

A baseline noise assessment by JH Consulting (2011) in the area between Middelburg, Cradock and Queenstown, revealed field test results congruent with those described by SANS 10103:2008 (Table 3-1 above). Baseline test results for this study for LAeq ranged from 34,6 – 47,6 (dBA) where no traffic was present. The lowest Lmin during these assessments was 17,3 (dBA). These results are typical of a remote rural setting with acoustic character influenced mostly by wind, rustling of vegetation and bird song. The same study revealed the impact of traffic where the LAmin results ranged from 17,5 – 35,2 (dBA) and the LAeq ranged from 55,8 – 69,2 (dBA). These influences were characteristic of a tarred/paved rural main road with cars and light and heavy delivery vehicles travelling upwards of 80km/h.

A M2 Environmental Connections Report (2012) for the Der Brochen Platinum Mine demonstrated similar sound pressure levels typical of a remote rural setting with LAeq from 31,7 – 59,9 (dBA).

3.3 Field Baseline Assessment

A baseline noise field assessment was carried out on 10 and 11 January 2017. This assessment was a day time assessment with a single confirmatory night time sampling position. A Casella CEL-246 Sound Level

Meter (SLM) was used with serial number 3721384. This SLM was calibrated on 29 August 2016 and its calibration seals were intact.

Figure 3-1. SLM Calibration evidence.

In support of various EIA specialist study contributions, a process of identifying Sensitive Receptors has been completed and compiled as indicated in Figure 3-2 below. Eleven monitoring positions were selected based on the planned project infrastructure and mining layout as well as the existing Sensitive Receptors in the area. The applicable nomenclature provided in this plan has been utilised to identify the positions were each noise measurement was captured.

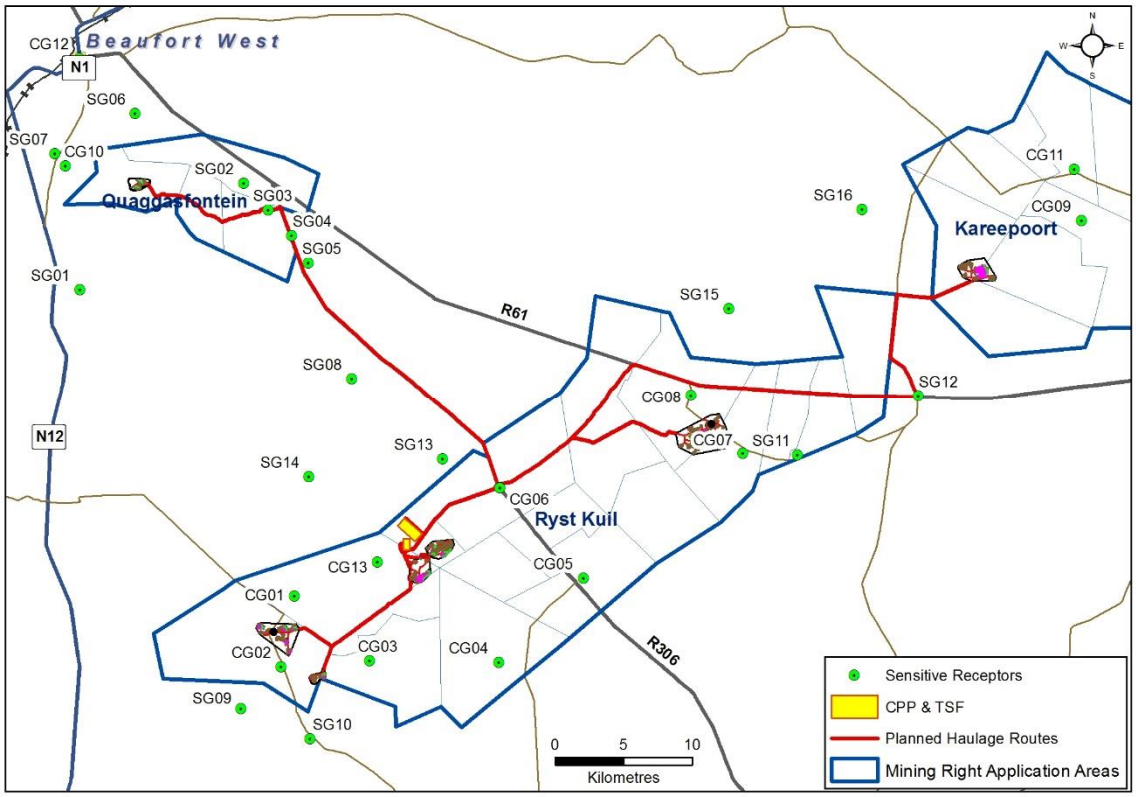

Figure 3-2. Map indicating the project area and identified Sensitive Receptors.

The maps below indicate the selected monitoring positions as well as instrument direction with the associated photographic record.

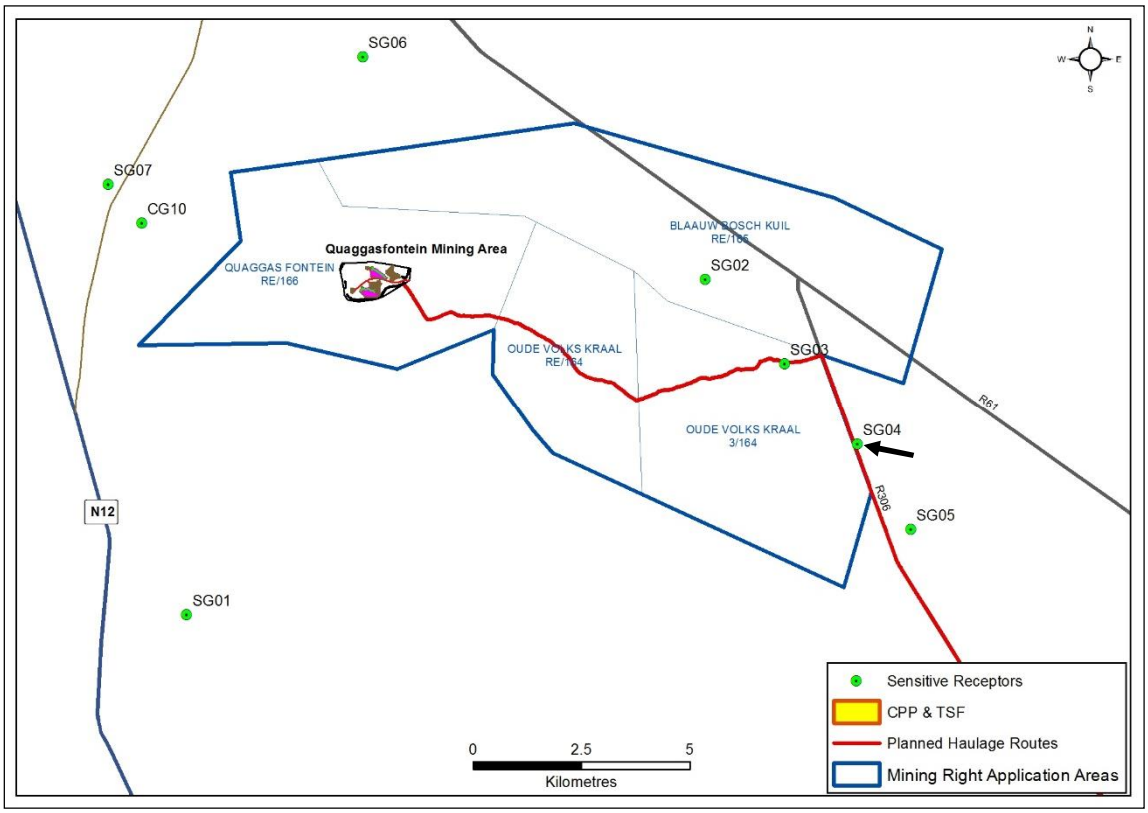

Figure 3-3. Map of the Quaggasfontein application area indicating the monitoring position SG04 and instrument direction.

Figure 3-4. Monitoring position SG04.

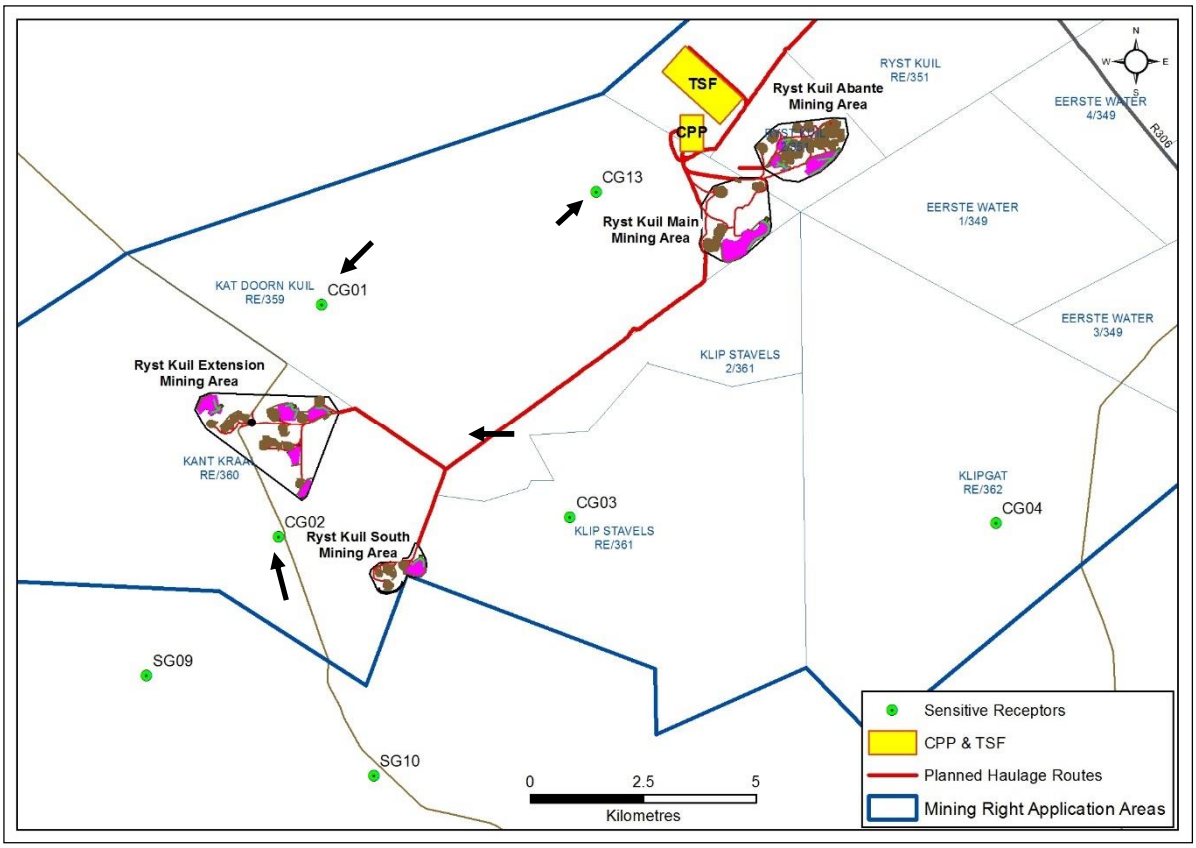

Figure 3-5. Map of the south western portion of the Ryst Kuil application area indicating the various monitoring positions and instrument direction.

Figure 3-6. Monitoring position CG01.

Figure 3-7. Monitoring position CG02.

Figure 3-8. Monitoring position CG03.

Figure 3-9. Monitoring position CG13.

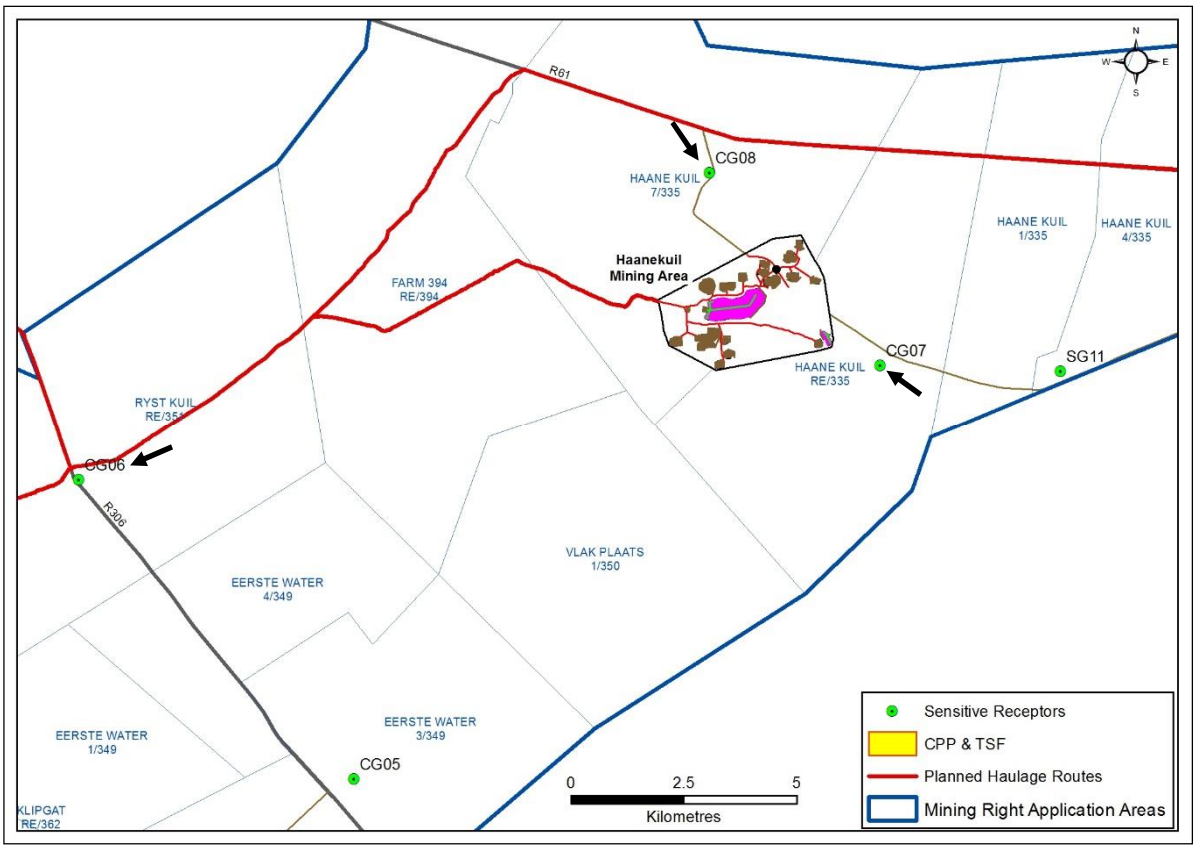

Figure 3-10. Map of the north eastern portion of the Ryst Kuil application area indicating the various monitoring positions and instrument direction.

Figure 3-11. Monitoring position CG06.

Figure 3-12. Monitoring position CG07.

Figure 3-13. Monitoring position CG08.

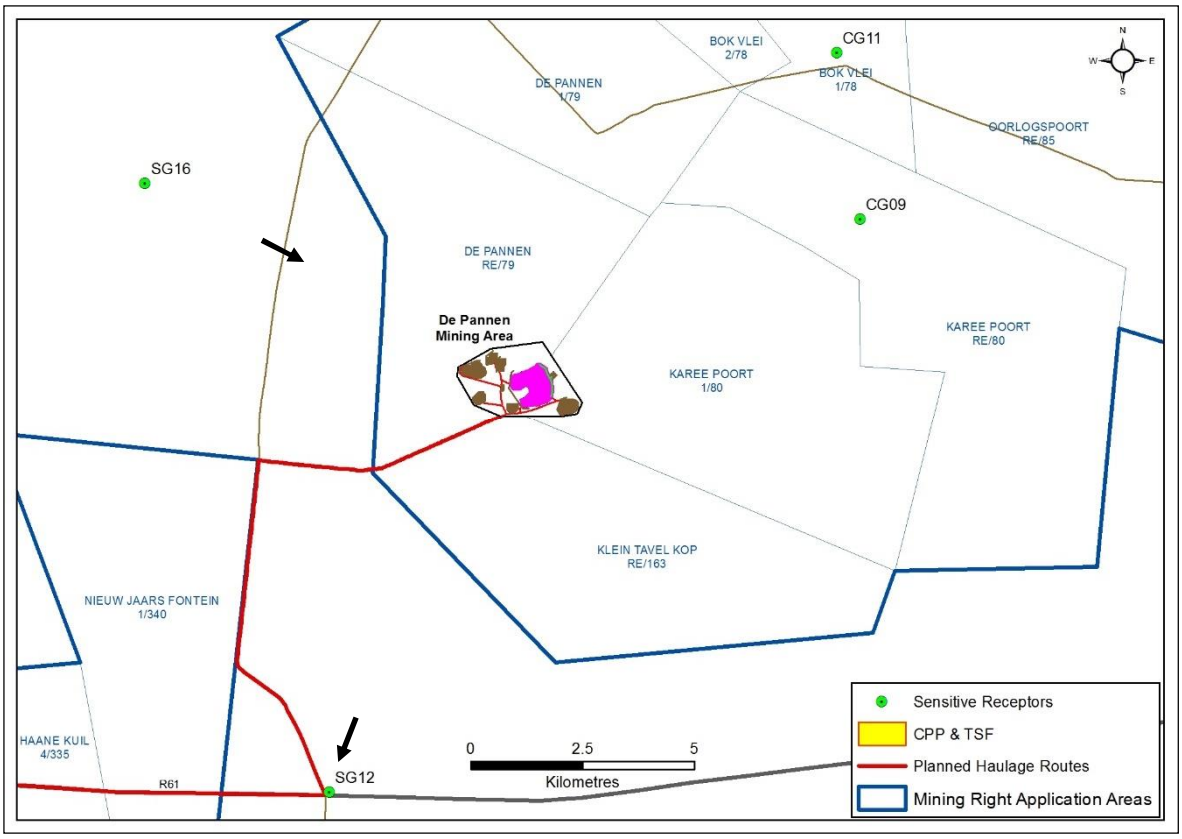

Figure 3-14. Map of the north eastern corner of the Ryst Kuil application area and the south western portion of the Kareepoort application area indicating the various monitoring positions and instrument direction.

Figure 3-15. Monitoring position SG12.

Figure 3-16. Monitoring position SG16.

Figure 3-17. Nocturnal monitoring position.

4. Results

The following results table is provided based on the field assessment.

Monitoring Site Nomenclature	Site Description	Date/ Time	Location Coordinates	Comments	Figure Reference	LAeq (dBA)
SG04	Alongside Rietbron road adjacent to SG04 homestead	11/01/2017 08:50	S 32°28'19,7" E 22°44'48,2"	Very quiet. Bird song continually evident. Very light breeze from NW. One farm LDV with trailer passed.	Figure 3-4	48,0 dBA
CG01	Located adjacent to shearing shed at the main homestead on Kat Doorn Kuil	10/01/2017 17:40	S 32°42'37,2" E 22°44'56,7"	Sheep & goats in small pens ±30m away. Gusting strong breeze. Flapping canvas on truck canopy to north of position	Figure 3-6	51,1 dBA
CG02	Located on north side of Aardoorn dirt road. Kantkraal labour homes adjacent	10/01/2017 19:40	S 32°45'24,5" E 22°44'22,9"	Gusting wind. Repetitive noise from windmill on south side of road. Some noise from children playing ±40m away	Figure 3-7	54,8 dBA
CG03	Located near farm boundary fence between future mine operations and CG03 Klip Stavel Farmstead	10/01/2017 18:15	S 32°44'23,0" E 22°46'24,6"	SPL facing west. Gusting strong breeze. No other interferences/contributing noise sources.	Figure 3-8	57,3 dBA
CG13	Located next to small corrugated iron structure used by Kat Doorn Kuil labour.	10/01/2017 17:05	S 32°41'13,4" E 22°48'51,5"	Adjacent windmill creating repetitive noise. Wind gusting strongly. SPL facing into wind.	Figure 3-9	57,8 dBA
CG06	Located just inside Rust Kuil fence line next to Rietbron dirt road.	10/01/2017 16:35	S 32°38'10,9" E 22°54'24,5"	Fairly strong gusting wind from the NW. One passenger vehicle passed on dirt road during monitoring.	Figure 3-11	54,9 dBA
CG07	Located just inside farm gate leading to CG07 farm stead.	11/01/2017 09:50	S 32°36'36,3" E 23°05'39,5"	Strong gusting wind from NE. Bird song constantly evident. No anthropogenic activity in area.	Figure 3-12	57,4 dBA
CG08	Located inside farm gate of Haanekuil Farmstead	11/01/2017 09:35	S 32°34'42,1" E 23°03'27,4"	Light but consistent breeze with some gusting from the NW. Bird song consistently evident in adjacent bushes	Figure 3-13	51,1 dBA

Monitoring Site Nomenclature	Site Description	Date/ Time	Location Coordinates	Comments	Figure Reference	LAeq (dBA)
SG12	Located on Nelspoort dirt road at intersection with R61 adjacent to Rooi Dam farmstall	11/01/2017 10:20	S 32°34'39,8" E 23°14'00,7"	Strong gusting wind. Numerous cars passing on tarred R61 road. One LDV approached on Nelspoort road and turned off at the farm stall before passing the monitoring position	Figure 3-15	64,8 dBA
SG16	Located on eastern verge of Nelspoort dirt road between future De Pannen operations and SG16	11/01/2017 10:40	S 32°29'12,8" E 23°13'10,1"	Strong gusting wind. Some bird song. No vehicles passed during monitoring period.	Figure 3-16	63,2 dBA
Night Fall	Located on dirt road proximal to Ryst Kuil south western side. Nocturnal measurement	10/01/2017 10:40	Not representative of CG or SG therefore no position recorded	Strong gusting wind with some sparse rainfall. No vehicles passed during monitoring.	Figure 3-17	54,8 dBA

These field monitoring results confirm the rural nature of the noise character of the project area.

5. Potential Noise Sources

Within a mining site, increased noise levels are directly linked with the various activities associated with the construction of the mining area and related infrastructure, and the operational as well as closure phases of the activity.

5.1 Construction Phase

The proposed Construction Phase activities are anticipated to include the following:

-
- Establishing of central processing plant infrastructure,
- Access road widening,
- Top soil stripping,
- Waste and ROM stockpile footprint civils,
- Soft overburden and hard material (drill and blast to remove very hard material) during the development of the pit boxcuts, and;
- Construction of supporting infrastructure i.e. office, ablutions/change house etc.

5.1.1 General Civil Works

The activity of clearing vegetation, widening access roads and preparing footprints and foundations for the CPP, Tailings Storage Facility (TSF) and related infrastructure will impact on the acoustic character of the area.

5.1.2 Blasting

Hard rock blasting will be required as part of the civil works to prepare the footprint and foundations, as well as during the development of the pit box cuts.

5.1.3 Traffic

During the construction phase a significant increase in traffic to and from the site is anticipated. Internal traffic within the site boundaries will also be elevated. The movement of large numbers of employees and contract workers during construction will increase noise levels. In addition, the delivery of materials and infrastructure on large trucks will commence during the construction phase.

5.2 Operational Phase

5.2.1 Mining

The following noise related activities are anticipated during the operational phase of mining:

- Topsoil stripping and loading;
- Soft overburden load and haul;
- Drill and blast operations;
- Infill and exploration drilling;
- Crushing;
- In Pit Loading;
- Material Hauling;

- Ventilation Fans;
- General vehicle movement.

Mining operations are planned to take place over 2 shifts for a 5 day week. A day shift will start at 06h30 and a night shift that will start at 18h30.

5.2.2 Plant Operation

Noise associated with the CPP operations is only applicable to the Ryst Kuil application area as the other application blocks do not include plant operations. The East Block Central Processing Plant (CPP) is planned to operate on a 24 hr continuous operation shift basis.

- Ore receipt and primary crushing;
- Primary and secondary milling, grinding and cleaning;
- Flotation and concentrate thickening;
- Reagent mixing and distribution facilities;
- Pumping;
- Tailings thickening and disposal facilities.

5.3 Closure Phase

Closure phase activities are by their very nature less intrusive from a noise perspective than those produced during operational phase activities. Verification of anticipated operational phase noise impacts will take place over the Life of Mine (LOM) and will inform the Closure Phase impact assessment and mitigation measures. It is however unlikely that any additional/new mitigation measures will be required during the closure phase.

6. Interested and affected parties

The role played by interested and affected parties (IAP's) through the public consultation process is vital to the sustainability of any development. Comment and concerns provided by such IAP's provide guidance to the various impact assessment teams through identifying potential impacts timeously.

The public consultation process for the Karoo Uranium Project project was initiated in 2014 and a re-run was conducted in 2015 and 2016. This included newspaper advertisements, site notices and various public and focus group meetings. A database of well over 1,000 registered IAP's as well as their comments and concerns was compiled during this process.

6.1 Community Noise Concerns

There are numerous definitions for noise such as: a). Sound which a listener does not wish to hear (unwanted sounds); b). Sound from sources other than the one emitting the sound it is desired to receive, measure or record. c). A class of sound of an erratic, intermittent or statistically random nature.

Simply from a community or sensitive receptor perspective, noise is any unwanted sound over and above the natural background noise to which the community or sensitive receptor has become accustomed. It should however be emphasised that the perception of noise or sound is subjective to each hearer. Sound may not be noticed by one member of a family while another complains of not being able to sleep.

SANS 10103 described through a tabulated format the anticipated community responses from elevated/excessive or increased sound pressure levels. See Table 6-1 below.

Table 6-1. Categories of Community Group Response (SANS 10103-2008)

1	2	3
Excess $\Delta L_{Req,T}$[a] dBA	**Estimated community/group response**	
	Category	**Description**
0 – 10	Little	Sporadic complaints
5 – 15	Medium	Widespread complaints
10 – 20	Strong	Threats of community/group action
>15	Very strong	Vigorous community/group action

a $L_{Req,T}$ should be calculated from the appropriate of the following:

1) $)L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS $L_{Req,T}$ of the residual noise (determined in the absence of the specific noise under investigation).

2) $)L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level for the ambient noise given in table 1.

3) $)L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the acceptable rating level for the applicable district as determined from table 2.

4) $\Delta L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in an area because of a proposed development under investigation.

NOTE Overlapping ranges for the excess values are given because a spread in the community reaction may be anticipated

According to the Ref 1. Table in SANS 10103 (replicated in Table 6-2 below), the expected response from a local community to noise impact, i.e. the exceedance of the noise over the acceptable rating level for the appropriate district, is provided, but expressed in terms of the effects of impact, on a scale of 'none' to 'very high'.

Table 6-2. Anticipated response intensity to increase in dB

Increase dB	Response Intensity	Remarks	Noise Impact
0	None	Change not discernible by a person	None
3	None to little	Change just discernible	Very low
3 ≤ 5	Little	Change easily discernible	Low
5 ≤ 7	Little	Sporadic complaints	Moderate
7	Little	Defined by National Noise Regulations as being 'disturbing'	Moderate
7 ≤ 10	Little to medium	Sporadic complaints	High
10 ≤ 15	Medium	Change of 10dB perceived as 'twice as loud' leading to widespread complaints	Very high
15 ≤ 20	Strong	Threats of community/group action	Very high

During the public consultation process for these mining right applications, some interested and affected parties (IAP's) raised concern about noise during the 2014 consultative process. No specific detailed concerns were recorded regarding noise sources other than the possibility of a general increase in undesirable noise. The issues raised area provided in Table 6-3 below.

Table 6-3. Selection of noise related comments/concern from consultation process

Mechanism/Medium	IAP	Comment	Response
Comment received following distribution of Frazerberg Public meeting minutes. Record: FG minutes emailed 190914. Notice of project re-alignment emailed 041214. App notice emailed 110615.	Gysbert: Blydevooruitsight Trust:	Totale arbeidsmag, 250 werknemers by aanleg en myne. By die pit sal ongeveer 10- 20 mense wees. Geen arbeider sal by die sateliet operasies woon nie. Arbeiders sal met busse in en uit vervoer word. Daar is risiko's vir die boer en mynbestuur as die arbeiders op die mynarea woon. Bestraling sal beperk wees tot in die pit. Daar sal gekyk moet word na die beheer van die stof. Die afstand van bestraling is klein. Indien dit gemeet word neem die bestralingseffek eksponensieel af met toename in afstand vanaf die bron. Stof en geraas sal 'n groter impak op inwoners uitoefen.	Comments noted.
Comment received from meeting on 1 July 2014.	Theunis Botha: land owner	Geraas hoof impak, stilte sal verdwyn na mynbou begin. The most important impact is the change in noise levels.. Meeting 1 July 2014	Comment noted. The potential impact of mining related noise is dealt with in this study.
		The Mining Right Application should consider the following issues/studies/aspects: Live stock, stock waste, veld damage, roads, dust, noise, human interference with stock movement at water points positions.	

7. Sensitive Receptors

Sensitive Receptors are best defined as those locations or areas where dwelling units or other fixed, developed sites of frequent human use occur that may be impacted by the proposed mining activity. Sensitive Receptors (SR's) have been identified through knowledge of the site, various site visits as well as through topographic map or air photo and Google Earth (TM) searches for each application block.

A Google Image (TM) has been provided with place markers for each SR identified within reasonable proximity to the project area. Each SR has been assessed in terms of its function/use as well as its distance from the closest source of noise within the project area. It should be noted that the distance of an identified sensitive receptor to the closest underground stoping has for obvious reason been excluded.

7.1 Ryst Kuil Application Area

Within the Mining Right application boundaries for the Ryst Kuil application the following SR's have been identified:

SR ID	Description	Distance to Nearest Mining Activity	Comment
CG01	Kat Doorn Kuil homestead	2.0 km (Ryst Kuil Extension)	Some buildings occupied
CG02	Kant Kraal homestead	1.1 km (Ryst Kuil Extension)	Slightly elevated topography between mining area and occupied homestead
CG03	Klipstawels homestead	3.5 km (Ryst Kuil South)	Occupied homestead
CG04	Klipkrans homestead	8.2 km (Ryst Kuil Main)	Occupied homestead
CG05	Eerstewater homestead	9.8 km (Ryst Kuil Abante)	Occupied homestead
CG06	Ryst Kuil homestead	5.2 km (Ryst Kuil Main)	Unoccupied homestead (derelict)
CG07	Lootsplaas homestead	1.4 km (Haanekuil)	Occupied homestead
CG08	Haanekuil homestead	2.0 km (Haanekuil)	Occupied homestead
CG13	Stock Watering point & recently erected informal home.	2.2 km (CPP)	Non-permanent home
SG08	Saucy's Kuil homestead	11.0 km (TSF)	Occupied homestead
SG09	Amosvlei	5.2 km (Ryst Kuil Extension)	Unknown status
SG10	Vaalkraal homestead	4.1 km (Ryst Kuil South)	Unoccupied homestead (derelict)
SG11	Blydskap homestead	5.3 km (Haanekuil)	Occupied homestead
SG13	Toornitzkuil	5.1 km (TSF)	Unknown status
SG14	Hoekskuil	7.3 km (TSF)	Unknown status
SG15	Veerekuil	7.8 km (Haanekuil)	Unknown status

7.2 Quaggasfontein Application Area

Within the Mining Right application boundaries for the Quaggasfontein application the following SR's have been identified:

SR ID	Description	Distance to Nearest Mining Activity	Comment
CG10	Quaggasfontein homestead	4.8 km (Quaggasfontein)	Occupied homestead
CG12	Beaufort West Town	9.6 km (Quaggasfontein)	Populated area
SG01	Olive Grove Guest Farm	8.3 km (Quaggasfontein)	Occupied homestead
SG02	Blouboskuil homestead	6.8 km (Quaggasfontein)	Occupied homestead
SG03	Oude Volks Kraal homestead	8.8 km (Quaggasfontein)	Occasionally occupied homestead, close to haul road
SG04	Uitsig homestead	11.0 km (Quaggasfontein)	Occupied homestead, close to haul road
SG05	Retreat homestead	12.9 km (Quaggasfontein)	Occupied homestead, close to haul road
SG06	Hansrivier	4.6 km (Quaggasfontein)	Occupied homestead
SG07	Steenrotsfontein	5.8 km (Quaggasfontein)	Occupied homestead

7.3 Kareepoort Application Area

Within the Mining Right application boundaries for the Kareepoort application the following SR's have been identified:

SR ID	Description	Distance from Project area	Comment
CG09	Kareepoort homestead	7.5 km (De Pannen)	Occupied homestead
CG11	Bokvlei homestead	9.4 km (De Pannen)	Occupied homestead
SG12	Rooidam Farm Stall	9.3 km (De Pannen)	Retail business, close to haul road
SG16	Los Boome homestead	8.1 km (De Pannen)	Occasionally occupied homestead

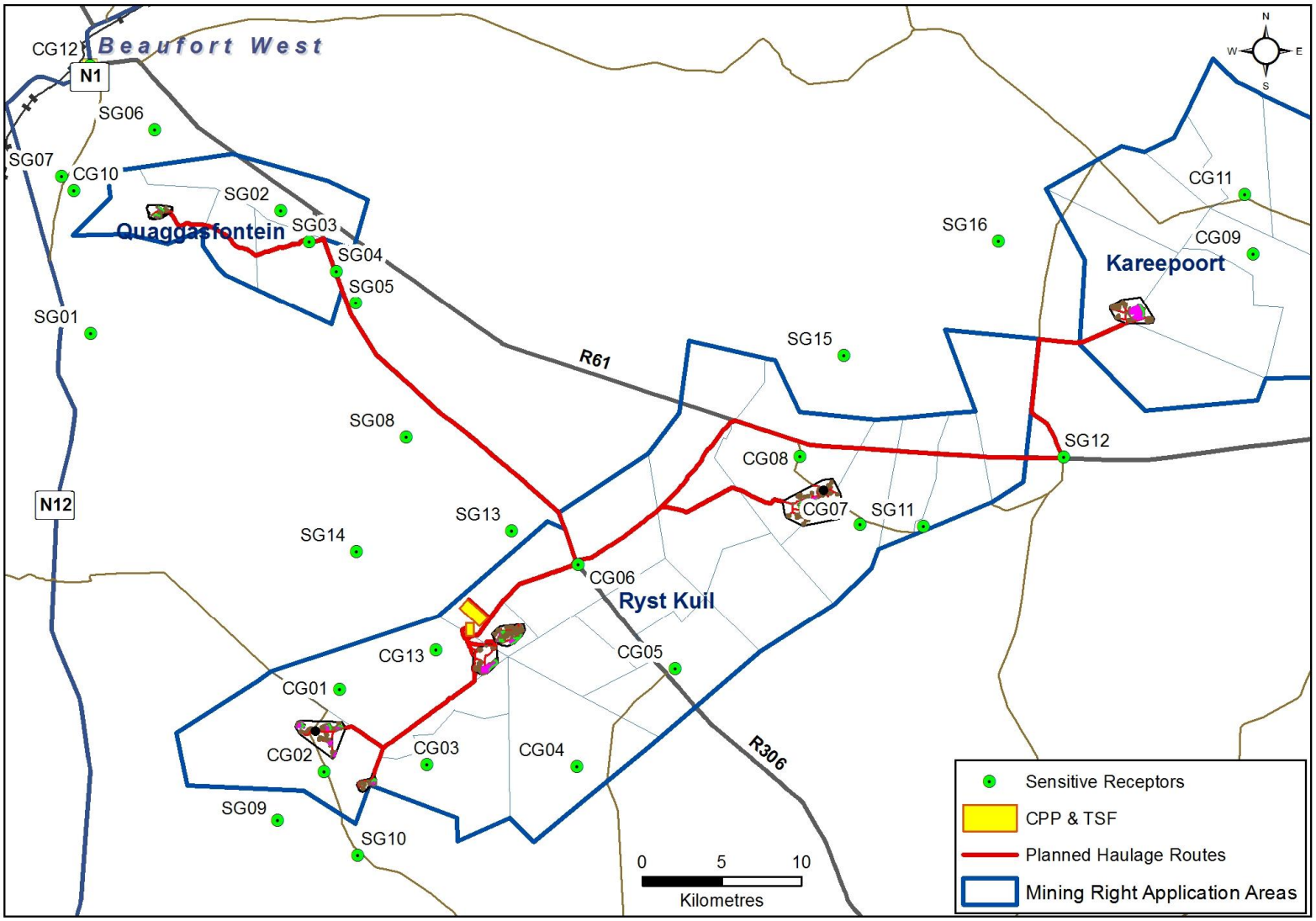

Figure 7-1. Karoo Uranium Mine Project Area – potential sensitive receptors relative to project infrastructure.

Selected Photographic Records of Identified Sensitive Receptor

Figure 7-2. Old farmstead at Kat Doorn Kuil (CG01).

Figure 7-3. Dilapidated remains of the De Pannen Homestead.

Figure 7-4. Homestead NE of De Pannen area (CG09).

Figure 7-5. Unoccupied Rystkuil Homestead (CG06).

8. Impact Assessment

8.1 Methodology

Impacts are described according to the nature, the potential extent, the duration and intensity of the impacts as well as the probability of their occurrence (Table 8-1). Significance considers a combination of impact factors (Table 8-2).

Table 8-1. Definitions of each of the impact criteria used to determine the significance

CRITERIA	*Description*
Nature	The effect that the proposed activity will have on groundwater and includes what will be affected and how.
Extent / Scale	The spatial extent of the impact, i.e. limited to the site; local (limited to within 25 km of the area); regional (limited to ~200 km radius); national (limited to the borders of South Africa); or international (extending beyond South Africa's borders).
Duration	Indicates whether the impact will be temporary (during construction only); short term (1-5 years); medium term (5-10 years); long term (longer than 10 years, but will cease after operation); or permanent.
Intensity	Establishes whether the magnitude of the impact exceeds ambient groundwater guidelines, and is described as none (no impact); low (where guidelines are not exceeded); medium (where guidelines are exceeded occasionally, but the receiving environment is not sensitive); or high (where guidelines are exceeded in sensitive environments, i.e. residential areas).
Probability	Considers the likelihood of the impact occurring and is described as uncertain; improbable (low likelihood); probable (distinct possibility); highly probable (most likely); or definite (impact will occur regardless of prevention measures).
Significance	Significance before and after mitigation is low if the impact will not have an influence on the decision or require to be accommodated in the project design; medium if the impact could have an influence on the environment and will require modification of the project design or alternative mitigation or high where it could have a "no-go" implication regardless of any possible mitigation.
Status of the impact	Is a statement of whether the impact is positive (a benefit); negative (a cost); or neutral, indicating in each case who is likely to benefit and who is likely to bear the costs of each impact.
Degree of Confidence in Predictions	Is based on the availability of specialist knowledge and other information.

Table 8-2. Definitions of the various significance ratings

SIGNIFICANCE RATING	*CRITERIA*
Low	The impact is likely to have a negligible influence on groundwater and the receiving environment and no modifications or mitigations are necessary to the proposed plan. This is allocated to impacts of any severity at a local scale and temporary.
Medium	The impact could have an influence on groundwater and the receiving environment, which will require modification of the proposed and/or alternative mitigation. This is allocated to impacts with moderate severity that extend locally to regionally in the short term.
High	The impact could have a significant influence on groundwater and the receiving environment and could result in a 'no-go' implication for the development, regardless of any mitigation. This would be allocated to impacts of high magnitude, locally for longer than a month, and/or for impacts of a high magnitude regionally and beyond.

Table 8-3. Impact assessment methodology

OCCURRENCE		**Severity**	
Probability of occurrence	Duration of occurrence	Magnitude (severity) of impact	Scale / extent of impact
To assess each impact, the following four ranking scales are used:			

PROBABILITY (P)	**DURATION (D)**
5 – Definite/don't know	5 – Permanent: after rehabilitation and closure
4 – Highly probable	4 – Long-term: decommissioning phase and until rehabilitated.
3 – Medium probability	3 – Medium-term: operational phase
2 – Low probability	2 – Short-term: Construction phase
1 – Improbable	1 – Immediate
0 – None	
SCALE (S)	**MAGNITUDE (M)**
5 – International	10 – Very high/don't know
4 – National	8 – High: >20% change from current conditions
3 – Regional	6 – Moderate: 10 to 20% change from current conditions
2 – Local	4 – Low: <10% change from current conditions
1 – Site only	2 – Minor – **Negligible:** no measurable effect (<1%) from current conditions
0 – None	

The significance of the two aspects, occurrence and severity, is assessed using the following formula:
SP (significance points) = (magnitude + duration + scale) * probability
The maximum value is 150 significance points (SP). The impact significance points are assigned a rating of high, medium or low with respect to their environmental impact as follows:

SP >60	Indicates **high** environmental significance	An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.
SP 26 – 60	Indicates **moderate** environmental significance	An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless it is mitigated.
SP <26	Indicates **low** environmental significance	Impacts with little real effect and which should not have an influence on or require modification of the project design.
+	Positive impact	An impact that is likely to result in positive consequences/effects.

Potential impacts were assessed using the above calculation and rating system, and mitigation measures were proposed for all relevant project phases (construction to decommissioning).

8.2 Attenuation Factors

Factors that influence the attenuation of noise include the following:

- Distance from noise source
- Reflective/Absorptive surfaces
- Topography
- Wind speed
- Temperature
- Humidity

It should be noted that this impact assessment considered distance from noise source as the main attenuation factor and the influence of reflective/absorptive surfaces, topography, wind speed, temperature and humidity were not accounted for. M de Jager (M2 Env Connections, 2011) reported an attenuation of noise from the source of construction related activities similar to the conditions anticipated during the construction phase of this application.

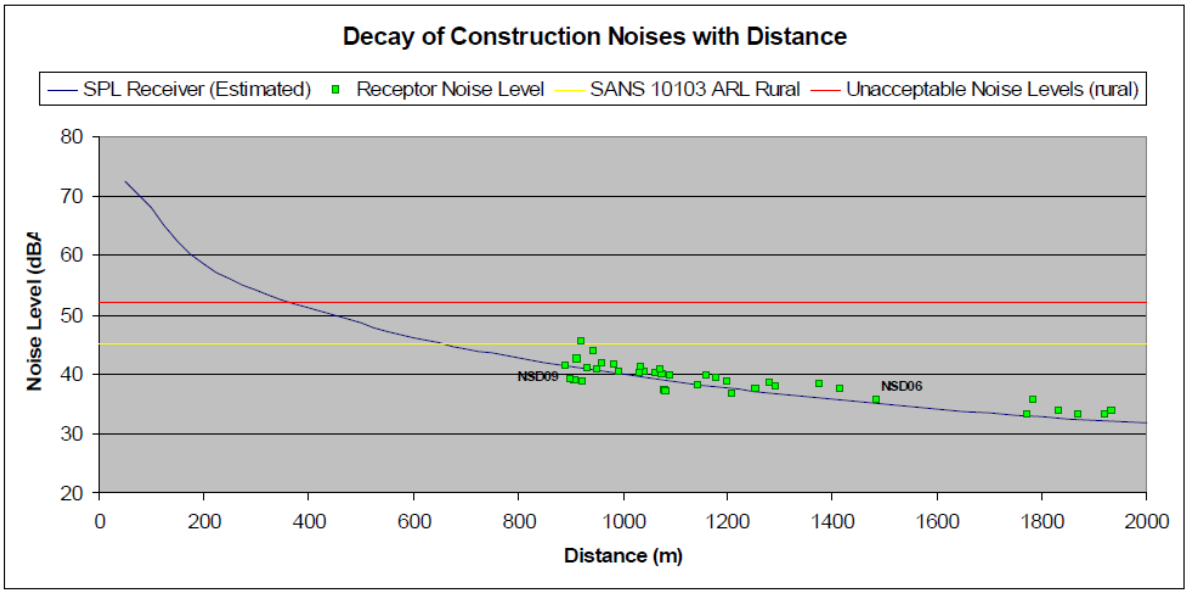

Figure 8-1. Graphic of attenuation over distance from source as presented by M de Jager (2011).

Attenuation fell below the acceptable sound pressure level for rural areas during day time as presented in SANS 10103 at a distance of approximately 850m from the noise source.
A high level impact assessment based on the methodology described above is presented below.

8.3 Construction Phase Impacts

The table below addresses the noise impacts anticipated on those SR's within a 2km radius of the proposed mining activities during the construction phase. Those SR's located between 2km and 5km from the noise source have all been assessed.

8.4 Operational Phase Impacts

The table below addresses the noise impacts anticipated on those SR's within a 2km radius of the proposed mining activities during the operational phase. Those SR's located between 2km and 5km from the noise source have all been assessed.

8.5 Closure Phase Impacts

The table below addresses the noise impacts anticipated on those SR's within a 2km radius of the proposed mining activities during the construction phase. Those SR's located between 2km and 5km from the noise source have all been assessed.

Construction phase									
No	**Receptor**	**Impact and result**	**M**	**S**	**D**	**P**	**SP**	**Mitigation**	**SP after mitigation**
1	**SR1, SR4, SR5, SR10**	Increased noise levels experienced in the homestead during daylight hours due to construction related activities.	4	1	2	4	28	Limited mitigation measures available. See general mitigation measures.	28
2	**SR2, SR7, SR9, SR11, SR16**	Increased noise levels experienced in the homestead during daylight hours due to construction related activities.	2	1	2	3	15	No mitigation required.	15
Operational phase									
No	**Receptor**	**Impact and result**	**M**	**S**	**D**	**P**	**SP**	**Mitigation**	**SP after mitigation**
3	**SR1, SR4, SR5, SR10**	Increased noise levels experienced in the homestead during daylight hours due to operational related activities.	4	1	3	4	32	Limited mitigation measures available. See general mitigation measures.	32
4	**SR2, SR7, SR9, SR11, SR16**	Increased noise levels experienced in the homestead during daylight hours due to operational related activities.	2	1	3	4	24	No mitigation required.	24

9. Mitigation

Mitigation measures for noise control are limited due to the nature of the physics. However various mitigation measures can be considered to be applied singly or together where noise related complaints may be experienced. There mitigation measures include but are not limited to:

- Where possible routing all access roads and haul roads at least 850m from any SR unless where additional impacts on other aspects of the receiving environment may be significantly impacted;
- Vehicle speed limitations within the mining right areas;
- Ensuring all equipment in use is maintained and equipped with the OEM's required muffler/exhaust/silencer;
- Consider the acoustic rating of equipment when selecting equipment;
- Minimise site and plant activities after hours;
- Limiting the number of activities that take place simultaneously in close proximity to SR's; and
- Maintaining a healthy consultative relationship with SR's in order to facilitate the sharing of knowledge and possible complaints as well as proposed corrective/preventative actions between parties.

9.1 Blasting Mitigation

Blasting is an integral part of hard rock mining and is therefore unavoidable. The noise character of blasting is also such that it is regularly noticeable against the background environmental noise even though the duration is short. The blasting industry has come a long way in South Africa and is a highly specialised and regulated field. For this reason the modern techniques of blasting include the following factors that not only improve safety during blasting but also reduce the impact of blasting on the acoustic landscape. These factors include but are not limited to the following:

- Minimising the volume of blast material required for an effective blast;
- Minimising the frequency of blasts;
- Correct tamping of blast holes;
- Minimising the number of blast holes for each blast thereby reducing the SPL and air blast as well as vibration associated with the blast.

10. Assumptions and knowledge gaps

The following recommendations are provided based on the assumptions and knowledge gaps:

- A healthy relationship should be developed with all land owners and occupiers that either live in or use a Sensitive Receptor location. Project liaison with such persons should include project planning and potential noise and other impacts.
- Records of the SPL recorded should be shared with the owner/occupier of the SR location/homestead in a written format.

11. References

NOISE IMPACT STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT: Development of the Der Brochen Platinum Mine near Steelpoort, Limpopo Province. M2 Environmental Connections, J9-AADB/NIA/201202-Rev 1, 2012

NOISE IMPACT ASSESSMNET REPORT for the Environmental Management Programme Report for the proposed Arthur Taylor Colliery Opencast Mining Expansion Project (ATCOM East), Witbank: Mpumalanga. 2010.

SOUTH AFRICAN STANDARD - Code of practice, SANS 10103:2008, The measurement and rating of environmental noise with respect to annoyance and to speech communication.

SOUTH AFRICAN STANDARD - Code of practice, SANS 10210:2008, Calculating and predicting traffic noise.

SOUTH AFRICAN STANDARD - Code of practice, SABS 10357: 2008, The calculation of sound propagation by the Concawe method.

SOUTH AFRICAN STANDARD - Code of practice, SABS 10328:2008, Methods for environmental noise impact assessments.

TECHNICAL ASSESSMENT REPORT in support of the EMP for the South Western Karoo Basin Gas Exploration Application Project, JH Consulting 2011. NOISE REPORT: EASTERN PRECINCT

The then DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM. NO. R. 154. Noise Control Regulations in Terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989). Govt. Gazette. No. 13717, 10 January 1992.