

NOISE BASELINE

Noise Baseline Assessment

NOISE BASELINE ASSESSMENT FOR "THE PROPOSED DEVELOPMENT OF 50MW PV SOLAR PARK AND ASSOCIATED INFRASTRUCTURE (88KV TRANSMISSION LINE) ON PORTIONS 15, 27 & 28 OF THE FARM SCHIETFONTEIN 437 JQ WITHIN MADIBENG LOCAL MUNICIPALITY, NORTH WEST PROVINCE"

Prepared for Phakanani Environmental (Pty) Ltd. for the proposed development by Zolograph Investments (RF) (Pty) Ltd.

April 2016

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- Signed by Carl Schoeman:



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EXECUTIVE SUMMARY

Environmental Assurance (Pty) Ltd (ENVASS), as independent environmental consulting company, was appointed by Phakanani Environmental (Pty) Ltd. to undertake a noise baseline assessment for the proposed development of a 50mw photovoltaic solar park and associated infrastructure (with an 88kv transmission line) on portions 15, 27 & 28 of the farm Schietfontein 437 JQ within Madibeng local municipality, North West Province, for their client, Zolograph Investments (RF) Propriety Limited.

Zolograph Investments RF (Pty) Ltd (Reg. No. 2010/009466/07) is proposing the establishment of a 50MW PV solar energy generation facility with associated infrastructure (88KV transmission line) and structures. Should construction activities occur, increased noise will be generated by the additional vehicle movement, heavy machinery and other workings associated with the construction phase. During the operational phase, increased vehicle activity and operation of the proposed facility will also lead to increased levels of noise generated. As a result, the ambient noise levels will be changed. The construction and operation of the proposed development will lead to noise generation. Noise generated can become a nuisance (or health risk) when it is not properly managed. Not only to the proposed activity, but also to the surrounding land users.

It is important to distinguish between a noise nuisance (noise “annoyance”) and noise pollution. Noise pollution occurs when applicable limits, as set by the relevant standards herein discussed, are exceeded and health risks are possible. Noise pollution occurs when no real effort is made to prevent loud noises from being emitted, no mitigating measures are taken and generally demonstrates gross negligence which may lead to legal action being taken against those who pollute - as per the “polluter pays” principle in the National Environmental Management Act (No. 107 of1998). A noise annoyance can normally be associated with “disturbing the peace”, even though no limits are exceeded or no health threats are imminent. Noise may cause stress or agitation (as demonstrated in the field of environmental psychology), therefore noise nuisances must also be assessed and insofar prevented or reduced.

The South African National Standard, SANS 10103:2008, describes nuisance sound (annoyance by generated noise) as: “... the general negative reaction of the community or person to a condition creating displeasure or interference with specific activities. Additionally the nuisance of noise can be described as sound which is perceived as very loud, disturbing or negatively affecting hearing.” A noise nuisance, however, does not equal noise pollution (as mentioned). Noise pollution is when normal anthropogenic and ecological functions (reproduction of birds or frogs), human health and/or wellbeing and any other normal function of the environment, present during baseline conditions in most natural to semi-natural areas, are inhibited or affected by newly generated noise.

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As various activities could contribute to noise generation, it is important to determine the extent of noise generated by specified activities. This can in turn lead to the management and mitigation of noise generating activities by means of implementing different measures with the aim of preventing the noise generated from becoming noise pollution.

For the proposed development, the most sensitive receptors identified for the project area are the workers on site and the surrounding land users. In the direct vicinity of the proposed development, residential properties and further away, other industrial operations are situated which may already create noise. The sensitive receptors around the area can possibly be influenced by the noise emanating from the proposed activity by causing an annoyance or pollution. The region is predominantly characterised by agricultural, industrial and various residential land users.

This assessment found that current noise generation activities exceed the limits prescribed by SANS 10103: 2008, both during the day and night-time. During day time all of these exceedances occurred along the northern border as a result of the adjacent road (R566) and in the night time, the exceedances occurred all along the site. The following is a summary of results:

Table 1: Noise measurements from the assessment

Schietfontein Noise Levels		
	Day Time Measurements	Night Time Measurements
SANS Limit:	50 dB	40 dB
Monitoring Point Data		
NM1	70.6	66.9
NM2	46.4	47.6
NM3	48.6	49.3
NM4	44.8	46.8
NM5	45.7	48.3
NM6	46.5	47.6
NM7	59.3	61.2
NM8	68.7	62.3

As baseline noise already exceed limits, care should be taken in the design and operation of the new facility/ies (if and when they are constructed) to protect all men and women who work there against possible health effects. Extra care should be taken to avoid noise to increase to an even higher threshold as is already present. These results should be used to intelligently design and plan around impacts by existing noise (constructing noise barriers, insulating buildings and/or making

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ear protection compulsory, for example). The results should also be used as a baseline against noise is continuously measured in order to prevent the activities on it from exceeding limits.

It is recommended that, once the activity is operational, an environmental noise study is conducted if a noise complaint is received to assess performance against these baseline results as well as all applicable limits. This study should measure all direct and activity specific noise and compare it against residual noise (leaving the site premises).

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GLOSSARY

A list of commonly used acronyms, terms, measurement units and definitions is included below for the purpose of ensuring uniformity in the interpretation of this report:

Acronyms	
ASTM	American Society for Testing and Materials
ENVASS	Environmental Assurance (Pty) Ltd
SANS	South African National Standards
Average period	Period of time over which the average value is determined.
Non-residential area	Means any area not classified for residential use as per local town planning scheme.
Residential area	Means any area classified for residential use in terms of the local town planning scheme.
SANS	Means the South African National Accreditation System establish by Section 3 of the Accreditation for Conformity Assessment Calibration and Good Laboratory Practices Act 19 of 2006.
Terms	
Ambient Sound Level	Consistent with the national Noise Regulations which was promulgated in terms of the Environment Conservation Act (ECA), 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 has been put into operation.

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	For the purposes of this study ambient noise will be defined as the total surrounding sound in a given position at a given time, and is usually composed of sound from a variety of emitting sources, both far (in which case it will be softer) and near.
A-weighting	The human ear is not equally sensitive to sound of all frequencies, i.e. it is less sensitive to low pitched (or 'bass') than high pitched (or 'treble') sound. In order to compensate when making sound measurements, the measured value is passed through a filter that simulates the human hearing characteristic. Internationally this is an accepted procedure when working with measurements that relate to human responses to sound/noise.
dB or dBA	The Decibel, the dB (or dBA) is not the unit of sound. The human ear is a phenomenally sensitive instrument that can detect fluctuations in air pressure over an extremely wide range of amplitudes. This makes the handling of sound quantities in absolute terms, i.e. Pascal (Pa), very cumbersome. For this reason a sound measurement is expressed as ten times the logarithm of the ratio of the sound measurement to a reference value, 20 micro (millionth) Pa. This process converts a scale of constant increases to a scale of constant ratios and considerably simplifies the handling of sound measurement quantities. The attached 'A' indicates that the sound measurement has been A-weighted.
L_{Aeq}	(The equivalent A-weighted sound pressure level). This is internationally the most often used parameter to measure noise in relation to human responses.
L_{Amax}	The maximum sound pressure level of a noise event, normally measured on an A-weighted decibel scale.
L_{Leq}	(The equivalent sound pressure level). This is in essence a time-averaged sound measurement. Sound continuously fluctuates as a function of time. In order to effectively assess the effect of sound or noise on human beings it is very often necessary to obtain a measure of the average exposure to the sound or noise.
Noise	Noise is generally defined as unwanted sound.
Noise nuisance	Noise nuisance means any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person.
Nuisance	A legal definition of a noise that offends or upsets the receiver because it is occurring at the wrong time in the wrong place or is of a character that annoys due to excessive tonal components or impulses.
Quest Technologies SoundPro	Sound Level Meter used.

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Sound	Sound is small fluctuations in air pressure (measured in N/m ² , or Pascal) that are transmitted as vibrational energy via the medium (air) from the source to the receiver. The human ear is in essence a pressure transducer, which converts these small fluctuations in air pressure into electrical signals, which the brain then interprets as sound.
Sound or Noise Level	A sound or noise level is a sound measurement that is expressed in terms of dB or dBA.

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1. INTRODUCTION

1.1 BACKGROUND

Environmental Assurance (Pty) Ltd (ENVASS), as independent environmental consultants, was appointed Phakanani Environmental (Pty) Ltd to undertake a noise baseline assessment for the proposed development of a 50 MW photovoltaic solar park and associated infrastructure (with an 88 KV transmission line) on portions 15, 27 & 28 of the Farm Schietfontein 437 JQ within the Madibeng Local Municipality, North West province, for their client, **Zolograph Investments (RF) (Pty) Ltd.**

Construction and operational activities of the proposed development, will most probably lead to the generation of noise. Generated noise can become a nuisance (or health risk) when it is not properly managed and mitigated. The noise can be a concern to the proposed development and the surrounding land users.

The South African National Standard SANS, 10103:2008, describes activities generating unwanted or nuisance sound as: “annoyance is the general negative reaction of the community or person to a condition creating displeasure or interference with specific activities. Additionally the nuisance of noise can be described as sound which is perceived as very loud, disturbing or negatively affecting hearing.” A noise nuisance, however, does not equal noise pollution. Noise pollution is when normal ecological functions (reproduction of birds or frogs), human health and/or wellbeing and any other normal function of the environment, present during baseline conditions, are inhibited or affected by newly generated noise.

As various activities can contribute to noise generation, it is important to determine the extent of noise generated by the proposed activities. This can in turn lead to the management and mitigation of noise generating activities by means of implementing different measures with the aim of preventing the noise generated from being perceived as a nuisance.

1.2 STUDY AREA

The study area is located on the proposed developments boundary. The proposed development is planned on Portions 15, 27 and 28 of the farm Schietfontein 437 JQ (see Figure 1, Locality Map) within Madibeng Local Municipality, Bojanala District North West Province, with a total extent of 183 Ha. The vegetation of the area is classified as the Marikana Thornveld and as per the site visit observation, the site is well vegetated.

The proposed project will have access from the R566 which runs adjacent to the northern boundary of the proposed site. The proposed development will aim to deliver electricity via an 88kV transmission line. The selected site was deemed appropriate for the development as the flat terrain, climate and favourable radiation conditions provide an ideal location.

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1.3 LEGISLATIVE REQUIREMENTS

Section 28(1) of the National Environmental Management Act 107 of 1998 (NEMA) places a general duty of care on any person who causes pollution, to take reasonable measures to prevent such pollution from occurring. Noise monitoring is considered to be a measure to exercise this duty of care, as the study undertaken will provide the baseline conditions of noise on the proposed site, which can then be used to determine the possible impact of the proposed development and thereby provide possible mitigation measures to prevent noise pollution.

The National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Section 34 requires:

Control of noise

(1) The Minister may prescribe essential national standards-

(a) for the control of noise, either in general or by specified machinery or activities or in specific places or areas; or

(b) for determining

(i) a definition of noise; and

(ii) the maximum levels of noise.

(2) When controlling noise the provincial and local spheres of government are bound by any prescribed national standards.

Noise should be measured in accordance with the requirements of the South African National Standard SANS 10103:2008, "The measurement and rating of environmental noise with respect to annoyance and to speech communication" and SANS 10328:2008, "Methods for environmental noise impact assessment" must also be closely adhered to.

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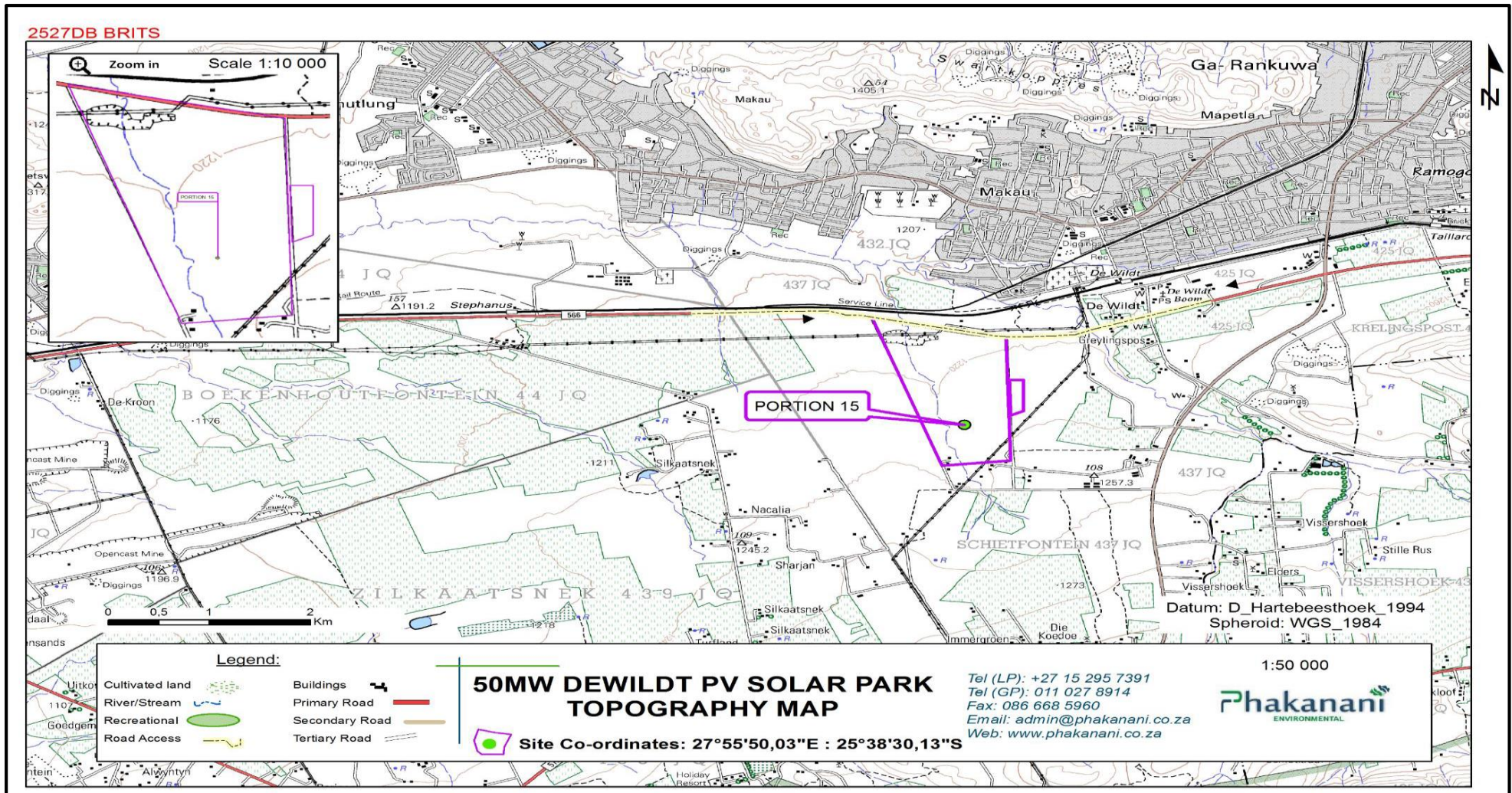


Figure 1: Regional Site Locality Map (Phakanani Environmental, 2016)

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1.4 SENSITIVE RECEPTORS

For the proposed development, the most sensitive receptors identified in the project area are the workers on site and the surrounding land users. In the direct vicinity of the site are other industrial operations which can possibly influence the noise of the proposed development. The areas identified as most sensitive is numbered 1 to 5 on Figure 2 below. These were characterised as sensitive due to the relative close proximity of these receptors to the proposed site and the existing noise generating activities in the area, encapsulating the specific receptors.

Table 2: Sensitive Receptors

Sensitive Receptor	Description
1	Area used as residence, south of the proposed development. Further south of this area, the N4 runs which is a noise generator. This area is approximately 200 meters from the proposed site.
2	Area used as residence, south of the proposed development. Further south of this area, the N4 runs which is a noise generator. This area is approximately 100 to 400 meters from the proposed site.
3	Area used as residence and agricultural land east of the proposed development. Further east of this area, the M21 runs which is a noise generator. This area is approximately 900 meters from the proposed site.
4	Area used as residence east of the proposed development. Further east of this area, the M21 runs which is a noise generator, and to the north the R566. This area is approximately 600 meters from the proposed site.
5	Area used as residence and agricultural land northeast of the proposed development. Further east of this area, the M21 runs which is a noise generator and also to the north the R566. This area is approximately 900 meters from the proposed site.

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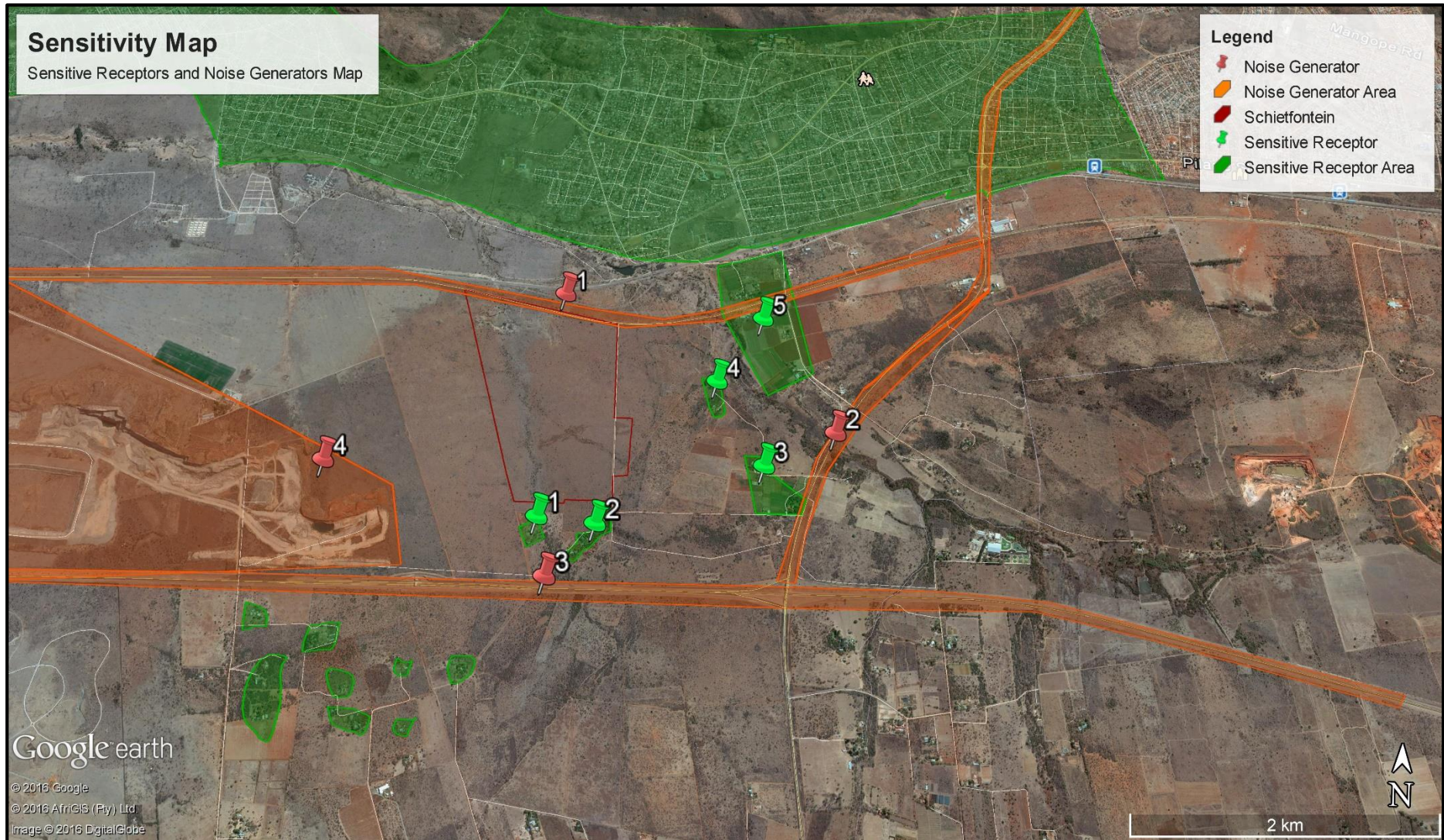


Figure 2: Sensitivity Map

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The only distinct areas that will be greatly affected by the proposed development, identified from the sensitive receptors, are the areas used as residence marked 1 to 5 on the map (Figure 2). These areas are deemed the most sensitive due to the close proximity of the proposed development. The other sensitive areas not marked with a number, indicates areas which are already affected by a certain amount of noise being generated by the areas and activities marked in orange. These are further discussed in the following section.

1.5 NOISE GENERATORS

Various actions and activities add to noise levels measured in the vicinity of the site and these can be classed as noise generators. These include, however is not limited to the following (see Figure 2, Sensitive Receptors and Noise Generators Map):

- The R566 regional road running directly adjacent and north to the site with its associated noise impact from vehicle movement;
- The N4 national road approximately 500m to the south of the proposed development;
- The M21 metropolitan road approximately 1.3 km to the east of the proposed site; and
- The Eland Platinum mine to the west of the proposed site (approximately 900 m away).

Table 3: Noise Generators

Noise Generator	Description
1	The R566 road runs adjacent the proposed site, in addition it also runs pas the sensitive receptor number 5 and 4.
2	The M21 road runs adjacent to the sensitive receptors number 5, 4 and 3.
3	The N4 highway runs to the south of the proposed site and is a noise generator to the sensitive receptors number 1 and 2 and partly 3.
4	The mine on the adjacent property is the fourth noise generator, approximately 800 – 900 m from the proposed site.
1 – 3	These three noise generators encloses the area of the sensitive receptors. Therefore these areas are deemed the most sensitive as receptors outside this area will be affected by the roads and additional noise generators.

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2. PURPOSE AND SCOPE

Assessing noise is conducted to determine baseline condition prior to commencement of developments in order to identify possible impacts and to provide mitigation measures should it be found that an impact can occur due to the proposed development. Therefore the purpose of the study is to assess the potential noise impact of the proposed development and to determine this, it is necessary to understand the existing baseline conditions of the proposed development area. It is crucial to understand the current noise environment of the study to be able to define the impact of the proposed development on both sound generated during the day and during the night.

The scope of this assessment is to:

- Determine the baseline noise levels of the proposed site;
- Determine the possible noise impact of the proposed development;
- Determine the sensitive receptors of the area;
- Determine the current noise generating activities in the area; and
- Provide mitigation measures for the proposed development.

3. METHODOLOGY

The noise assessment is compiled by studying and analysing the proposed activities and by determining the possible noise impacts these activities will have on the surrounding land users. Various data source inputs are required which includes, but is not limited to the following:

- The site layout and geographical location;
- Sensitive receptors in the area;
- Noise generating activities in the area; and
- Actual measured noise data from the proposed site.

The site layout and classification is compiled from background information and from data gathered on the site visit to the proposed development site. These assist in determining the correct zoning of the area and further to determine the sensitive receptors and noise generating activities in the area. In addition, during the site visit, appropriate locations are identified to measure the ambient noise of the proposed area.

During the site visit, the actual noise study is conducted and the conditions and characteristics of the each monitoring point is noted. The study is conducted in terms of the provisions of SANS 10103 of 2008, during a day and night time

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period and will be the baseline ambient noise criteria for the study area. A calibrated, Quest Technologies Noise Meter is used with its supplied wind shield. For the purpose of monitoring environmental noise, the Quest Technologies Sound Pro SE/DL Handheld Sound Level Meter and Real Time Frequency Analyser, which can measure both class I and class II frequencies, is used. The sound level meter is calibrated annually to ensure that correct measurements are obtained.

From the abovementioned data, the areas or activities of the activities most prone to noise generation is determined and actual noise measurements are obtained.

A report is then compiled with all available information and recommendations and mitigation measures are recommended to prevent noise from becoming pollution should the activity be approved.

4. LIMITATIONS AND ASSUMPTIONS

A baseline noise assessment was undertaken on the 14th of April 2016 during the prescribed times of SANS 10103:2008. As the assessment is based on a single day's activities, the data obtained is deemed as the average noise levels that will be generated in the general day to day continuance of the current activities in the area. This is a limitation, however all reasonable steps are taken to ensure that the study is representative of the general conditions of the proposed site.

It is assumed that the proposed development will generate a certain amount of noise due to noise generating activities associated with construction and operation of the proposed project. Furthermore that the developer will apply noise mitigation measures on the proposed project as and where required to minimise the possible impact.

Lastly it is assumed that the proposed area is classified as a Suburban District with little road traffic as per Table 2 of the SANS 10103:2008 standard and as such the specific noise level limits are used. Suburban can be classified as a district immediately outside a city or town, and therefore as the site is located just opposite an informal residential area (Tshwara, situated between Ga-Rankuwa and Brits).

5. STATEMENT OF COMPETENCE

Environmental Assurance (Pty) Ltd has a proven track record pertaining to compliance monitoring, measurements and baseline assessments. All the staff members involved in the monitoring and measurement division are formally trained ECO's with a minimum qualification of an honours degree at a tertiary institution. Each of these staff members are linked to a growth and development plan wherefrom they attend compulsory selected ECO related training sessions at selected institutions.

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Environmental Assurance (Pty) Ltd uses certified field equipment, particular with reference to indicative ambient air quality sampling and Noise measurements. To this effect, Environmental Assurance (Pty) Ltd have access to the latest field apparatus, techniques and technology. Our fleet of field vehicles are available 24 / 7 for monitoring and field work duties.

6. NOISE

6.1 NOISE GENERATION

It is important to predict and determine possible areas of noise generation as early identification can help develop mitigation or prevention plans for the specific noise generating activities.

The table below (Table 4: Categories of Community and Group Response to Noise Impacts (SANS 101013-2008)) provides an approximate response from a local community to increases in noise observed and it exceeding the acceptable noise rating in the area as determined under Table 5 (

Table 5: Acceptable Noise Limits for various areas (**SANS 101013-2008**). If a large increase is observed it can be assured that affected parties will have a similar response as stated in the table below.

Table 4: Categories of Community and Group Response to Noise Impacts (SANS 101013-2008)

Excess $DL_{Req,T}$ dB(A)	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.

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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) $DL_{Req,T}$ = 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

Table 5: Acceptable Noise Limits for various areas (SANS 101013-2008)

Type of district	Equivalent continuous rating level ($L_{Req,T}$) for noise dB(A)					
	Outdoors			Indoors, with open windows		
	Day-night $L_{R,dn1}$	Day-time $L_{Req,d2}$	Night-time $L_{Req,n2}$	Day-night $L_{R,dn1}$	Day-time $L_{Req,d2}$	Night-time $L_{Req,n2}$
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: 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

6.2 NOISE DATA

Physics determines that propagation of sound waves is faster in hot air and slower in cold air. In the day time, the air near the earth surface is hotter than the air above and therefore sound waves will be refracted to the sky. On the other side, during the night-time, the air near the surface of the earth is cooler and sound waves are refracted to the earth surface. This results in sound travelling further in the night. Therefore the night-time limit is lower and some exceedances can occur

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should activities that occur in the day time also occur in the night time. Due to the site being classified as Suburban, the limit of 50 dB applies for day time and 60 dB for night time.

Figure 3 on the overleaf provides the assessment localities and Table 6 thereafter the results from the assessment.

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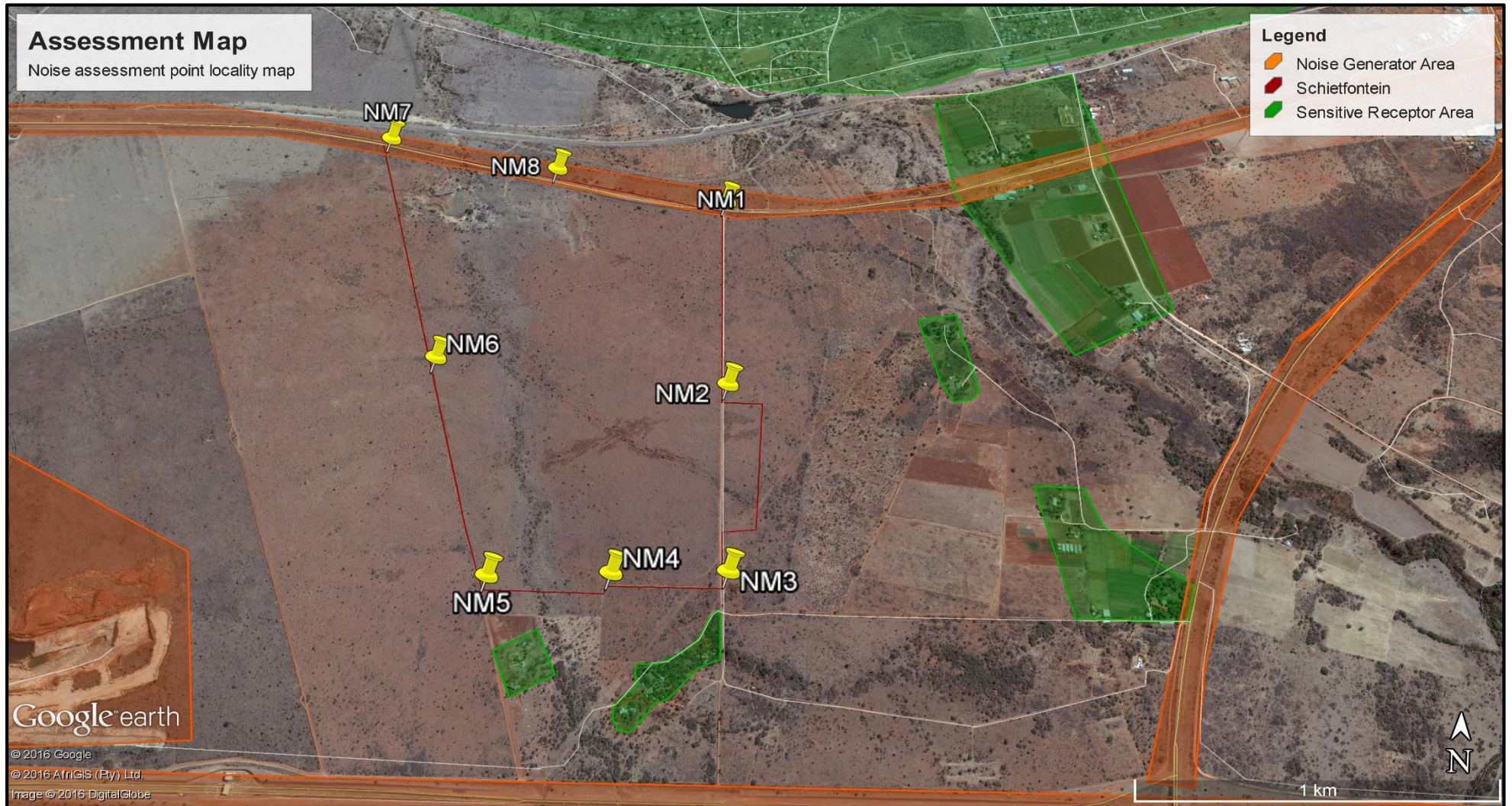


Figure 3: Assessment Map

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Table 6: Noise measurements from the proposed boundary provides details of actual noise levels monitored both during the day and night (see Figure 3: Assessment Map, for locations monitored for the study).

Table 6: Noise measurements from the proposed boundary

Schietfontein Noise Levels		
	Day Time Measurements	Night Time Measurements
SANS Limit:	50 dB	40 dB
Monitoring Point Data		
NM1	70.6	66.9
NM2	46.4	47.6
NM3	48.6	49.3
NM4	44.8	46.8
NM5	45.7	48.3
NM6	46.5	47.6
NM7	59.3	61.2
NM8	68.7	62.3

6.3 DISCUSSION

6.3.1 Assessment

Overall impression of the site: The proposed site is characterised by Marikina Thornveld of the greater area with good groundcover. The characteristics and condition of each monitoring point is described in the following table and the extraneous factors that produce noise in the vicinity of the proposed development is also included:

Table 7: Monitoring Point conditions / characteristics

Monitoring Point	Conditions / Characteristics
NM1	Site access entrance on the R566, on the north eastern boundary. Various types of vehicles utilising the road.
NM2	Site boundary to the East with very little noise generating activities. Low ambient noise levels, typical to the Thornveld.
NM3	Site boundary to the southeast with very little noise generating activities. Low ambient noise levels, typical to the Thornveld. This point is the closest to a sensitive receptor.

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NM4	Southern site boundary with very little noise generating activities. Low ambient noise levels, typical to the Thornveld. This point is also situated close to a sensitive receptor.
NM5	South-western site boundary with very little noise generating activities. Low ambient noise levels, typical to the Thornveld. This point is also situated close to a sensitive receptor.
NM6	Site boundary to the West with very little noise generating activities. Low ambient noise levels, typical to the Thornveld.
NM7	North-western site boundary, directly adjacent to the R566. Various vehicles moving past this point. Ambient noise levels much higher due to the vehicle movement.
NM8	The northern site boundary, directly adjacent to the R566. Various vehicles moving past this point. Ambient noise levels much higher due to the vehicle movement.

From Table 6: Noise measurements from the proposed boundary, the actual noise measurements are provided which were obtained from the noise assessment programme are discussed as follow:

During the day time assessment, three exceedances of the limit occurred, at NM1, NM7 and NM8. The noise measured exceeded the limit of 70 dB with a value of 59.3 up to 70.6 dB. The remaining monitoring points indicated lower ambient noise in the range of 44.8 dB up to 48.6 dB. The point exceeding the limit is situated along the R566 and are more than likely to exceed the limit continually with different vehicles travelling on the road.

During the night time assessment, exceedances occurred at all of the eight monitoring points. The greatest of these occurred at NM1, NM7 and NM8, which is again the monitoring points directly adjacent to the R566 road. The remainder of monitoring points indicated lower ambient noise levels very similar to those measured during the day time with minor increases.

6.3.2 Impact of proposed development

As can be reasonably expected, the proposed activities will give rise to a certain amount of noise generated, possibly exceeding the set limits. However the zoning of the area should be changed to Industrial. The sensitive receptors identified could possibly be affected by the proposed development, especially those identified as the most sensitive receptors (1 to 5 on Figure 2: Sensitivity Map). The impact however should be the highest during the construction phase due to various equipment installation and industrial equipment use and less so during the operational phase where construction is ceased.

It is expected that the noise generating activities during construction will have at least the following noise generating activities / operations as part of the construction phase:

Table 8: Typical noise levels from construction equipment (AS 2436, 2010)

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Activity description	Sound power level at source (dB)
Air Compressor (power tools)	101
Backhoe	104
Bulldozer	108
Compactor	113
Concrete Pump	108
Concrete Saw	117
Concrete Truck	109
Dump Trucks	117
Excavator	107
Front End Loader	113
Generators	99
Grader	110
Mobile Crane	104
Piling (bored)	111
Pneumatic hand tools	116
Vibratory Roller	108
Water Cart	107
Combined equipment (10 most noisy)	123.5

These typical activities associated with construction activities often generate noise and will be perceived as an annoyance, however these will be limited to the construction phase and very limited to maintenance during the operational phase.

The general noise measured from a PV plant, measured at 10 m is 60 dB reducing with distance away from the site. This is approximately equal to the noise generated by a large air conditioner. In addition, when the sun is not shining, no power can be generated, further reducing the noise that can be expected during the evening ("Solar PV inverter decibel levels: Do solar farms make noise? - Solar Choice", 2016).

From studies conducted ("Inverter Noise Emissions from a solar PV application", 2016) on existing PV installations, specifically the inverter as the main noise generator, at a distance of approximately 15 m away from the source, the noise measured was at around 65 dB. At 65 m, the noise measured was 52 dB and at approximately 110 m away from the source, the noise was measured at 47 dB. From Table 4: Categories of Community and Group Response to Noise Impacts (SANS 101013-2008), an increase in observable noise will warrant a negative response from the community, however as per the statement made, should not be an issue due to the distance of the receivers away from the proposed development.

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Therefore the noise expected from the general operation of the activity is expected to be acceptable and the noise in line with the ambient noise of the proposed site.

Due to the noise levels expected from the mainly the construction phase activities, the following section provides mitigation measures to prevent and minimise noise exceedances of the proposed activity.

6.4 MITIGATION MEASURES

In order to minimise the possible effect of noise the following general mitigation measures can be implemented for both the construction and operational phases of the proposed project:

General:

- Regular monitoring of noise generating activities should occur. This will serve as the core of noise mitigation as it will enable the determination of problem areas. If deemed necessary, the points indicating exceedances in the current study could be re-measured.
- Personal Protective Equipment to all persons working in areas where high levels of noise can be expected.
- Major noise generating activities can be restricted to between 06h00 and 18h00 on Monday to Friday, and 06h00-13h00 on Saturdays and Sundays.
- Placement of noise generating activities can be planned as far away as possible from affected areas and/or persons.
- Installation of acoustic enclosures for equipment to stop noise at the source.
- Ensure that all staff on the proposed activity is provided with “noise sensitivity” training to ensure noise generation is limited.
- The efficiency of noise mitigation measures should be assessed on a regular basis.
- No amplified music should be allowed on the site.
- Good public relations are essential. The information provided to stakeholders should be factual and not set unrealistic expectations.
- A clear line of communication should be in place where complaints can be lodged and response can be provided on.
- A clear commitment should be made on accommodating the local communities in preventing noise as far as possible. and
- Should any complaints regarding noise be received from the adjacent community / staff, a baseline noise assessment and subsequent noise monitoring should be conducted.

Vehicle and vehicle movement:

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- Limit vehicle movement to daylight hours.
- All vehicles to be fitted with low noise and frequency hooters.
- Ensure that vehicles are fitted with noise reduction measured such as mufflers, etc.
- Ensure that vehicles on the site are serviced on a regular basis to ensure that noise suppression mechanisms are effective.
- Regular inspections and maintenance of equipment, vehicles and machinery to prevent unnecessary noise. and
- All vehicles should be switched off when not in use.

Construction activities:

- A noise prevention barrier should be erected in areas where noise can travel to sensitive receptors. This barrier should be placed as close to the noise generating activity as possible.
- All construction equipment and machinery should be serviced on a regular basis.
- All construction equipment and machinery should be fitted with noise reduction technology to prevent noise generation as far as possible.
- All construction activities should be limited to daylight hours alone. Generally work should not be allowed on Sundays and Public Holidays.
- All noise generating activities/installations should be planned and placed as far away from sensitive receptors as possible.
- Should this not be possible, noise barriers should be installed at various positions around these noise generators.
- All equipment should be switched off when not in use.
- No workers should be allowed to stay on the site.
- Site workers must comply with the Provincial Noise Regulations.
- Appropriate directional and intensity settings are to be maintained on all hooters and sirens. and
- Excessively noisy machinery must only be used during regular operating hours and not after hours where possible.

6.4.1 NOISE MONITORING PROGRAMME

It is recommended that a measure, such as a complaints register, be available on site where complaints can be made. It is not expected that noise will be generated to such an extent that it will be a nuisance by the general operation of the proposed development, however in the event of complaints are being received, the need will arise for a noise monitoring programme. Therefore the following methodology will provide the sampling methodology for the programme in order to determine the noise generating activities on site which should be mitigated.

For example (as per SANS 10103):

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“Measuring points that are representative of the noise climate should be selected. At each measuring point, the microphone should be placed at a height of between 1,2 m and 1,5 m for general investigations, and, if practicable, at least 3,5 m away from walls, buildings and other large flat vertical surfaces.

Noise sampling is undertaken in accordance with the requirements of the South African National Standard SANS 10103:2008, “The measurement and rating of environmental noise with respect to annoyance and to speech communication”. SANS 10328:2008, “Methods for environmental noise impact assessment” must also be closely adhered to. For the purpose of the noise study, a Quest Technologies Sound Pro SE/DL Handheld Sound Level Meter and Real Time Frequency Analyser, which can measure both class I and class II frequencies, is used.

To establish ambient noise levels on the mine areas, the equivalent noise level (LAeq), the maximum sound pressure level (LAm_{ax}) and the minimum sound pressure level (LA_{min}) will be recorded during 10 minute running average per sampling location. The meter is set up at each of the sampling locations, with the microphone height of between 1.2 and 1.5 meters above the ground level and well clear of any reflecting surfaces (minimum of 3.5 meters clearance). Should there be wind present during sampling, it is necessary to cover the microphone with the standard wind shield.

A day time (06:00 – 22:00), night time (22:00 – 06:00) comparative study will be conducted where sampling will be done first during the day and then again during the night”

7. CONCLUSION

The report indicates that the baseline conditions for the site which is limited to excessive noise generation to the north of the proposed site in accordance with the road and vehicle movement on the R566 road. The ambient noise levels of the proposed site is currently low and the construction activities will have an impact on the current ambient noise level. However with mitigation measures implanted during the construction phase, the impact can be limited. During the operational phase of the proposed project, the noise impact is expected to be low as per previous studies conducted and will be in line with current ambient noise levels.

The various noise generators and sensitive receptors must be considered when the activity authorisation is considered. Should the proposed activity be approved, the mitigation measures provided in the report should serve as a guideline for the prevention and mitigation of noise activities and should be implemented accordingly. Furthermore, should complaints be received, the proposed methodology (Section 6.4.1) in this report should be followed to assess the noise generating activities of the development.

8. BIBLIOGRAPHY

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