

Environmental Resources Management Southern Africa (Pty) Ltd
for ArcelorMittal International SA (Pty) Ltd

ENVIRONMENTAL NOISE IMPACT ASSESSMENT

**Development of the Gas-Fired Independent Power Plant,
Saldanha, Western Cape Province**



Study done for:



Prepared by:



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EXECUTIVE SUMMARY

INTRODUCTION AND PURPOSE

Enviro-Acoustic Research CC was contracted to conduct an Environmental Noise Impact Assessment (ENIA) to determine the potential noise impact on the surrounding environment due to the development of Independent Gas-Fired Power Plant near Saldanha, Western Cape Province.

This report describes the existing Rating Levels as well as the potential noise impact that the operation may have on the surrounding sound environment, highlighting the methods used, potential issues identified, findings and recommendations. The Terms of Reference (TOR) for this study is in the National/International guidelines and regulations: the latest Environmental Impact Assessment guidelines, the SANS 10103:2008, SANS 10328, SANS 10357, Noise Control Regulation PN 200 of 2013 and the IFC: General EHS Guidelines (Equator Principal).

PROJECT DESCRIPTION

The International Power Consortium South Africa (IPCSA), have developed a solution to **Saldanha Steel's requirement for stable, economical electricity over the long term.** This solution consists of a 1507 MW Combined Cycle Gas Turbine (CCGT) power plant to be erected **adjacent to the ArcelorMittal's Saldanha Steel site.**

The project will supply the power needs of ArcelorMittal's Saldanha Steel plant (± 160 MW of base load energy, peaking up to 250 MW) and excess electricity will be made available to industries within the Saldanha Industrial Development Zone (IDZ) and/or Municipalities within the Western Cape Province. The project will be developed in two phases.

The project will be developed in two phases, with the development of six Siemens Trent60 50 MW nominal gas turbines in open cycle (labelled T1 through to T6 – one turbine will be a redundant unit to ensure uninterrupted power supply) developed in phase one with three Siemens SGT5-4000F 435 MW nominal combined cycle plants, labelled Unit 1, Unit 2 and Unit 3 (erected on three self-contained power 'islands') developed during the second phase.

NEED AND DESIRABILITY OF PROJECT

Due to economic and environmental advantages, power generation does provide valuable employment and business opportunities. It must be noted when such projects are close to potential noise-sensitive receptors, consideration must be given to ensuring a compatible co-existence.

This does not suggest that the sound from the facility should not be audible under all circumstances as this is an unrealistic expectation that is not required or expected from any other agricultural, commercial, industrial or transportation related noise source, but rather that the sound due to the power generation activities should be at a reasonable level in relation to the ambient sound levels.

BASELINE ASSESSMENT

Ambient sound levels were measured at one location for a two night-time period during May 2016 using a class-1 Sound Level Meter. The sound level meters would measure **“average” sound levels over a 10 minutes period, save the data and start with a new 10 minute measurement** till the instrument was stopped. This data was also augmented with additional measurements at three locations during the day and night.

Longer term measurements indicated a location with a complex sound character, where the cumulative combination of natural (ocean and wind) and anthropogenic (sounds from the house, road traffic and Saldanha Steel) sounds resulted in an elevated ambient sound level more typical of an urban area.

Short term measurements indicated ambient sound levels typical of an urban noise district (with main roads, business and workshops) closer to the project site. Daytime ambient sound levels are higher, mainly due to road traffic, although wind-induced noises also contributed to the ambient sound levels. Short term measurements away from roads, business and residential dwellings indicate an area with the potential to be very quiet.

NOISE IMPACT DETERMINATION

A SANS 10103:2008 rating typical of an urban noise district (at the closest receptors) was assigned due to the character of the area. Therefore, the criteria used to evaluate the potential of a noise impact included:

- The projected noise rating levels when compared to the SANS 10103: 2008 rating level of 45 dBA (52 dBA for a disturbing noise);
- The potential change in ambient sound levels, with a change less than 3 dB ideal.

The projected noise rating levels were calculated using a sound propagation model. A conceptual scenario was developed for the construction phase with two scenarios considered during the operational phase. The output of the modelling exercise indicated that there is negligible risk of a noise impact for both phases. This would be even less for the decommissioning phase.

FINDINGS

While the maximum projected noise rating level could be as high as 36 dBA (at NSD02) during peak operation once fully commissioned, this is significantly less than the night-time ambient sound level and the potential noise impact is considered insignificant. The change in ambient sound levels is expected to be significantly less than 3 dBA at all the surrounding noise-sensitive receptors.

MITIGATION

Mitigation is not required due to the low significance of a noise impact, neither is a routine noise measurement programme recommended. Measurement locations, frequencies and procedures are provided as a guideline for the developer to consider should there be a noise complaint if people in the future settle closer than 2,000m from the plant (unlikely as the land belongs to ArcelorMittal).

RECOMMENDATIONS

The increases in noise levels are of negligible significance. It is therefore the recommendation that the project should be authorized (from a noise impact perspective) with no additional mitigation conditions.

CONTENTS OF THE SPECIALIST REPORT – CHECKLIST

Contents of this report in terms of Regulation GNR 982 of 2014, Appendix 6	Cross-reference in this report
(a) details of— the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 14
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	See below
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.3
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 1.6
(f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Sections 3.1
(g) an identification of any areas to be avoided, including buffers;	Not relevant and required.
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Buffers not required.
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 6
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Sections 8 and 13
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	No comments received (Section 1.5)
(p) any other information requested by the competent authority.	The DEA had the following comment in the approval of the Scoping Report: <i>'A compliance and road map on provincial and national regulations on dust and noise'.</i>

Contents of this report in terms of Regulation GNR 982 of 2014, Appendix 3 - Environmental Impact Assessment Process	Cross-reference in this report
Describe any policies or legislation relevant to your field that the applicant will need to comply with.	Sections 2.2.1 and 2.2.2
Comment on need/desirability of the proposal in terms your field and in terms of the proposal's location.	Section 9.2
Determine the-- (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and (ii) degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated;	Sections 8
Determine what the most ideal location within the site for the activity is in terms of your field.	Entire site suitable from a noise perspective
Identify suitable measures to avoid, manage or mitigate identified impacts.	Negligible significance of noise impact, no mitigation required
Identify residual risks that need to be managed and monitored.	There will be no residual risks after closure.
Include a concluding statement indicating a preferred alternative in terms of your field.	In terms of acoustics there is no preference for alternatives in terms of site or technology as discussed in the Scoping Report for this Project.

This report should be cited as:

De Jager, M. (2016): "*Environmental Noise Impact Assessment: Development of a Gas-Fired Independent Power Plant near Saldanha, Western Cape Province*". Enviro-Acoustic Research CC, Pretoria

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September 2016

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environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

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File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

--

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I, **Morné de Jager**, declare that –

General declaration

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.



Signature of the specialist:

Enviro-Acoustic Research cc

Name of company (if applicable):

8 September 2016

Date:

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GLOSSARY OF ABBREVIATIONS

AADT	Annual Average Daily Traffic
AZSL	Acceptable Zone Sound Level (Rating Level)
DoE	Department of Energy
EARES	Enviro Acoustic Research cc
ECA	Environment Conservation Act (Act 78 of 1989)
EMP	Environmental Management Plan
FEL	Front End Loader
HRSG	Heat recovery steam generation
i.e.	that is
IFC	International Finance Corporation
IPP	Independent Power Producer
km	kilometres
m	Meters (measurement of distance)
m ²	Square meter
m ³	Cubic meter
mamsl	Meters above mean sea level
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NCR	Noise Control Regulations (under Section 25 of the ECA)
SABS	South African Bureau of Standards
SANS	South African National Standards
TLB	Tip Load Bucket
WHO	World Health Organisation

1 INTRODUCTION

1.1 INTRODUCTION AND PURPOSE

Enviro-Acoustic Research (EARES) cc was appointed to undertake a specialist study to determine the potential noise impact on the surrounding environment due to the proposed development of a Gas-Fired Independent Power Plant by ArcelorMittal International SA near Saldanha, Western Cape Province (see **Figure 1-1**).

This report describes the existing Rating Levels as well as the potential noise impact that the operation may have on the surrounding sound environment, highlighting the methods used, potential issues identified, findings and recommendations. The Terms of Reference (TOR) for this study is in the National/International guidelines and regulations: the latest Environmental Impact Assessment guidelines, the SANS 10103:2008, SANS 10328, SANS 10357, Noise Control Regulation PN 200 of 2013 and the IFC: General EHS Guidelines (Equator Principal).

1.2 BRIEF PROJECT DESCRIPTION

The International Power Consortium South Africa (IPCSA), have developed a solution to **Saldanha Steel's requirement for stable, economical electricity over the long term**. This solution consists of a 1507 MW Combined Cycle Gas Turbine (CCGT) power plant to be **erected adjacent to the ArcelorMittal's Saldanha Steel site**.

The project will supply the power needs of ArcelorMittal's Saldanha Steel plant (± 160 MW of base load energy, peaking up to 250 MW) and excess electricity will be made available to industries within the Saldanha Industrial Development Zone (IDZ) and/or Municipalities within the Western Cape Province. The project will be developed in two phases.

Phase 1 will include six Siemens Trent60 50 MW nominal gas turbines in open cycle (labelled T1 through to T6 – with one turbine as backup) with phase 2 including three Siemens SGT5-4000F 435 MW nominal combined cycle plants, labelled Unit 1, Unit 2 and Unit 3 respectively that will be erected on three self-contained **power 'islands'** each approximately 150m long x 60m wide.

Phase 1 of the project will be constructed over approximately 15 – 18 months and constitute the following components:

- Site entrance with truck staging areas, hard standing areas;
- Offices and control room;
- Warehouse areas and workshops;
- Installation of six open cycle Siemens Industrial Trent 60 gas turbines (T1, T2, T3, T4, T5 and T6), one of which will be a redundant unit to ensure uninterrupted supply;
- Associated step-up transformers for every generating unit;
- 132KV and 400 kV switchyard;
- Site drainage;
- Gas receiving, conditioning and forwarding;
- Waste-Water treatment and water reclamation plant; and
- Storm water collection reservoir (25,000 m³) and water treatment plant.

Phase 2 of the project will take 18 – 20 months and will include the following additional components:

- Installation of complete UNIT 1, UNIT 2 and UNIT 3 open cycle Siemens SCC5-4000F gas turbine (total approx. 1,305 MW nominal (Installed Gross capacity) combined cycle plants);
- Associated step-up transformers, and station switchyard.

1.3 STUDY AREA

The study area is described in terms of environmental components that may contribute or change the sound character in the area.

1.3.1 Location

The proposed facility is situated in the West Coast District municipal area (Saldanha Bay Local Municipality) in the Western Cape Province. The town of Saldanha is around 10km west with Vredenburg located 10km north-west from the proposed project.

1.3.2 Climatic Conditions

Saldanha falls within the Mediterranean climate zone which is characterised by warm, dry summers and cold, wet winters. The rainfall in the project area occurs most primarily between the months of April and September, with precipitation intensity highest in the months of June and July. The area generally receives little rainfall (between 250 and 350mm per year) with most of this rainfall during the winter months, giving it a Mediterranean climate. The prevailing winds in the area are predominantly from the south.

1.3.3 Topography

The landscape can be described at moderately undulating plains. There are no topographical features that can break the line of sight to the project and will assist in minimizing the propagation of noise from the project.

1.3.4 Surrounding Land Use

The power plant will be developed around 5km from the Saldanha Industrial Development Zone (IDZ), but **ArcelorMittal's** Saldanha plant is located just west of the proposed project. There is a large railway siding to the north and Saldanha Bay Oil Storage Centre to the south. The land use to the east is mainly wilderness (dryland grazing).

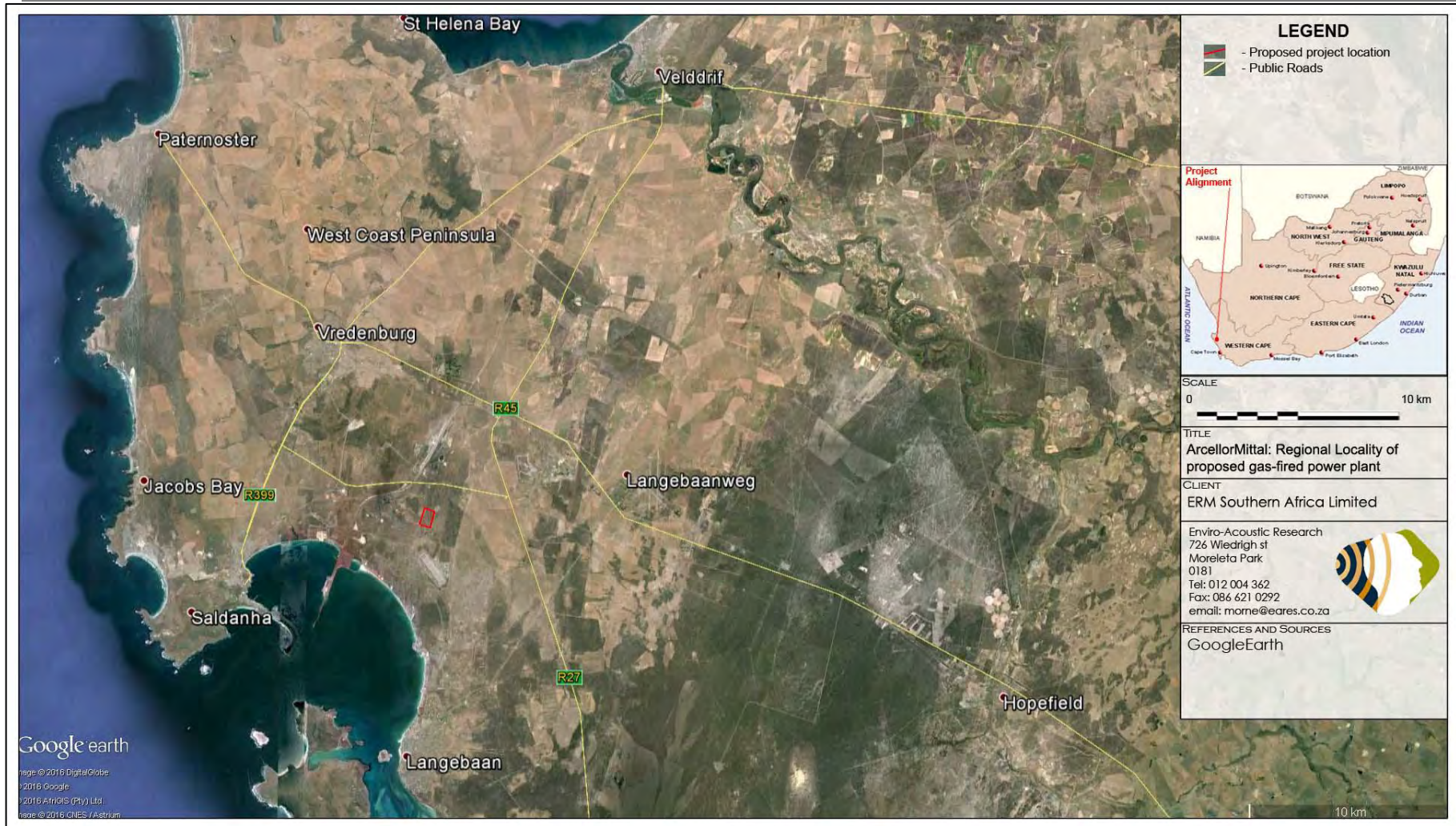


Figure 1-1: Locality map indicating proposed project location

1.3.5 Roads and Rail lines

The S3253 is located south of the project site, the S3240 to the north with the Saldanha Export Terminal rail line passing the site to the west.

1.3.6 Residential areas

Excluding farmsteads (generally comprising of one main dwelling with a number of houses in the vicinity used by the farm workers), there are no formal residential areas within 5,000m.

1.3.7 Other Industrial Activities

ArcelorMittal's Saldanha Plant is located directly to the west with the Salkor railway siding to the north. Both operations are active 24 hours per day.

1.3.8 Ground conditions and vegetation

The surrounding area falls within the "Fynbos" biome, with the vegetation type being typical of the Cape Floristic Region. The site and surrounding area has been largely disturbed, heavily grazed and trampled. While disturbed, the surface area is generally well covered by vegetation.

Taking into consideration available information it is the opinion of the author that the ground conditions (when considering acoustic propagation on a ground surface) can be classified as medium, which implies that it will have a moderately acoustical absorbency. It should be noted that this factor is only relevant for air-borne waves being reflected from the ground surface, with certain frequencies slightly absorbed by the vegetation.

1.3.9 Residential Areas

There are no formal residential areas within 5,000m from the proposed project.

1.3.10 Other Potential Interested and Affected Parties in terms of Acoustics

The area is sparsely populated in the vicinity of the industrial zone. The closest noise-sensitive receptors are further than 2,000m from the proposed project. Also refer to **Figure 1-2**.

1.3.11 Ambient sound levels and available information

Existing ambient sound levels are discussed in **Section 3.2**. Generally, as typical with coastal areas, ambient sound levels are impacted by surf action.

1.4 POTENTIAL NOISE-SENSITIVE RECEPTORS (DEVELOPMENTS) AND NO-GO AREAS

An assessment of the area was done using available topographical maps to identify potential Noise-sensitive developments (NSD) in the area. The data was imported into GoogleEarth® to allow a more visual view of the areas where Noise-sensitive developments were identified. Noise-sensitive developments and other potential Interested and Affected Parties identified are highlighted in **Figure 1-2**. It should be noted that NSD01 is an unused building, confirmed by NSD02 that it will not to be used in the future for residential purposes.

1.5 COMMENTS REGARDS TO NOISE RECEIVED DURING THIS PROJECT

No specific comments are registered at the time this report was compiled, noise was mentioned in passing in a comment by DEA on the original scoping report for the project.

1.6 TERMS OF REFERENCE

A noise impact assessment must be completed for the following reasons:

- It is a controlled activity in terms of the NEMA regulations and a ENIA is required, because:
 - It may cause a disturbing noise that is prohibited in terms of section 18(1) of the Government Notice 579 of 2010
- It is generally required by the local or district authority as part of the environmental authorization or planning approval in terms of Regulation 2(d) of GN R154 of 1992 (Regulation 4(1) in terms of PN.200 of 2013 – Western Cape).

In addition, Appendix 6 of GN 982 of December 2014 (Gov. Gaz. 38282), issued in terms of the National Environmental Management Act, No. 107 of 1998 also defines minimum information requirements for specialist reports.

The document (in South Africa) that addresses the issues specifically concerning environmental noise is SANS 10103:2008. It has recently been thoroughly revised and brought in line with the guidelines of the World Health Organisation (WHO). It provides the maximum average ambient noise levels during the day and night to which different types of developments indoors may be exposed.

In addition, SANS 10328:2008 does specify the methodology to assess the potential noise impacts on the environment due to a proposed activity that might impact on the environment.

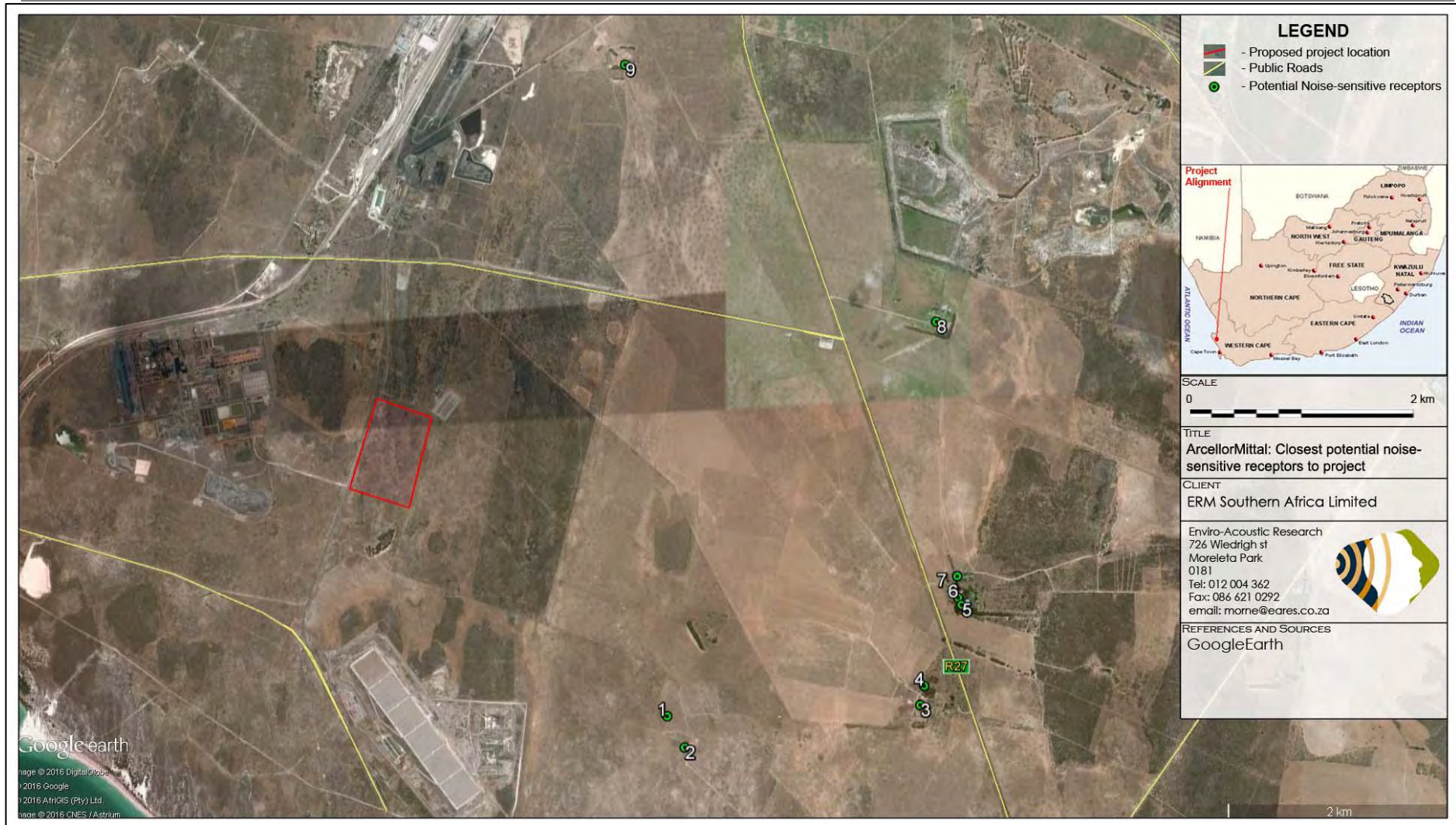


Figure 1-2: Aerial image indicating potentially noise-sensitive receptors close to proposed development

This standard also stipulates the minimum requirements to be investigated for Scoping purposes. These minimum requirements are:

- a) The purpose of the investigation;
- b) A brief description of the planned development or the changes that are being considered;
- c) A brief description of the existing environment;
- d) The identification of the noise sources that may affect the particular development, together with their respective estimated sound pressure levels or sound power levels (or both);
- e) The identified noise sources that were not taken into account and the reasons why they were not investigated;
- f) The identified noise-sensitive developments and the estimated impact on them;
- g) Any assumptions made with regard to the estimated values used;
- h) An explanation, either by a brief description or by reference, of the methods that were used to estimate the existing and predicted rating levels;
- i) The location of the measurement or calculation points, i.e. a description, sketch or map;
- j) Estimation of the environmental noise impact;
- k) Alternatives that were considered and the results of those that were investigated;
- l) A list of all the interested or affected parties that offered any comments with respect to the environmental noise impact investigation;
- m) A detailed summary of all the comments received from interested or affected parties as well as the procedures and discussions followed to deal with them;
- n) Conclusions that were reached;
- o) Recommendations, i.e. if there could be a significant impact, or if more information is needed, a recommendation that an environmental noise impact assessment be conducted; and
- p) If remedial measures will provide an acceptable solution, which would prevent a significant impact, these remedial measures should be outlined in detail and included in the final record of decision if the approval is obtained from the relevant authority. If the remedial measures deteriorate after a certain time and a follow-up auditing or maintenance programme (or both) is instituted, this programme should be included in the final recommendations and accepted in the record of decision if the approval is obtained from the relevant authority.

2 LEGAL CONTEXT, POLICIES AND GUIDELINES

2.1 THE REPUBLIC OF SOUTH AFRICA CONSTITUTION ACT ("THE CONSTITUTION")

The environmental rights contained in section 24 of the Constitution provide that everyone is entitled to an environment that is not harmful to his or her well-being. In the context of noise, this requires a determination of what level of noise is harmful to well-being. The general approach of the common law is to define an acceptable level of noise as that which the reasonable person can be expected to tolerate under the particular circumstances. The subjectivity of this approach can be problematic, which has led to the development of noise standards (see **Section 2.5**).

"Noise pollution" is specifically included in Part B of Schedule 5 of the Constitution, which means that noise pollution control is a local authority competence, provided that the local authority concerned has the capacity to carry out this function.

2.2 THE ENVIRONMENT CONSERVATION ACT (ACT 73 OF 1989)

The Environment Conservation Act ("ECA") allows the Minister of Environmental Affairs and Tourism ("now the Ministry of Water and Environmental Affairs") to make regulations regarding noise, among other concerns. See also **section 2.2.1**.

2.2.1 Noise Control Regulations (GN R154 of 1992)

In terms of section 25 of the ECA, the national Noise Control Regulations (GN R154 in *Government Gazette* No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.

Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996 legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. Provincial Noise Control Regulations exist in the Free State, Gauteng and Western Cape provinces.

The National Noise Control Regulations (GN R154 1992) defines:

"disturbing noise" as:

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.

In addition:

In terms of Regulation 2 -

"A local authority may –

(c): if a noise emanating from a building, premises, vehicle, recreational vehicle or street is a disturbing noise or noise nuisance, or may in the opinion of the local authority concerned be a disturbing noise or noise nuisance, instruct in writing the person causing such noise or who is responsible therefor, or the owner or occupant of such building or premises from which or from where such noise emanates or may emanate, or all such persons, to discontinue or cause to be discontinued such noise, or to take steps to lower the level of the noise to a level conforming to the requirements of these Regulations within the period stipulated in the instruction: Provided that the provisions of this paragraph shall not apply in respect of a disturbing noise or noise nuisance caused by rail vehicles or aircraft which are not used as recreational vehicles;

(d): before changes are made to existing facilities or existing uses of land or buildings, or before new buildings are erected, in writing require that noise impact assessments or tests are conducted to the satisfaction of that local authority by the owner, developer, tenant or occupant of the facilities, land or buildings or that, for the purposes of regulation 3(b) or (c), reports or certificates in relation to the noise impact to the satisfaction of that local authority are submitted by the owner, developer, tenant or occupant to the local authority on written demand";

In terms of Regulation 4 of the Noise Control Regulations:

"No person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof".

2.2.2 Western Cape Provincial Noise Control Regulations: PN 200 of 2013

The control of noise in the Western Cape is legislated in the form of the Noise Control Regulations in terms of Section 25 the Environment Conservation Act No. 73 of 1989, applicable to the Province of the Western Cape as Provincial Notice 200 of 20 June 2013.

The regulations define:

"ambient noise" means the all-encompassing sound in a given situation at a given time, measured as the reading on an integrated impulse sound level meter for a total period of at least 10 minutes".

"disturbing noise" means a noise, excluding the unamplified human voice, which—

- (a) exceeds the rating level by 7 dBA;
- (b) exceeds the residual noise level where the residual noise level is higher than the rating level;
- (c) exceeds the residual noise level by 3 dBA where the residual noise level is lower than the rating level; or
- (d) in the case of a low-frequency noise, exceeds the level specified in Annex B of SANS 10103;

“noise sensitive activity” means any activity that could be negatively impacted by noise, including residential, healthcare, educational or religious activities;

“low-frequency noise” means sound which contains sound energy at frequencies predominantly below 100 Hz;

“rating level” means the applicable outdoor equivalent continuous rating level indicated in Table 2 of SANS 10103;

“residual noise” means the all-encompassing sound in a given situation at a given time, measured as the reading on an integrated impulse sound level meter for a total period of at least 10 minutes, excluding noise alleged to be causing a noise nuisance or disturbing noise;

“sound level” means the equivalent continuous rating level as defined in SANS 10103, taking into account impulse, tone and night-time corrections;

These Regulations prohibits anyone for causing a disturbing noise (Clause 2) and uses the $L_{Aeq, impulse}$ descriptor to define ambient sound and noise levels.

Also, in terms of regulation 4:

(1) The local authority, or any other authority responsible for considering an application for a building plan approval, business licence approval, planning approval or environmental authorisation, may instruct the applicant to conduct and submit, as part of the application—

- (a) a noise impact assessment in accordance with SANS 10328:2008 to establish whether the noise impact rating of the proposed land use or activity exceeds the appropriate rating level for a particular district as indicated in SANS 10103; or

- (b) where the noise level measurements cannot be determined, an assessment, to the satisfaction of the local authority, of the noise level of the proposed land use or activity.
- (2) (a) A person may not construct, erect, upgrade, change the use of or expand any building that will house a noise-sensitive activity in a predominantly commercial or industrial area, unless he or she insulates the building sufficiently against external noise so that the sound levels inside the building will not exceed the appropriate maximum rating levels for indoor ambient noise specified in SANS 10103.
- (b) The owner of a building referred to in paragraph (a) must inform prospective tenants or buyers in writing of the extent to which the insulation measures contemplated in that paragraph will mitigate noise impact during the normal use of the building.
- (c) Paragraph (a) does not apply when the use of the building is not changed.
- (3) Where the results of an assessment undertaken in terms of subregulation (1) indicate that the applicable noise rating levels referred to in that subregulation will likely be exceeded, or will not be exceeded but will likely exceed the existing residual noise levels by 5 dBA or more—
- (a) the applicant must provide a noise management plan, clearly specifying appropriate mitigation measures to the satisfaction of the local authority, before the application is decided; and
- (b) implementation of those mitigation measures may be imposed as a condition of approval of the application.
- (4) Where an applicant has not implemented the noise management plan as contemplated in sub-regulation (3), the local authority may instruct the applicant in writing to—
- (a) cease any activity that does not comply with that plan; or
- (b) reduce the noise levels to an acceptable level to the satisfaction of the local authority.

2.3 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

The National Environmental Management Act ("NEMA") defines "pollution" to include any change in the environment, including noise. A duty therefore arises under section 28 of NEMA to take reasonable measures while establishing and operating any facility to prevent noise pollution occurring. NEMA sets out measures which may be regarded as reasonable. They include the following measures:

1. to investigate, assess and evaluate the impact on the environment;

2. to inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment;
3. to cease, modify or control any act, activity or process causing the pollution or degradation;
4. to contain or prevent the movement of the pollution or degradation;
5. to eliminate any source of the pollution or degradation; and
6. to remedy the effects of the pollution or degradation.

In addition, Appendix 6 of GN 982 of December 2014 (Gov. Gaz. 38282), issued in terms of this Act, have general requirements for EAPs and specialists. It also defines minimum information requirements for specialist reports.

2.3.1 Appendix 6 of GN 982 of December 2014 (Gov. Gaz. 38282)

These regulations define the required information to compile a specialist report. Chapter 4, Part 2 highlights this in section (8) *"A specialist report must contain all information set out in Appendix 6 to these Regulations"*. These requirements are further defined as:

Appendix 6

"Specialist reports"

1. (1) A specialist report prepared in terms of these Regulations must contain-
 - (a) details of-
 - (i) the specialist who prepared the report; and
 - (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;
 - (b) a declaration that the specialist is independent in a form as may be specified by the competent authority;
 - (c) an indication of the scope of, and the purpose for which, the report was prepared;
 - (d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;
 - (e) a description of the methodology adopted in preparing the report or carrying out them specialised process;
 - (f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;
 - (g) an identification of any areas to be avoided, including buffers;

- (h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;
- (i) a description of any assumptions made and any uncertainties or gaps in knowledge;
- (j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;
- (k) any mitigation measures for inclusion in the EMPr;
- (l) any conditions for inclusion in the environmental authorisation;
- (m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;
- (n) a reasoned opinion-
 - (i) as to whether the proposed activity or portions thereof should be authorised;
 - and
 - (ii) if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;
- (o) a description of any consultation process that was undertaken during the course of preparing the specialist report;
- (p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and
- (q) any other information requested by the competent authority.

2.4 NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT (ACT 39 OF 2004)

Section 34 of the National Environmental Management: Air Quality Act (Act 39 of 2004) makes provision for:

- (1) the Minister to prescribe essential national noise standards -
 - (a) for the control of noise, either in general or by specified machinery or activities or in specified places or areas; or
 - (b) for determining –
 - (i) a definition of noise
 - (ii) the maximum levels of noise
- (2) When controlling noise the provincial and local spheres of government are bound by any prescribed national standards.

This section of the Act has been promulgated, but no such standards have yet been issued. Draft regulations have however, been promulgated for adoption by Local Authorities.

An atmospheric emission licence issued in terms of Section 22 may contain conditions in terms of noise.

2.4.1 Model Air Quality Management By-law for adoption and adaptation by Municipalities (GN 579 of 2010)

Model Air Quality Management By-Laws for adoption and adaptation by municipalities was published by the Department of Water and Environmental Affairs in the Government Gazette of 2 July 2010 as Government Notice 579 of 2010.

The main aim of the model air quality management by-law is to assist municipalities in the development of their air quality management by-law within their jurisdictions. It is also the aim of the model by-law to ensure uniformity across the country when dealing with air quality management challenges. Therefore, the model by-law is developed to be generic in order to deal with most of the air quality management challenges. With Noise Control being covered under the Air Quality Act (Act 39 of 2004), noise is also managed in a separate section under this Government Notice.

- **IT IS NOT** the aim of the model by-law to have legal force and effect on municipalities when published in the Gazette; and
- **IT IS NOT** the aim of the model by-law to impose the by-law on municipalities.

Therefore, a municipality will have to follow the legal process as set out in the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000) when adopting and adapting the model by-law to its local jurisdictions.

2.5 NOISE STANDARDS

There are a few South African scientific standards (SABS) relevant to noise from mines, industry and roads. They are:

- SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication';
- SANS 10210:2004. 'Calculating and predicting road traffic noise';
- SANS 10328:2008. 'Methods for environmental noise impact assessments'.

- SANS 10357:2004. 'The calculation of sound propagation by the Concave method'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful *per se*.

2.6 NATIONAL TRANSPORT POLICY (SEPTEMBER 1996)

The White Paper sets the vision for transport in South Africa that provides for *safe, reliable, effective, efficient and fully integrated transport operations and infrastructure which..... are environmentally and economically sustainable*. The White Paper further states that *"the provision of transportation infrastructure and the operation of the transportation system have the potential for causing damage to the physical and social environment, inter alia, through atmospheric and noise pollution, ecological damage and severance. ... The Department of Transport is committed to an integrated environmental management approach in the provision of transport"*. It is also stated that *"As part of the overall long-term vision for the South African transport system, transport infrastructure will, inter alia, be structured to ensure environmental sustainability and internationally accepted standards"*. One of the strategic objectives for transport infrastructure to achieve this vision is to promote environmental protection and resource conservation.

2.7 INTERNATIONAL GUIDELINES

While a number of international guidelines and standards exist, those selected below are used by numerous countries for environmental noise management.

2.7.1 Guidelines for Community Noise (WHO, 1999)

The World Health Organization's (WHO) document on the *Guidelines for Community Noise* is the outcome of the WHO- expert task force meeting held in London, United Kingdom, in April 1999. It is based on the document entitled "Community Noise" that was prepared for the World Health Organization and published in 1995 by the Stockholm University and Karolinska Institute.

The scope of WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments.

Guidance on the health effects of noise exposure of the population has already been given in an early publication of the series of Environmental Health Criteria. The health risk to humans from exposure to environmental noise was evaluated and guidelines values derived. The issue of noise control and health protection was briefly addressed.

The document uses the L_{Aeq} and $L_{A,max}$ noise descriptors to define noise levels. It should be noted that a follow-up document focusing on Night-time Noise Guidelines for Europe (WHO, 2009).

2.7.2 Night Noise Guidelines for Europe (WHO, 2009)

Refining previous Community Noise Guidelines issued in 1999, and incorporating more recent research, the World Health Organization has released a comprehensive report on the health effects of night time noise, along with new (non-mandatory) guidelines for use in Europe. Rather than a maximum of 30 dB inside at night (which equals 45-50 dB max outside), the WHO now recommends a maximum year-round outside night-time noise average of 40 dB to avoid sleep disturbance and its related health effects. The report notes that only below 30 dB (outside annual average) are *"no significant biological effects observed,"* and that between 30 and 40 dB, several effects are observed, with the chronically ill and children being more susceptible; however, *"even in the worst cases the effects seem modest."* Elsewhere, the report states more definitively, *"There is no sufficient evidence that the biological effects observed at the level below 40 dB (night, outside) are harmful to health."* At levels over 40 dB, *"Adverse health effects are observed"* and *"many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected."*

The 184-page report offers a comprehensive overview of research into the various effects of noise on sleep quality and health (including the health effects of non-waking sleep arousal), and is recommended reading for anyone working with noise issues. The use of an outdoor noise standard is in part designed to acknowledge that people do prefer to leave windows open when sleeping, though the year-long average may be difficult to obtain (it would require longer-term sound monitoring than is usually budgeted for by either industry or neighbourhood groups).

While recommending the use of the average level, the report notes that some instantaneous effects occur in relation to specific maximum noise levels, but that the health effects of these “cannot be easily established.”

2.7.3 Equator Principles

The **Equator Principles** (EPs) are a voluntary set of standards for determining, assessing and managing social and environmental risk in project financing. Equator Principles Financial Institutions (EPFIs) commit to not providing loans to projects where the borrower will not or is unable to comply with their respective social and environmental policies and procedures that implement the EPs.

The Equator Principles were developed by private sector banks and were launched in June 2003. Revision III of the EPs has been in place since June 2013. The participating banks chose to model the Equator Principles on the environmental standards of the World Bank (1999) and the social policies of the International Finance Corporation (IFC). Eighty-three financial institutions (2016) have adopted the Equator Principles, which have become the de facto standard for banks and investors on how to assess major development projects around the world.

The environmental standards of the World Bank have been integrated into the social policies of the IFC since April 2007 as the International Finance Corporation Environmental, Health and Safety (EHS) Guidelines.

2.7.4 IFC: General EHS Guidelines – Environmental Noise Management

These guidelines are applicable to noise created beyond the property boundaries of a development that conforms to the Equator Principle.

It states that noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. The preferred method for controlling noise from stationary sources is to implement noise control measures at source.

It goes as far as to proposed methods for the prevention and control of noise emissions, including:

- Selecting equipment with lower sound power levels;
- Installing silencers for fans;
- Installing suitable mufflers on engine exhausts and compressor components;

- Installing acoustic enclosures for equipment casing radiating noise;
- Improving the acoustic performance of constructed buildings, apply sound insulation;
- Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m² in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective;
- Installing vibration isolation for mechanical equipment;
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas ;
- Re-locating noise sources to less sensitive areas to take advantage of distance and shielding;
- Placement of permanent facilities away from community areas if possible;
- Taking advantage of the natural topography as a noise buffer during facility design;
- Reducing project traffic routing through community areas wherever possible;
- Planning flight routes, timing and altitude for aircraft (airplane and helicopter) flying over community areas; and
- Developing a mechanism to record and respond to complaints.

It sets noise level guidelines (see **Table 2-1**) as well as highlighting the certain monitoring requirements pre- and post-development. It adds another criterion in that the existing background ambient noise level should not rise by more than 3 dBA. This criterion will effectively sterilize large areas of any development. It is, therefore, the considered opinion that this criterion was introduced to address cases where the existing ambient noise level is already at, or in excess of the recommended limits.

Table 2-1: IFC Table .7.1-Noise Level Guidelines

Receptor type	One hour L _{Aeq} (dBA)	
	Daytime 07:00 - 22:00	Night-time 22:00 – 07:00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

The document uses the L_{Aeq,1 hr} noise descriptors to define noise levels. It does not determine the detection period, but refers to the IEC standards, which requires the fast detector setting on the Sound Level Meter during measurements for Europe.

3 CURRENT ENVIRONMENTAL SOUND CHARACTER

3.1 LIMITATIONS: ACOUSTICAL MEASUREMENTS

The following are limitations associated with the measurement of ambient sound levels:

- Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. High measurements may not necessarily mean that noise levels in the area are high. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of the day, faunal characteristics, vegetation in the area and meteorological conditions (especially wind). This is excluding the potential effect of sounds from anthropogenic origin. It is impossible to quantify and identify the numerous sources that influenced one 10-minute measurement using the reading result at the end of the measurement;
- Because a sound level measured is the combination of sounds both near and far, sound measurements can only indicate likely sound levels. These measurements cannot define the origin of potential noise sources, neither easily differentiate between a loud far-off noise nor a softer, but closer sound;
- Determination of road traffic and other noise sources of significance are important (traffic counts). In areas where roads are busy road traffic generally contributes to a significant portion of the ambient noise;
- Measurements over wind speeds of 3 m/s will provide data potentially influenced by wind-induced noises. Therefore sound data will have to be read in conjunction with meteorological (wind) data. SANS methodologies specifically recommend that data collected during windy conditions be discarded. If this data is to be used special precautions should be taken, including the use of all-weather wind shields specifically designed for use in higher wind conditions;
- Ambient sounds will vary with seasons as faunal activity increase and decrease, similarly as vegetation (in particular foliage) changes;
- Accurately defining ambient sound/noise levels at a community or house requires that measurements must be collected at that location for a long period of time;
- Exact location of a sound level meter in a small area (such as a single dwelling) in relation to structures, vegetation and external noise sources will impact on the measurements;
- While not audible while an instrument is erected at a measurement location, there could be a noise source in the area that can only be detected during the quieter periods or when the data is analysed at a future period (such as a water pump that only operates for a short period of time periodically during the day);

- Measurements recorded near oceans are naturally high most of the time due to surf noises;
- Measurements recorded near rivers, streams, wetlands, trees and bushy areas can be high. This is due to faunal activity which can dominate the sound levels around the measurement point. It is technically very difficult to “mask” fauna activity during a measurement period or find an area where there is no faunal activity that will not contribute unwanted sounds to measurements;
- Considering one variable/weighted/time is not sufficient for an acoustical assessment. L_{Amin} , L_{Aeq} , L_{Aeq} , L_{Ceq} , L_{AMax} , L_{A10} , L_{A90} and spectral analysis forms part of the many variables to be considered; and,
- As a residential area develops the presence of people will result in increased sounds. These are generally a combination of traffic noise, voices, animals and equipment (incl. TV’s and Radios). The result is that ambient sound levels will increase as an area matures.

3.2 MEASUREMENT PROCEDURE

The measurement of ambient sound levels is defined by the South African National Standard SANS 10103:2008 as: “**The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication**”.

The standard specifies the acceptable techniques for sound measurements including:

- type of equipment;
- minimum duration of measurement;
- microphone positions;
- calibration procedures and instrument checks; and
- weather conditions.

Ambient sound levels were measured over a period of two nights during May 2016 with the locations used to measure ambient (background) sound levels presented in **Figure 3-1**. Photos taken during the measurement date is presented in [Appendix B](#).

3.3 MEASUREMENT RESULTS

3.3.1 Measurement Point AMSGLTASL01 (NSD02)

This measurement location was just in front of a residential house, close to the fence of this dwelling. The microphone was approximately 5m from a large tree.

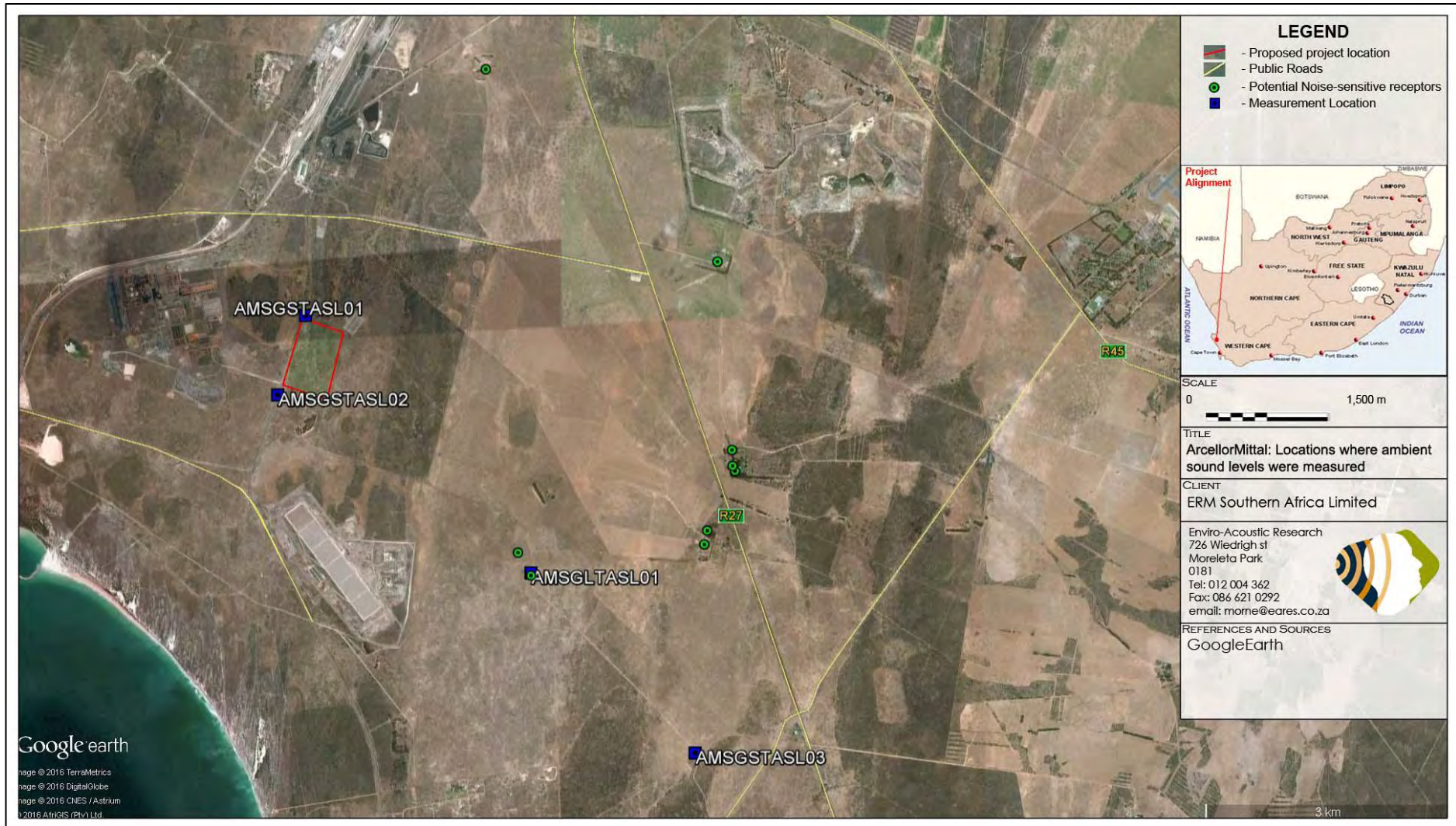


Figure 3-1: Locations where ambient sound levels were measured

Table 3-1 highlights sounds heard during equipment deployment and collection, with the equipment used to gather data presented in **Table 3-2**.

Table 3-1: Noises/sounds observed

Magnitude Scale Code: • Barely Audible • Audible • Dominating	During Deployment		During Collection
	Faunal and natural	Cows and Jackal communication. Bird calls. Cricket communication. Wind-induced noises at times.	Bird calls. Ocean.
	Residential	Water Pump (at times). Voices. Dogs barking (at times).	Dogs barking (occasional, dominating during event).
	Industrial & transportation	Road traffic sounds (during passing in distance). Saldanha Steel operations.	Road traffic sounds (during passing in distance).

Table 3-2: Equipment used to gather data at NSD02

Equipment	Model	Serial no	Calibration
SLM	SVAN 977	34160	May 2015
Microphone	ACO Pacific 7052E	54645	May 2015
Calibrator	Quest QC-20	OOC 020005	June 2015
Weather Station	WH3081PC	-	-

* Microphone fitted with the appropriate windshield (RION WS-03).

The instrument was setup to do the measurements over a 10-minute period, stop the measurement (and immediately start a new 10-minute measurement) and save the data until the instrument was stopped. Measured data is presented in **Figure 3-2** (equivalent and 10-minute A-weighted measurements, impulse and fast descriptor).

Measured $L_{Aeq,i}$ day/night-time data: This sound descriptor is mainly used in South Africa to define sound and noise levels. During the daytime 10-minute $L_{Aeq,10min}$ values ranged from 37 to 77 dBA. The night-time $L_{Aeq,10min}$ values (night-time reference period 22:00 – 06:00) ranged from 40 to 55 dBA. The daytime arithmetic mean was 49 dBA while the night-time average was 47 dBA. The equivalent daytime sound level (“average” value over 16 hours for the second day) was 61 dBA. The equivalent value for the first night was 49 dBA and 47 dBA for the second night. Measured data indicated an area with increased ambient sound levels due to natural sounds as well as various sounds of anthropogenic origin. Ambient sound levels are illustrated in **Figure 3-2**.

Measured $L_{Aeq,f}$ day/night-time data: Fast-weighted equivalent sound levels are included in this report as this is the sound descriptor used in most international countries to define the Ambient Sound Level. During the daytime $L_{Aeq,10min,f}$ values ranged from 35

to 74 dBA. The night-time $L_{Aeq,10min,f}$ values (night-time reference period 22:00 – 06:00) ranged from 38 to 54 dBA. The daytime arithmetic mean was 47 dBA while the night-time average being 46 dBA. The equivalent daytime sound levels were 55 (evening only), 58 and 48 (morning only) dBA. Night-time equivalent sound levels were 48 and 46 dBA. Ambient sound levels are illustrated in **Figure 3-2**.

Measured 10-minute L_{FA90} day/night-time data: L_{A90} is a statistical indicator that describes the noise level that is exceeded 90% of the time and frequently used to define the background sound level internationally. Daytime values ranged from 26 to 54 dBA₉₀ averaging at 37 dBA₉₀. The night-time L_{A90} values ranged from 23 to 50 dBA₉₀ (night-time reference period 22:00 – 06:00) averaging at 35 dBA₉₀. Measured L_{A90} data also confirm an area with increased sound levels. This area was never silent during the measurement (compared to a undeveloped rural area). This is illustrated in **Figure 3-3**.

L_{IAeq} - L_{FAeq} average difference, day/night-time: The average daytime difference between the $L_{Aeq,i}$ and $L_{Aeq,f}$ variables was 2.6 dB while the night-time average difference was 1.3 dBA. While impulsive noises were reported it is not significant.

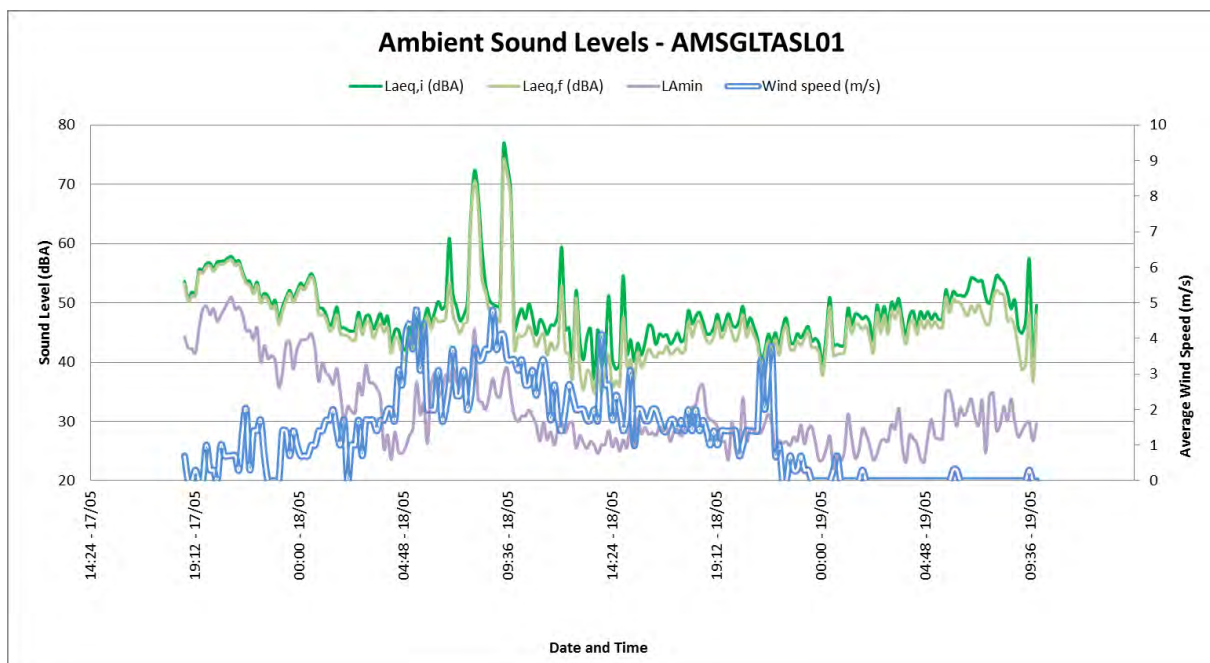


Figure 3-2: Ambient Sound Levels measured at AMSGLTASL01

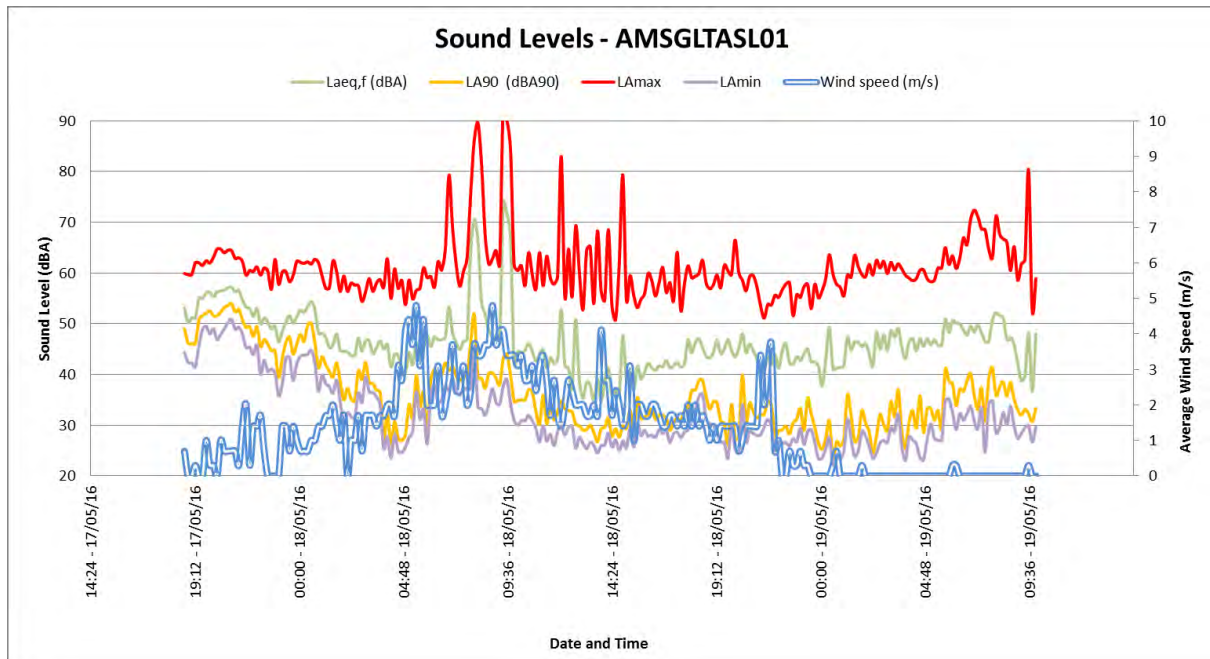


Figure 3-3: 10 minute maximum, 90th percentile, equivalent and minimum sound levels measured at AMSGLTASL01

L_{Amax} night-time occurrences: While there were numerous events where the maximum sound levels exceeded 65 dBA, this was limited to daytime hours. There were no noise events during the two night-time periods where the sound level exceeded 65 dBA. Night-time maximum noise events may affect sleeping patterns in humans (if they occur frequently at night).¹

Third octave spectral analysis:

Third octaves were measured and are displayed in the following Figures.

Lower frequency (20 – 250 Hz) – Noise sources of significance in this frequency band would include nature (wind and surf especially) and sounds of anthropogenic origin (such as electric motors) and vehicles (engine revolutions). Lower frequencies tend to travel further through the atmosphere than higher frequencies. The presence of significant acoustic energy in this frequency range indicates the presence of these noises. Smooth curves normally indicate noises of natural origin with wavy curves generally indicating sounds of anthropogenic origin. All measurements indicated significant acoustic energy in these low frequencies. Considering the sounds heard it is likely a combination of sounds

¹ World Health Organization. 2009. *Night Noise Guidelines for Europe*.

from natural sounds (wind, ocean). Sounds from the road may have contributed to this acoustic energy.

Third octave surrounding the 1000 Hz – This range contains energy mostly associated with human speech (350 Hz – 2,000 Hz; mostly below 1,000 Hz) and dwelling noises (including sounds from larger animals such as chickens, dogs, goats, sheep and cattle). Most measurements indicate that wind-induced sounds (based on the audible sounds heard) created a constant background noise, likely masking most other sounds in the area (although louder transient sounds will still be clearly audible - such as a bird call). The peak in 315 – 400 Hz range likely relates to voices heard the first night when the instrument was deployed.

Higher frequency (2,000 Hz upwards) – Smaller faunal species such as birds, crickets and cicada use this range to communicate and hunt etc. Morning and daytime measurements indicate peaks in the 4,000 – 5,000 Hz range, relating to the bird sounds nesting in the area. Measurements however indicated little sounds in this frequency range during the measurement period with wind-induced and surf noises dominating. Night-time measurements indicate peaks in the 2,000 (first night) and 2,500 (second night) Hz frequencies.

Spectral data analysis indicates an area with elevated ambient sound levels. There is no one particular sound but it is due to the cumulative effect of sounds from various sources, both close and far.

SANS 10103 Rating Level - Though the area indicates sound level typical of an urban noise district, the development character is more typical of a rural district. Considering the night-time sound levels a SANS 10103:2008 rating level typical of an Urban Noise District will be applicable.

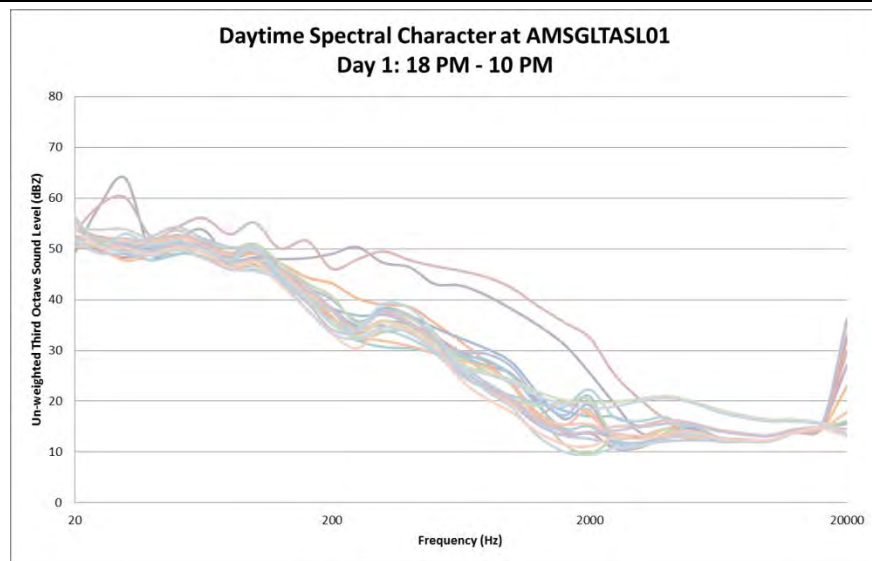


Figure 3-4: Spectral frequencies – AMSGLTASL01, Day 1

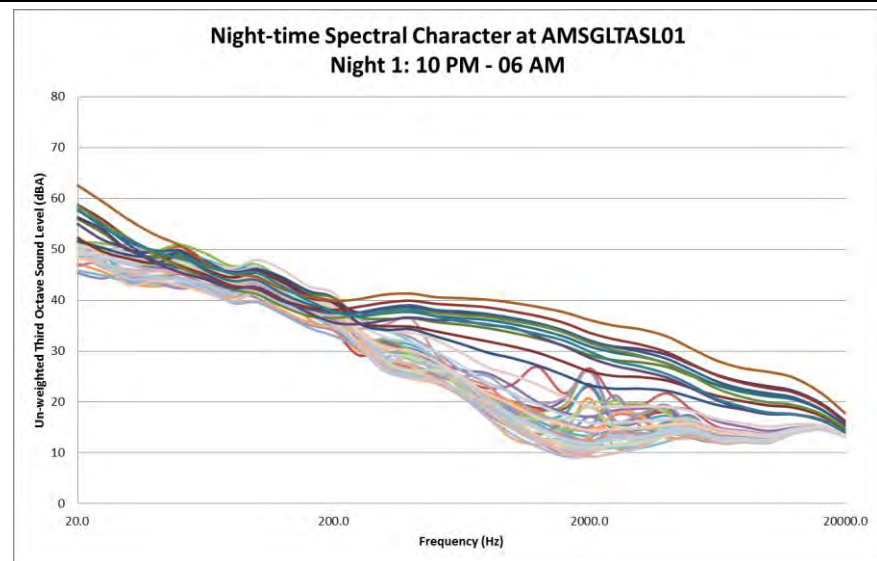


Figure 3-5: Spectral frequencies - AMSGLTASL01, Night 1

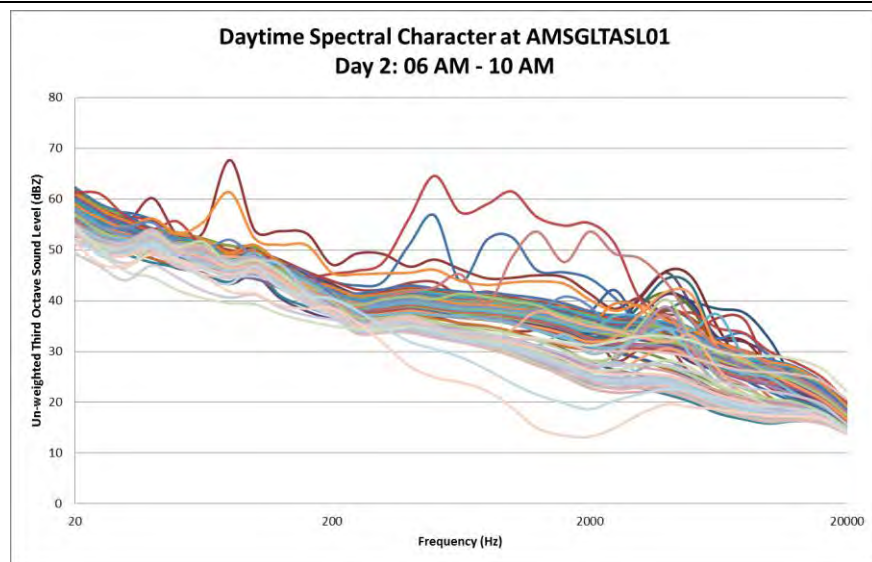


Figure 3-6: Spectral frequencies - AMSGLTASL01, Day 2

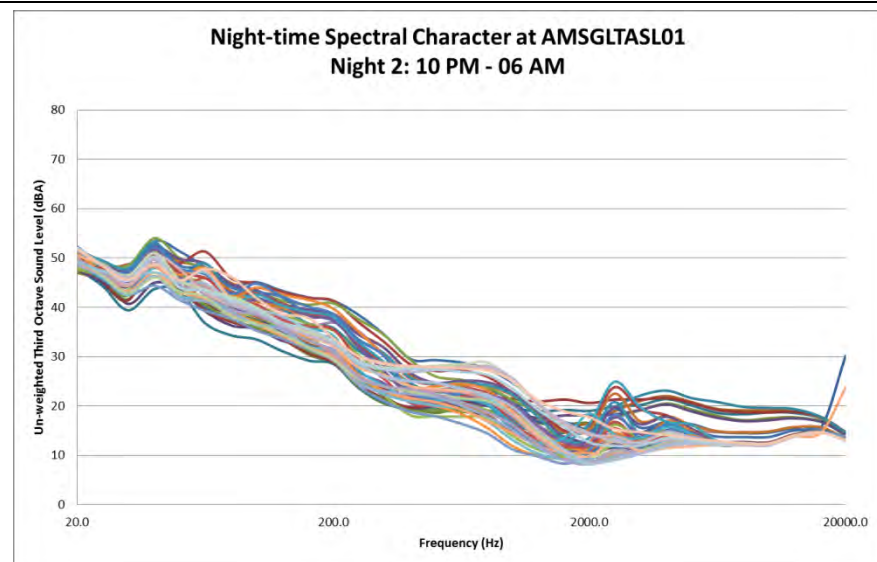


Figure 3-7: Spectral frequencies - AMSGLTASL01, Night 2

3.3.2 Single measurements – In vicinity of development area

A number of single measurements were collected to gauge the ambient sound character and levels in the area. Equipment used at these locations is defined in the following table. Refer to [Appendix B](#) for photos of the measurement locations.

Table 3-3: Equipment used to do singular measurements

Equipment	Model	Serial no	Calibration
SLM	RION NA-28	00901489	May 2015
Microphone	UC-59	02087	May 2015
Calibrator	Quest QC-20	QOC 020005	June 2015

Note: SLM fitted at all times with appropriate windshield

The data collected and information about the measurement locations are presented in **Table 3-4**.

Note:

$L_{Aeq,i}$ - Equivalent (average) A-weighted impulse-time-weighted noise level

$L_{Aeq,f}$ - Equivalent (average) A-weighted fast-time-weighted noise level

L_{A90} - Noise level that is exceeded 90% or more of the time, A-weighted fast-time-weighted noise level

Short term measurements indicated ambient sound levels typical of an urban noise district (with main roads, business and workshops) closer to the project site. Daytime ambient sound levels are higher, mainly due to road traffic, although wind-induced noises also contributed to the ambient sound levels. Short term measurements away from roads, business and residential dwellings indicate an area with the potential to be very quiet.

Table 3-4: Summary of singular noise measurements

Measurement location	L _{Aeq,i} level (dBA)	L _{Aeq,f} level (dBA)	L _{A90} Level (dBA90)	Spectral character	Comments
AMSGSTASL01 Daytime	76	73	52	Figure 3-8	Similar sound level from Saldanha Steel than night-time measurement (during periods of windless conditions and no road traffic). Increased wind induced noises and significantly more traffic. Bird sounds just audible during quiet periods. Gusty northerly wind. Traffic travelling about 80 - 100 km/h. 1. 74 cars, 3 trucks 2. 67 cars, 3 trucks
	76	73	50		
AMSGSTASL01 Night-time	51	47	45	Figure 3-9	Hum from Saldanha Steel dominating, possible flare. Sirens audible at times. Lower hum from Namaqua Sands. Reverse alarms at times. Sounds of trucks slamming or similar impulsive noise audible at times from ore loading area, just audible. Wind gusts but industry noises dominating.
	52	48	45		
AMSGSTASL02 Daytime	75	72	51	Figure 3-10	Sounds from Saldanha Steel constant background noise. Road traffic noises dominant noise most of times. Wind gusts at times. 1. 55 cars, 4 trucks 2. 59 cars, 2 trucks
	75	72	51		
AMSGSTASL02 Night-time	49	46	45	Figure 3-11	Sounds from Saldanha Steel dominating, constant hum. Flare visible. Frogs audible. Other unidentifiable sounds from Saldanha Steel, including sirens at times, locomotive hooter in distance during second measurement.
	51	47	46		
AMSGSTASL03 Daytime	49	47	39	Figure 3-12	Wind induced noises likely dominant with significant bird noises, northerly wind. Saldanha Steel audible as low rumble during quiet periods. Traffic noises just audible at times.
	47	45	37		
AMSGSTASL03 Night-time	37	29	24	Figure 3-13	Traffic on R27 road significant noise source during traffic passing. With no traffic passing low hum from Saldanha Steel works constant in background. Siren at road works area during first measurement. Faunal sounds at times and just audible. Northerly wind gusts at times but not increasing sound levels as there is little vegetation in area. Road traffic noises rather constant and audible above hum from steel works. Alarms from caracal deterrents active every few minutes (about 6-8 times). Bird call at times in distance.
	32	24	20		

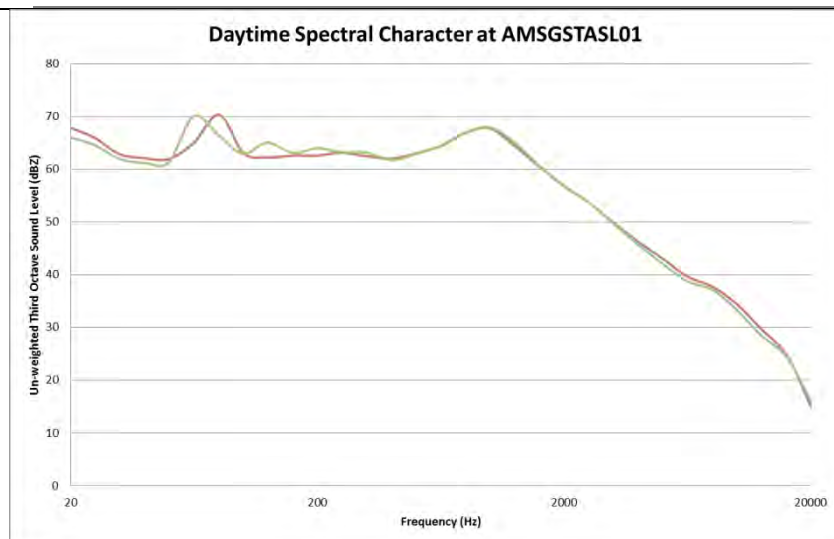


Figure 3-8: Spectral frequencies recorded at AMSGSTASL01

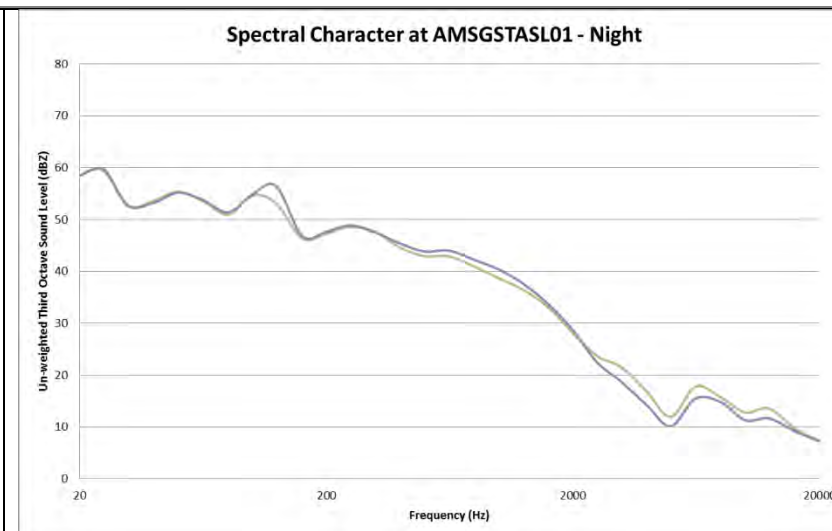


Figure 3-9: Spectral frequencies recorded at AMSGSTASL01

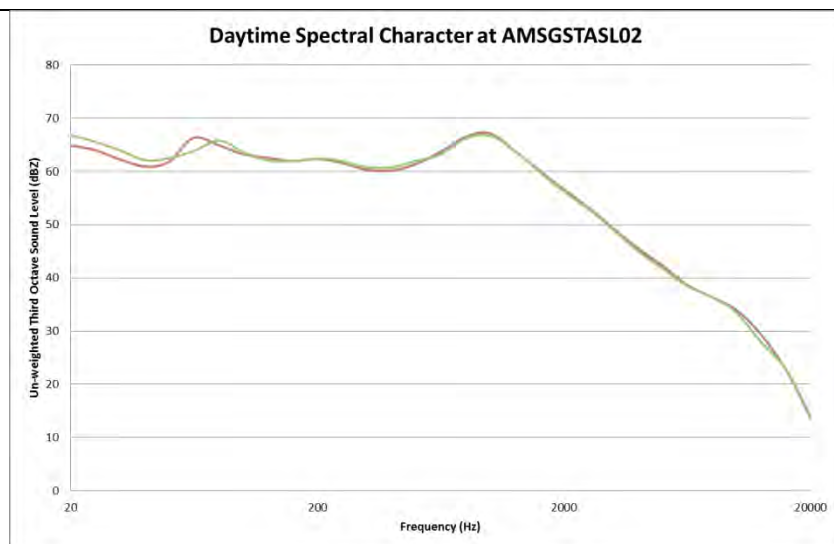


Figure 3-10: Spectral frequencies recorded at AMSGSTASL02

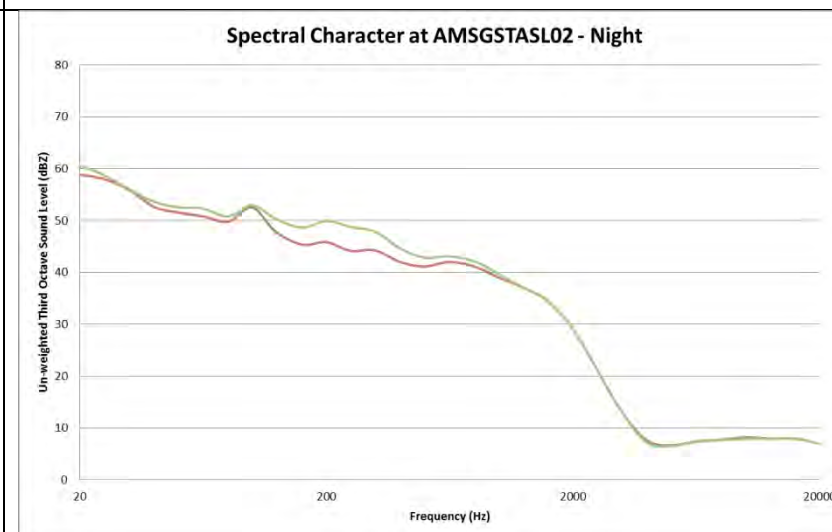


Figure 3-11: Spectral frequencies recorded at AMSGSTASL02

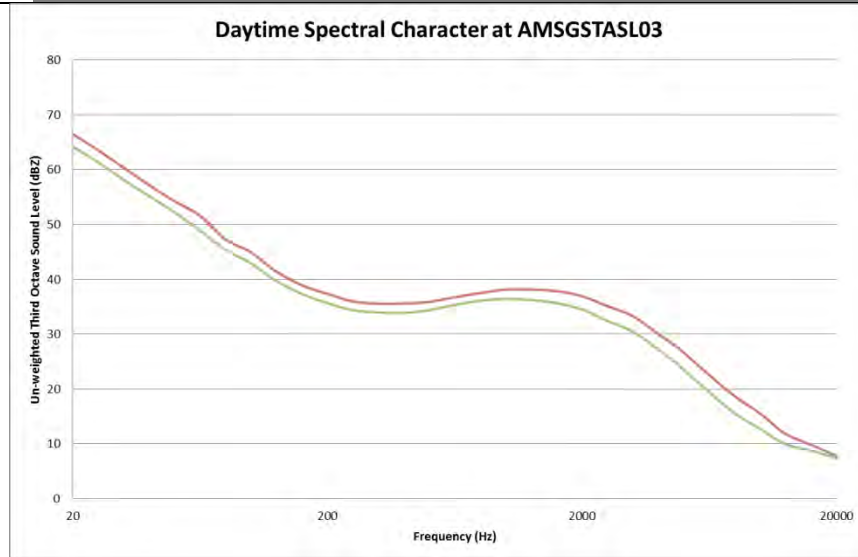


Figure 3-12: Spectral frequencies recorded at AMSGSTASL03

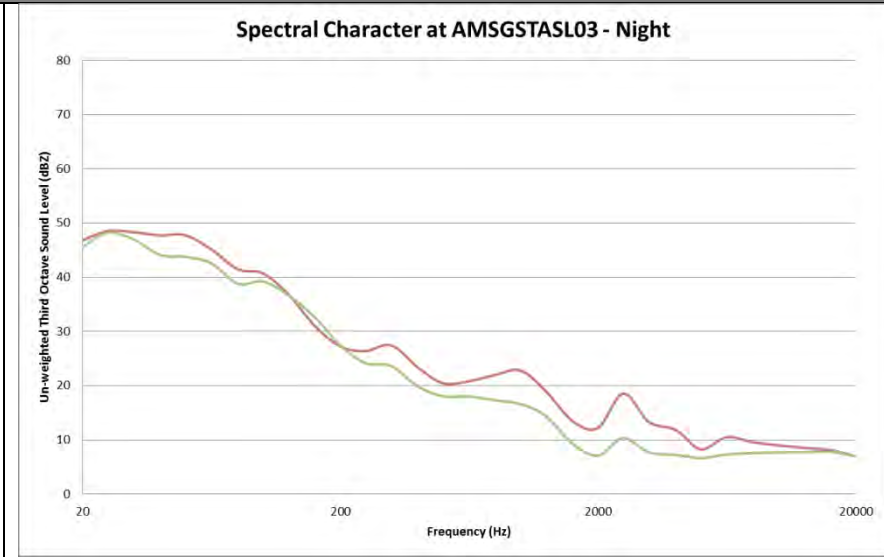


Figure 3-13: Spectral frequencies recorded at AMSGSTASL03

4 POTENTIAL NOISE SOURCES

Increased noise levels are directly linked with the various actions associated with the construction and operation of the project activities.

4.1 POTENTIAL NOISE SOURCES: CONSTRUCTION NOISES

4.1.1 Construction Activities

Construction activities include:

- Additional traffic to and from the site, as well as traffic on the site;
- Site preparation, including the site clearing and levelling, development of internal site roads and security fencing;
- Establishment of contractors camp, storage and laydown areas;
- Earthworks, possible blasting (if hard rock is encountered) and piling activities;
- Development of the foundations;
- Laying of pipelines and establishment of the switchyard, and;
- Construction of infrastructure and facilities.

As the project will be developed in phases, it is likely that the operational phase will be taking place simultaneously with the construction of phase 2. There are a number of factors that determine the audibility as well as the potential of a noise impact on receptors.

Maximum noises generated can be audible over a large distance, however, are generally of very short duration. If maximum noise levels however exceed 65 dBA at a receptor, or if it is clearly audible with a significant number of instances where the noise level exceeds the prevailing ambient sound level with more than 15 dB the noise can increase annoyance levels and may ultimately result in noise complaints. Potential maximum noise levels generated by construction equipment as well as the potential extent are presented in **Table 4-1**. The potential extent depends on a number of factors, including the prevailing ambient sound levels during the instance the maximum noise event occurred, as well as the spectral character of the noise and the ambient soundscape in the surroundings.

Average or equivalent sound levels are another factor that impacts on the ambient sound levels and is the constant sound level that the receptor can experience. Typical sound

power levels associated with various activities that may be found at a construction site is presented in **Table 4-2**.

4.1.2 Blasting

It is unlikely that blasting will be required as part of the civil works to clear obstacles or to prepare foundations and blasting will not be considered in this report for the following reasons:

- Blasting is highly regulated, and control of blasting to protect human health, equipment and infrastructure will ensure that any blasts will use the minimum explosives and will occur in a controlled manner. The breaking of obstacles with explosives is also a specialized field and when correct techniques are used, causes significantly less noise than using a hydraulic rock-breaker.
- People are generally more concerned about ground vibration and air blast levels that might cause building damage than the impact of the noise from the blast. However, these are normally associated with close proximity mining/quarrying.
- Blasts are an infrequent occurrence, with a loud but a relative instantaneous character. Potentially affected parties generally receive sufficient notice (siren) and the knowledge that the duration of the siren noise as well as the blast will be over relative fast results in a higher acceptance of the noise. Note that with the selection of explosives and blasting methods, noise levels from blasting is relatively easy to control.

4.2 POTENTIAL NOISE SOURCES: COMMISSIONING

Noise will be generated during the start-up and commissioning phase of the plant during:

- hot commissioning and clean-out of the heat recovery boiler hot-path exchanger bundles and the super-heater piping using high pressure, high temperature steam in order to clean the pipe internals off all welding debris and mill scale. The high pressure steam would be vented to atmosphere, generating high noise levels for around 2 - 4 hours per day over 2 – 4 days.
- hot commissioning of steam piping running from heat recovery steam generation (HRSG) to steam turbines, **during 'blow-out' operations** to clean the pipe internals of all debris and mill scale. High pressure steam will be blown through the live steam line and vented to atmosphere. This process could last for 3 – 4 hours per day for up to 2 – 4 days.
- the testing of high pressure steam safety valves during commissioning could generate a sound pressure level of 160 dBA. This state would be sustained intermittently only for a few minutes at a time over a one hour period at most.

These can be considered temporary noises, and excluding the testing of the safety valves, the noise levels are similar to the noises considered for the worse-case operational scenario and will be addressed as part of the operational phase. Noises from the testing of the safety valves will be high, but very temporary and the testing will be taking place during the day, when noises are of lower concern than noises at night.

4.3 POTENTIAL NOISE SOURCES: OPERATIONAL NOISES

While there are numerous sources of noises associated at a gas-fired power plant, the main sources of noise are the:

- The air intake fans;
- Fans located on the air and steam condensers;
- Gas Turbine, steam turbine and generator (normally within building);
- Ventilation fans located on the turbine generator building; and
- Exhaust and flue stacks.

Typical sound power levels associated with various power generation equipment or activities are presented in **Table 4-2**.

While the generator unit will also generate noise (from the diesel/gas engine/turbine, electrical generator, steam condenser and venting), these activities generally takes place within a building and due to attenuation through the building walls the effective noise levels will be significantly less than the noise emitted by the noise from the air intake fans, the extraction fans on the stacks and potentially the condenser cooling fans.

It should be noted that while the noise levels of one intake fan may be less than the noise levels from an extraction fan, there are generally a bank of intake fans that cumulatively generate more noise than the extraction fans on the exit stack.

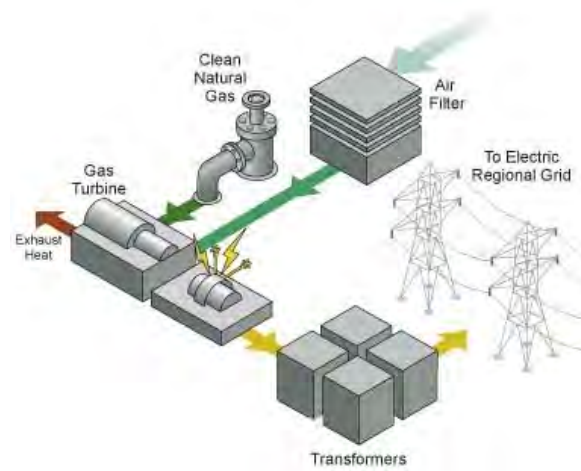


Figure 4-1: Simple gas-fired turbine generators (such as the Trent60)

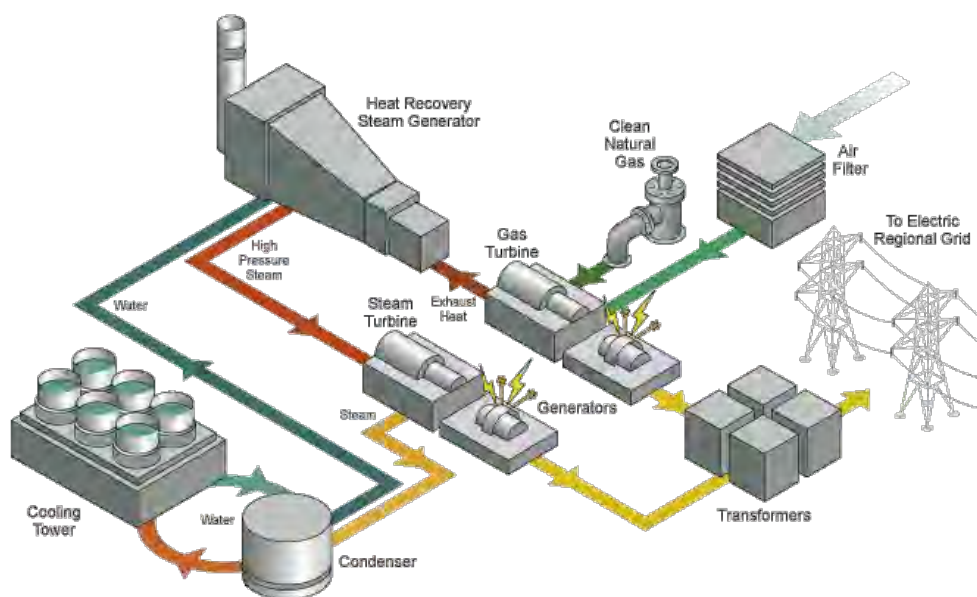


Figure 4-2: Combined Cycle Generation Process

Table 4-1: Potential maximum noise levels generated by construction equipment

Equipment Description ²	Impact Device?	Maximum Sound Power Levels (dBA)	Operational Noise Level at given distance considering potential maximum noise levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included – simple noise propagation modelling only considering distance) (dBA)											
			5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Backhoe	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Compactor (ground)	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Compressor (air)	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Concrete Batch Plant	No	117.7	92.7	86.7	80.6	72.7	66.7	63.1	60.6	57.1	52.7	49.2	46.7	40.6
Concrete Mixer Truck	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Crane	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Dozer	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Drum Mixer	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Dump Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Excavator	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Flat Bed Truck	No	118.7	93.7	87.7	81.6	73.7	67.7	64.1	61.6	58.1	53.7	50.2	47.7	41.6
Front End Loader	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Generator (>25KVA)	No	116.7	91.7	85.7	79.6	71.7	65.7	62.1	59.6	56.1	51.7	48.2	45.7	39.6
Generator (<25KVA)	No	104.7	79.7	73.7	67.6	59.7	53.7	50.1	47.6	44.1	39.7	36.2	33.7	27.6
Grader	No	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Impact Pile Driver	Yes	129.7	104.7	98.7	92.6	84.7	78.7	75.1	72.6	69.1	64.7	61.2	58.7	52.6
Jackhammer	Yes	119.7	94.7	88.7	82.6	74.7	68.7	65.1	62.6	59.1	54.7	51.2	48.7	42.6
Mounted Impact Hammer	Yes	124.7	99.7	93.7	87.6	79.7	73.7	70.1	67.6	64.1	59.7	56.2	53.7	47.6
Slurry Trenching Machine	No	116.7	91.7	85.7	79.6	71.7	65.7	62.1	59.6	56.1	51.7	48.2	45.7	39.6
Vibratory Concrete Mixer	No	114.7	89.7	83.7	77.6	69.7	63.7	60.1	57.6	54.1	49.7	46.2	43.7	37.6
Vibratory Pile Driver	No	129.7	104.7	98.7	92.6	84.7	78.7	75.1	72.6	69.1	64.7	61.2	58.7	52.6
Welder/Torch	No	107.7	82.7	76.7	70.6	62.7	56.7	53.1	50.6	47.1	42.7	39.2	36.7	30.6

² Equipment list and Sound Power Level source: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm

Table 4-2: Potential equivalent noise levels generated by various equipment

Equipment Description	Sound Power Levels (dBA)	Operational Noise Level at given distance considering equivalent (average) sound power emission levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included) (dBA)							
		10 m	20 m	50 m	100 m	200 m	500 m	1000 m	2000 m
Black start facility	102.9	71.9	65.9	57.9	51.9	48.4	45.9	37.9	31.9
Bulldozer CAT D9	111.9	80.9	74.9	66.9	60.9	57.4	54.9	46.9	40.9
Cement truck (with cement)	111.7	80.7	74.7	66.7	60.7	57.2	54.7	46.7	40.7
Crane	107.5	76.5	70.5	62.5	56.5	53.0	50.5	42.5	36.5
Diesel Generator (Large - mobile)	106.1	75.1	69.1	61.2	55.1	51.6	49.1	41.2	35.1
Dumper/Haul truck - Terex 30 ton	112.2	81.2	75.2	67.2	61.2	57.7	55.2	47.2	41.2
Electrical Turbine Generator	116.7	85.7	79.7	71.8	65.7	62.2	59.7	51.8	45.7
Elevated Flare	124.0	93.0	87.0	79.0	73.0	69.5	67.0	59.0	53.0
Excavator - Hitachi EX1200	113.1	82.1	76.1	68.1	62.1	58.6	56.1	48.1	42.1
Exhaust Fans	90.6	59.6	53.5	45.6	39.6	36.0	33.5	25.6	19.6
Extraction fan/blower (flue gas stack)	119.0	88.0	82.0	74.0	68.0	64.5	62.0	54.0	48.0
FEL - Bell L1806C	102.7	71.7	65.7	57.7	51.7	48.2	45.7	37.7	31.7
General noise	108.8	77.8	71.8	63.8	57.8	54.2	51.8	43.8	37.8
General Noise - Construction (commercial)	96.5	65.6	59.5	51.6	45.6	42.0	39.5	31.6	25.6
Generator building	96.0	65.0	59.0	51.0	45.0	41.5	39.0	31.0	25.0
Grader - Operational Hitachi	108.9	77.9	71.9	63.9	57.9	54.4	51.9	43.9	37.9
Intake Fans	97.7	66.8	60.7	52.8	46.8	43.2	40.7	32.8	26.8
JBL TLB	108.8	77.8	71.8	63.8	57.8	54.3	51.8	43.8	37.8
Road Transport Reversing/Idling	108.2	77.2	71.2	63.3	57.2	53.7	51.2	43.3	37.2
Road Truck average	109.6	78.7	72.6	64.7	58.7	55.1	52.6	44.7	38.7
Rock Breaker, CAT	120.7	89.7	83.7	75.7	69.7	66.2	63.7	55.7	49.7
Silenced radiator	98.3	67.3	61.3	53.4	47.3	43.8	41.3	33.4	27.3
Steam Turbine Condenser	105.4	74.4	68.4	60.4	54.4	50.9	48.4	40.4	34.4
Steam venting	101.7	70.7	64.7	56.7	50.7	47.2	44.7	36.7	30.7
Turbine Generator	116.7	85.7	79.7	71.8	65.7	62.2	59.7	51.8	45.7
Ventilation Fan	110.1	79.1	73.1	65.1	59.1	55.6	53.1	45.1	39.1
Vibrating roller	106.3	75.3	69.3	61.3	55.3	51.8	49.3	41.3	35.3
Water Cooling Fans	113.0	82.0	76.0	68.0	62.0	58.5	56.0	48.0	42.0

4.4 POTENTIAL NOISE SOURCES: DECOMMISSIONING

Decommissioning starts when power generation stops, signalling the beginning of the dismantling of the equipment. Activities that can take place include:

- Dismantling of the remaining equipment and infrastructure. This includes the following:
 - Dismantling of all equipment,
 - Removal of all remaining redundant infrastructure (buildings and structures, dams, workshop, access roads, possibly the offices and other buildings, etc.).
 - Removal of any contaminated soil.
 - The rehabilitation of disturbed areas including the necessary ripping of compacted soils and the shaping of rehabilitated areas to ensure free drainage.
 - Seeding of disturbed areas (if necessary to re-establish vegetation).
 - Monitoring and maintenance of the rehabilitated areas.

However, while there are numerous activities that can take place during the decommissioning stage, the potential noise impact will only be discussed in general. This is because the noise impacts associated with the decommissioning phase is normally less than both the construction and operational phases for the following reasons:

- Final decommissioning normally takes place only during the day, a time period when existing ambient sound levels are higher, generally masking most external noises for surrounding receptors;
- There is a lower urgency of completing this phase and less equipment remains onsite (and are used simultaneously) to effect the final decommissioning.

5 METHODS: NOISE IMPACT ASSESSMENT AND SIGNIFICANCE

5.1 NOISE IMPACT ON ANIMALS³

A great deal of research was conducted in the 1960's and 1970's on the effects of aircraft noise on animals. While aircraft noise have a specific characteristic that might not be comparable with industrial noise, the findings should be relevant to most noise sources.

Overall, the research suggests that species differ in their response to:

- Various types of noise;
- Durations of noise; and
- Sources of noise.

A general animal behavioural reaction to aircraft noise is the startle response. However, the strength and length of the startle response appears to be dependent on:

- which species is exposed;
- whether there is one animal or a group; and
- whether there have been some previous exposures.

Unfortunately, there are numerous other factors in the environment of animals that also influence the effects of noise. These include predators, weather, changing prey/food base and ground-based disturbance, especially anthropogenic. This hinders the ability to define the real impact of noise on animals.

From these and other studies the following can be concluded:

- Animals respond to impulsive (sudden) noises (higher than 90 dBA) by running away. If the noises continue, animals would try to relocate.
- Animals of most species exhibit adaptation with noise, including aircraft noise and sonic booms.
- More sensitive species would relocate to a more quiet area, especially species that depend on hearing to hunt or evade prey, or species that makes use of sound/hearing to locate a suitable mate.
- Noises associated with helicopters, motor- and quad bikes significantly impact on animals.

³Report to Congressional Requesters, 2005; USEPA, 1971; Autumn, 2007; Noise quest, 2010

There are guidelines that very briefly mention how potential noises can impact on wildlife from industrial and commercial industries. Most of these however do not have any set criteria that can be used to define the potential noise impact⁴. Faunal guidelines do exist that requires **the protection of an animal's surrounding environment, with "physical"** impacts such as water, habitat destruction etc. having a far more critical impact than that of noise.

5.1.1 Effects of Noise on Wildlife

Potential noise impacts on wildlife are very highly species dependent. Studies showed that most animals adapt to noises and would even return to a site after an initial disturbance, even if the noise continues. The more sensitive animals that might be impacted by noise would relocate to a quieter area.

There are a few specific studies discussing the potential impacts of noise on wildlife associated with construction, transportation and industrial facilities. Available information indicates that noises from transportation and industrial may mask the sounds of a predator approaching; similarly predators depending on hearing would not be able to locate their prey.

Many natural based acoustics themselves may be loud or impulsive. Examples include thunder, wind induced noises that could easily exceed 35 dBA ($L_{A90,fast}$) above wind speeds averaging 6 m/s, noise levels during early morning dawn chorus, crickets or loud cicada noises during late evening or early morning.

5.2 WHY NOISE CONCERNS COMMUNITIES⁵

Noise can be defined as "unwanted sound", and an audible acoustic energy that adversely affects the physiological and/or psychological well-being of people, or which disturbs or impairs the convenience or peace of any person. One can generalise by saying that sound becomes unwanted when it:

- Hinders speech communication;
- Impedes the thinking process;
- Interferes with concentration;
- Obstructs activities (work, leisure and sleeping); and
- Presents a health risk due to hearing damage.

⁴ E.g. International council of Mining & Metals. "Good Practice Guidance for Mining and Biodiversity". P.g. 63.

⁵World Health Organization, 1999; Noise quest, 2010; Journal of Acoustical Society of America, 2009

However, it is important to remember that whether a given sound is "noise" depends on the listener or hearer. The driver playing loud rock music on their car radio hears only music, but the person in the traffic behind them hears nothing but noise.

Response to noise is unfortunately not an empirical absolute, as it is seen as a multi-faceted psychological concept, including behavioural and evaluative aspects. For instance, in some cases, annoyance is seen as an outcome of disturbances, in other cases it is seen as an indication of the degree of helplessness with respect to the noise source.

Noise does not need to be loud to be considered "disturbing". One can refer to a dripping tap in the quiet of the night, or the irritating "thump-thump" of the music from a neighbouring house at night when one would like to sleep.

Severity of the annoyance depends on factors such as:

- Background sound levels, and the background sound levels the receptor is used to;
- The manner in which the receptor can control the noise (helplessness);
- The time, unpredictability, frequency distribution, duration, and intensity of the noise;
- The physiological state of the receptor; and
- The attitude of the receptor about the emitter (noise source).

5.3 IMPACT ASSESSMENT CRITERIA

5.3.1 Overview: The common characteristics

The word "noise" is generally used to convey a negative response or attitude to the sound received by a listener. There are four common characteristics of sound, any or all of which determine listener response and the subsequent definition of the sound as "noise". These characteristics are:

- Intensity;
- Loudness;
- Annoyance; and
- Offensiveness.

Of the four common characteristics of sound, intensity is the only one which is not subjective and can be quantified. Loudness is a subjective measure of the effect sound

has on the human ear. As a quantity it is therefore complicated, but has been defined by experimentation on subjects known to have normal hearing.

The annoyance and offensive characteristics of noise are also subjective. Whether or not a noise causes annoyance mostly depends upon its reception by an individual, the environment in which it is heard, the type of activity and mood of the person and how acclimatised or familiar that person is to the sound.

5.3.2 Noise criteria of concern

The criteria used in this report were drawn from the criteria for the description and assessment of environmental impacts considering the latest EIA Regulations, SANS 10103:2008 as well as guidelines from the World Health Organization.

There are a number of criteria that are of concern for the assessment of noise impacts. These can be summarised in the following manner:

- ***Increase in noise levels:*** People or communities often react to an increase in the ambient noise level they are used to, which is caused by a new source of noise. With regards to the Noise Control Regulations (promulgated in terms of the ECA), an increase of more than 7 dBA is considered a disturbing noise. See also **Figure 5-1**.
- ***Zone Sound Levels:*** Previously referred to as the acceptable rating levels, it sets acceptable noise levels for various areas. See also **Table 5-1**.
- ***Absolute or total noise levels:*** Depending on their activities, people generally are tolerant to noise up to a certain absolute level, e.g. 65 dBA. Anything above this level will be considered unacceptable.

In South Africa, the document that addresses the issues concerning environmental noise is SANS 10103:2008 (See also **Table 5-1**). It provides the equivalent ambient noise levels (referred to as Rating Levels), $L_{Req,d}$ and $L_{Req,n}$, during the day and night respectively to which different types of developments may be exposed.

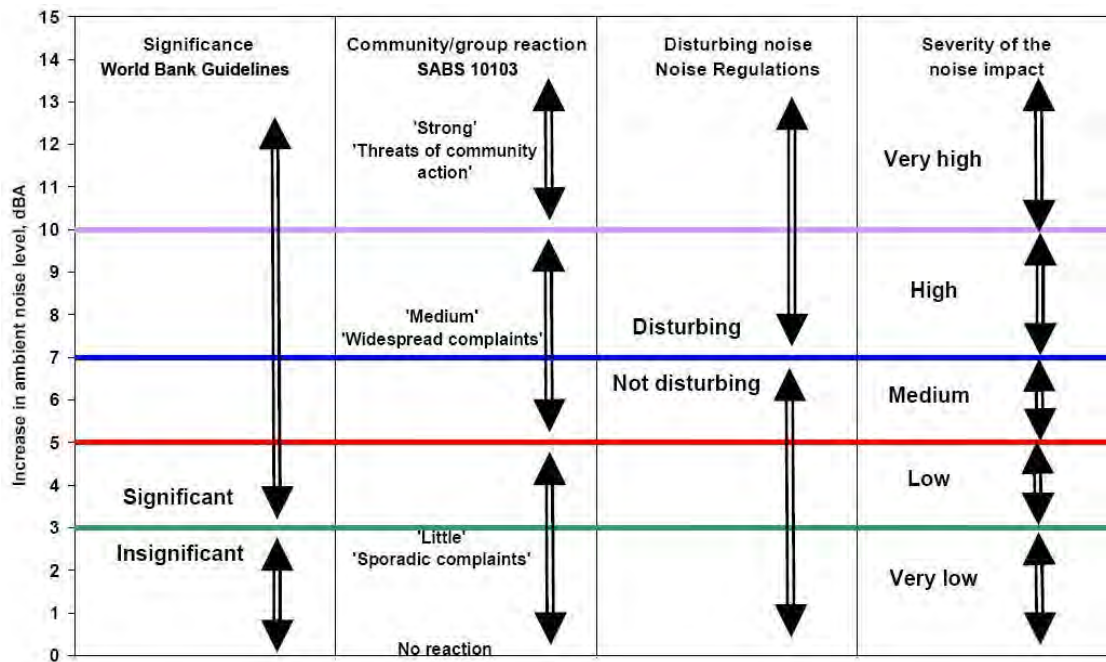


Figure 5-1: Criteria to assess the significance of impacts stemming from noise

SANS 10103:2008 also provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise. If Δ is the increase in sound level, the following criteria are of relevance:

- **$\Delta \leq 3$ dBA:** An increase of 3 dBA or less will not cause any response from a community. It should be noted that for a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level would not be noticeable.
- **$3 < \Delta \leq 5$ dBA:** An increase of between 3 dBA and 5 dBA will elicit 'little' community response with 'sporadic complaints'. People will just be able to notice a change in the sound character in the area.
- **$5 < \Delta \leq 15$ dBA:** An increase of between 5 dBA and 15 dBA will elicit a 'medium' community response with 'widespread complaints'. In addition, an increase of 10 dBA is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 15 dBA the community reaction will be 'strong' with 'threats of community action'.

Note that an increase of more than 7 dBA is defined as a disturbing noise and prohibited (National and Provincial Noise Control Regulations).

Table 5-1: Acceptable Zone Sound Levels for noise in districts (SANS 10103:2008)

1	2	3	4	5	6	7
Type of district	Equivalent continuous rating level ($L_{Req,T}$) for noise dBA					
	Outdoors			Indoors, with open windows		
	Day/night $L_{R,dn}^a$	Daytime $L_{Req,d}^b$	Night-time $L_{Req,n}^b$	Day/night $L_{R,dn}^a$	Daytime $L_{Req,d}^b$	Night-time $L_{Req,n}^b$
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

The area to the south, west and north is used for industrial purposes, with ambient sound levels west and north reflecting this industrial use. The closest potential noise-sensitive receptors are located more than 3,000m to the south-east. Ambient sound level measurements in the undeveloped areas (away from industry or dwellings) indicate a quiet rural area, although ambient sound levels are higher closer to the dwellings. However, most of the measurements away from the roads and industries indicates a character typical of a Rural Noise District. Therefore the SANS 10103:2008 rating levels typical of a Rural Noise District will be considered (see also **Table 5-1**):

- Rating Level during the day ($L_{Req,D}$) of 45 dBA; and
- Rating Level during the night ($L_{Req,N}$) of 35 dBA.

The Western Cape Provincial Noise Control Regulations: PN 200 of 2013 will be used in conjunction with the SANS guideline.

International guidelines should also be considered. The International IFC (Equator Principle) Residential; institutional and educational referenced areas includes ratings of:

- Use of $L_{Req,D}$ of 55 dBA during the daytimes; and
- Use of $L_{Req,N}$ of 45 dBA during the night-times.

5.3.3 Evaluation of Impacts – Defining the significance of the impact

The impact assessment criteria are devised from the *ERM IA Standard* as well as the *ERM Noise Impacts* guideline. The process of determining the noise impact significance is illustrated in **Figure 5-2**.

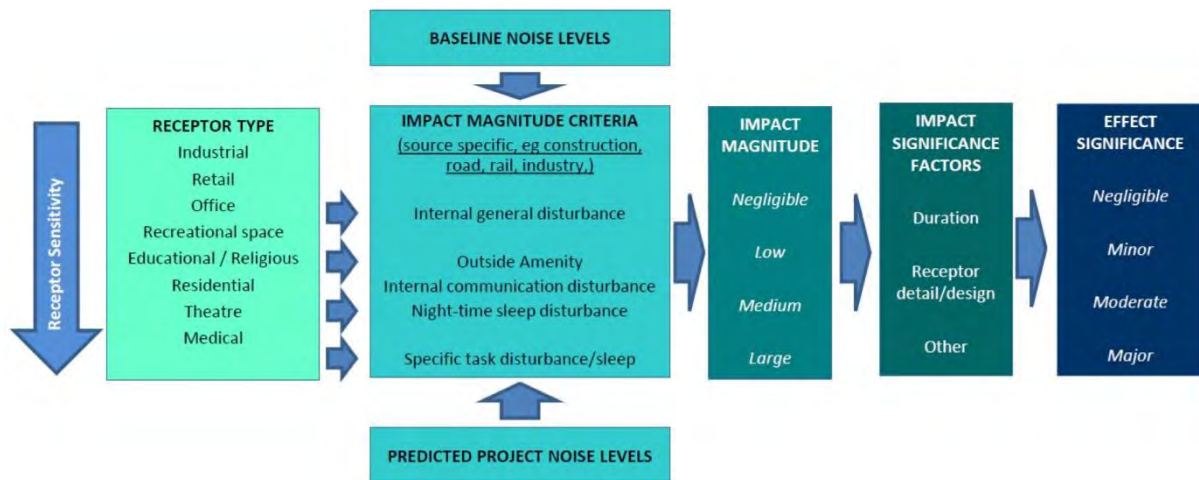


Figure 5-2: Noise Impact Significance Assessment Process

Once the prediction of noise impacts is complete, each impact is described in terms of its various relevant characteristics (e.g., type, scale, duration, frequency, extent). The terminology used to describe impact characteristics is shown in **Table 5-2**.

Table 5-2: Impact Characteristic Terminology

Characteristic	Definition	Designations
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect).	Direct Indirect Induced
Extent	The “reach” of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.).	Footprint Local Regional International
Duration	The time period over which a resource or / and receptor is affected.	Temporary Short-term Long-term Permanent
Scale	The scale of the impact (e.g., the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.).	Low Medium Large
Frequency	A measure of the constancy or periodicity of the impact.	[no fixed designations; intended to be a numerical value or a qualitative description]

The definitions for the **type** designations are shown in **Table 5-3**. Definitions for the other designations are resource/receptor-specific, and are discussed in the resource/receptor-specific impact assessment chapters presented later in this report.

Table 5-3: Impact Type Definitions

Designations	Definition
Direct	Impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the habitats which are affected).
Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of camp followers resulting from the importation of a large Project workforce).

The above characteristics and definitions apply to planned and unplanned events. An additional characteristic that pertains only to unplanned events is **likelihood**. The **likelihood** of an unplanned event occurring is designated using a qualitative scale, as described in **Table 5-4**.

Table 5-4: Definitions for Likelyhood Designations

Likelihood	Definition
Unlikely	The event is unlikely but may occur at some time during normal operating conditions.
Possible	The event is likely to occur at some time during normal operating conditions.
Likely	The event will occur during normal operating conditions (i.e., it is essentially inevitable).

Once an **impact's** characteristics are defined, the next step in the impact assessment phase is to **assign each impact a 'magnitude'**. **Magnitude is typically** a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent
- Duration
- Scale

- Frequency

Additionally, for unplanned events only, magnitude incorporates the 'likelihood' factor discussed above.

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the impact. As discussed above, the magnitude designations themselves are universally consistent, but the descriptions for these designations vary on a resource/receptor-by-resource/receptor basis. The universal magnitude designations are:

- Positive;
- Negligible;
- Small – Changes in ambient sound levels lower than 3 dB;
- Medium – Changes in ambient sound levels between 3 – 7 dBA; and
- Large – Changes in ambient sound levels higher than 10 dBA.

In the case of a *positive impact*, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the purpose of the Impact Assessment to indicate that the Project is expected to result in a *positive impact*, without characterizing the exact degree of positive change likely to occur.

In the case of impacts resulting from unplanned events, the same resource/receptor-specific approach **to concluding a magnitude designation is utilised, but the 'likelihood' factor is considered, together with the other impact characteristics, when assigning a magnitude designation.**

In addition to characterizing the magnitude of impact, the other principal impact evaluation step is definition of the sensitivity/vulnerability/importance of the impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity/vulnerability/importance of the resource/receptor, which may be physical, biological, cultural or human. Other factors may also be considered when characterizing sensitivity/vulnerability/importance, such as legal protection, government policy, stakeholder views and economic value.

As in the case of magnitude, the sensitivity/vulnerability/importance designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis. The sensitivity/vulnerability/importance designations used herein for all resources/receptors are:

- Low
- Medium
- High

Once magnitude of impact and sensitivity/vulnerability/importance of resource/receptor have been characterized, the significance can be assigned for each impact. Impact significance is designated using the matrix shown in *Figure1*.

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Figure 5-3: Impact Significance

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity/vulnerability/importance designations that enter into the matrix. Box A provides a context for what the various impact significance ratings signify.

It is important to note that impact prediction and evaluation take into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design, regardless of the results of the IA Process). An example of an embedded control is a standard acoustic enclosure that is designed to be installed around a piece of major equipment.

Box 5-1: Context of Impact Significance

An impact of negligible significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

An impact of **minor significance** is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. In either case, the magnitude should be well within applicable standards.

An impact of **moderate significance** has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is **as low as reasonably practicable** (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.

An impact of **major significance** is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of IA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

5.4 REPRESENTATION OF NOISE LEVELS

Preliminary noise rating levels was calculated in this report using both the SANS 10357:2004 (Concave) and ISO 9613-2:1996 sound propagation algorithms. It is however important to understand the difference between sound or noise level as well as the noise rating level (also see Glossary of Terms, [Appendix A](#)).

Sound or noise levels generally refers to a level as measured using an instrument, whereas the noise rating level refers to a calculated sound exposure level to which various corrections and adjustments was added. These noise rating levels are further processed into a 3D map illustrating noise contours of constant rating levels or noise isopleths. In this noise scoping report it will be used to illustrate the potential extent of the calculated noises of the project and not a noise levels at a specific moment in time.

6 ASSUMPTIONS AND LIMITATIONS

6.1 MEASUREMENTS OF AMBIENT SOUND LEVELS

Limitations associated with ambient sound measurements are discussed in section 3.1.

6.2 CALCULATING NOISE EMISSIONS – ADEQUACY OF PREDICTIVE METHODS

The noise emissions into the environment from the various sources as defined will be estimated for a conceptual operational phase, using the sound propagation algorithms described in SANS 10357:2004 and ISO 9613-2.

The following was considered:

- The octave band sound pressure emission levels of defined equipment;
- The distance of the receiver from the noise sources;
- The impact of atmospheric absorption;
- Potential cumulative effect of numerous equipment operating simultaneously;
- Height corrections were not considered with the entire area assumed at 0m above mean sea level;
- Acoustical characteristics of the ground were not considered and hard ground conditions were modelled.

The noise emission into the environment due to additional road traffic will not be considered in this report due to the low potential of a noise impact on the identified noise sensitive receptors.

6.3 ADEQUACY OF UNDERLYING ASSUMPTIONS

Noise experienced at a certain location is the cumulative result of innumerable sounds emitted and generated both far and close, each in a different time domain, each having a different spectral character at a different sound level. Each of these sounds are also impacted differently by surrounding vegetation, structures and meteorological conditions that result in a total cumulative noise level represented by a few numbers on a sound level meter. As previously mentioned, it is not the purpose of noise modelling to accurately determine a likely noise level at a certain receptor, but to calculate a noise rating level that is used to identify potential issues of concern from the proposed development.

6.4 UNCERTAINTIES OF INFORMATION PROVIDED

While it is difficult to define the character of a measured noise in terms of numbers (third octave sound power levels), it is difficult to accurately model noise levels at a receptor from any operation. The projected noise levels are the output of a numerical model with the accuracy depending on the assumptions made during the setup of the model. Assumptions include:

- The octave sound power levels selected for processes and equipment accurately represent the sound character and power levels of this processes/equipment. The determination of these levels in itself is subject to errors, limitations and assumptions with any potential errors carried over to any model making use of these results;
- Sound power emission levels from processes and equipment change depending on the load the process and equipment is subject too. While the octave sound power level is the average (equivalent) result of a number of measurements, this measurement relates to a period that the process or equipment was subject to a certain load. Normally these measurements are collected when the process or equipment is under high load. The result is that measurements generally represent a worse-case scenario;
- During the scoping phase it is unknown which exact processes and equipment will be operational (and when operational and for how long), modelling considers a scenario where all processes and equipment are under full load for a set time period. Modelling assumptions complies with the precautionary principle and operational time periods, sound power levels and number of equipment operational are frequently overestimated. The result is that projected noise levels would likely over-estimate actual noise levels;
- Ambient sound levels vary over time of day, season and largely depend on the complexity and development character of the surrounding environment. To allow the calculation of change in ambient sound levels, a potential ambient sound level of 20 dBA is assumed. This level represents a very quiet environment.
- Modelling cannot capture the potential impulsive or tonal character of a noise that can increase the potential nuisance factor.
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify;
- Acoustical characteristics of the ground are over-simplified with ground conditions accepted as uniform. Considering hard ground conditions will project a worst-case scenario.

7 PROJECTED NOISE RATING LEVELS

7.1 CONSTRUCTION PHASE NOISE IMPACT

Construction activities are highly variable, taking place at different locations, using various equipment, each piece of equipment operating under a different load. As a result, noises generated during the construction phase are highly variable and cannot be defined. The approach taken in this assessment is to assume a number of construction activities at numerous locations using various equipment, all operating at full load.

This is an unrealistic scenario, and will represent a worst-case situation. Construction activities take place in various phases, with the first equipment normally a grader to start with site clearing, building up as more equipment is delivered and construction activities proceeds. Typical equipment that is used on a project site includes:

- Numerous road trucks that deliver various construction equipment;
- Earthworks using a combination of one or more graders, bulldozers, excavators and front-end-loaders for the clearing of vegetation, the levelling of the ground surface as well as the developing access roads;
- The development of laydown areas for equipment and material;
- Dump or road trucks to deliver road building material as well as equipment used in road construction (grader, vibratory steel drum roller, bitumen sprayer, paver, roller and water truck);
- The use of one or more backhoe-loaders for the digging of trenches, foundations and assist in the installation of security fencing;
- Piling activities if required;
- The development of onsite batching plants or the delivery of ready-mix concrete using trucks, formwork, rebar construction and the pouring of concrete;
- Construction of buildings and installation of power generation structures and components (road trucks, cranes, welding, various impulsive sounds);
- Cleaning of site, loading and removal of unused construction equipment.

As the project will take place in phases, the construction of the second phase will coincide with the operation of phase 1 equipment. The general arrangement of infrastructure for the proposed power station is presented in **Figure 7-1**, with the location of the conceptual construction noise sources indicated in **Figure 7-2**⁶. The contours of construction noise rating levels are presented in **Figure 7-3** (day) and **Figure 7-4** (night).

⁶ General noise represents a number of equipment operating simultaneously.

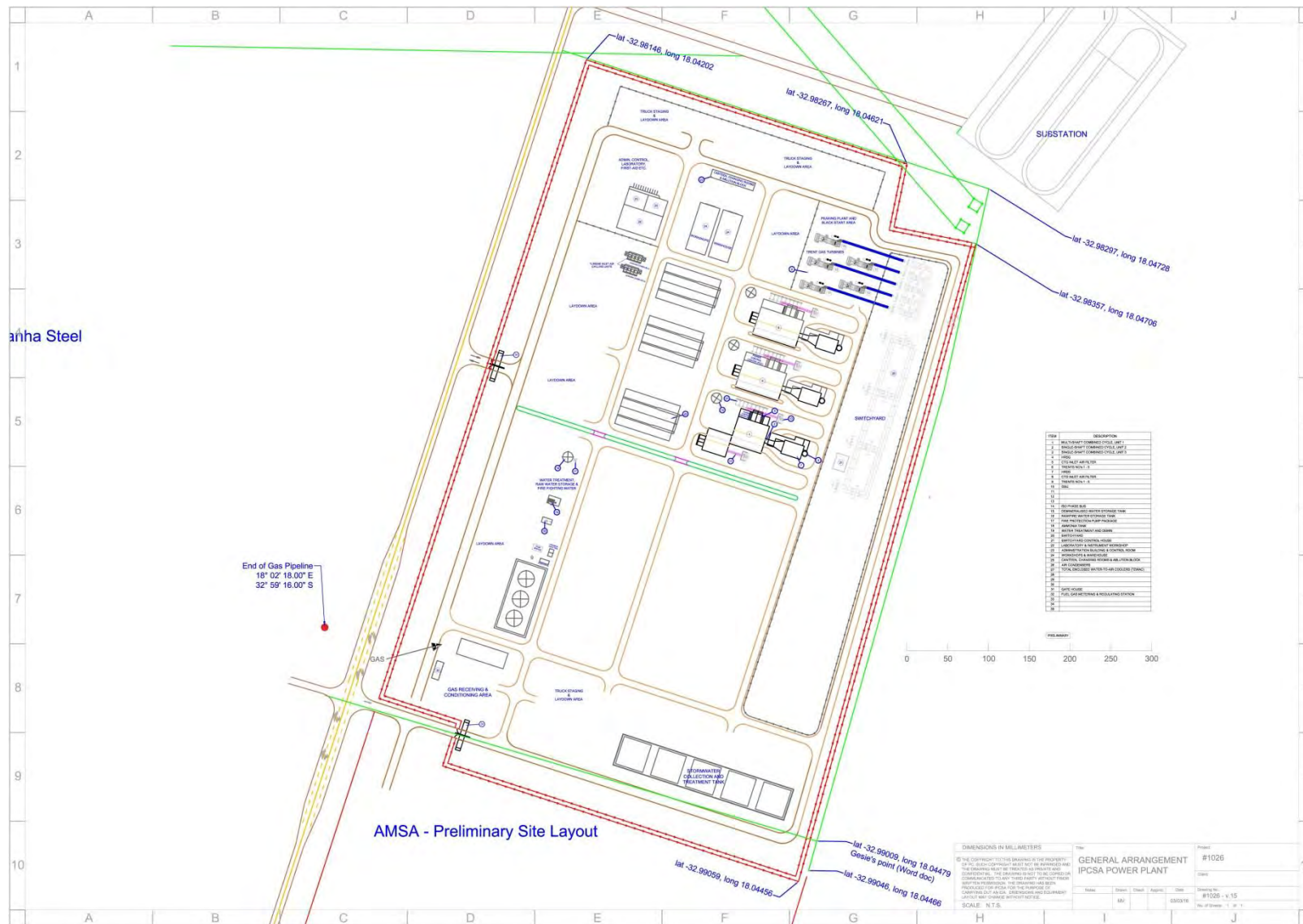


Figure 7-1: Layout as conceptualised and evaluated – General Arrangement IPCSA Power Plant



Figure 7-2: Location of construction activities as conceptualized and evaluated

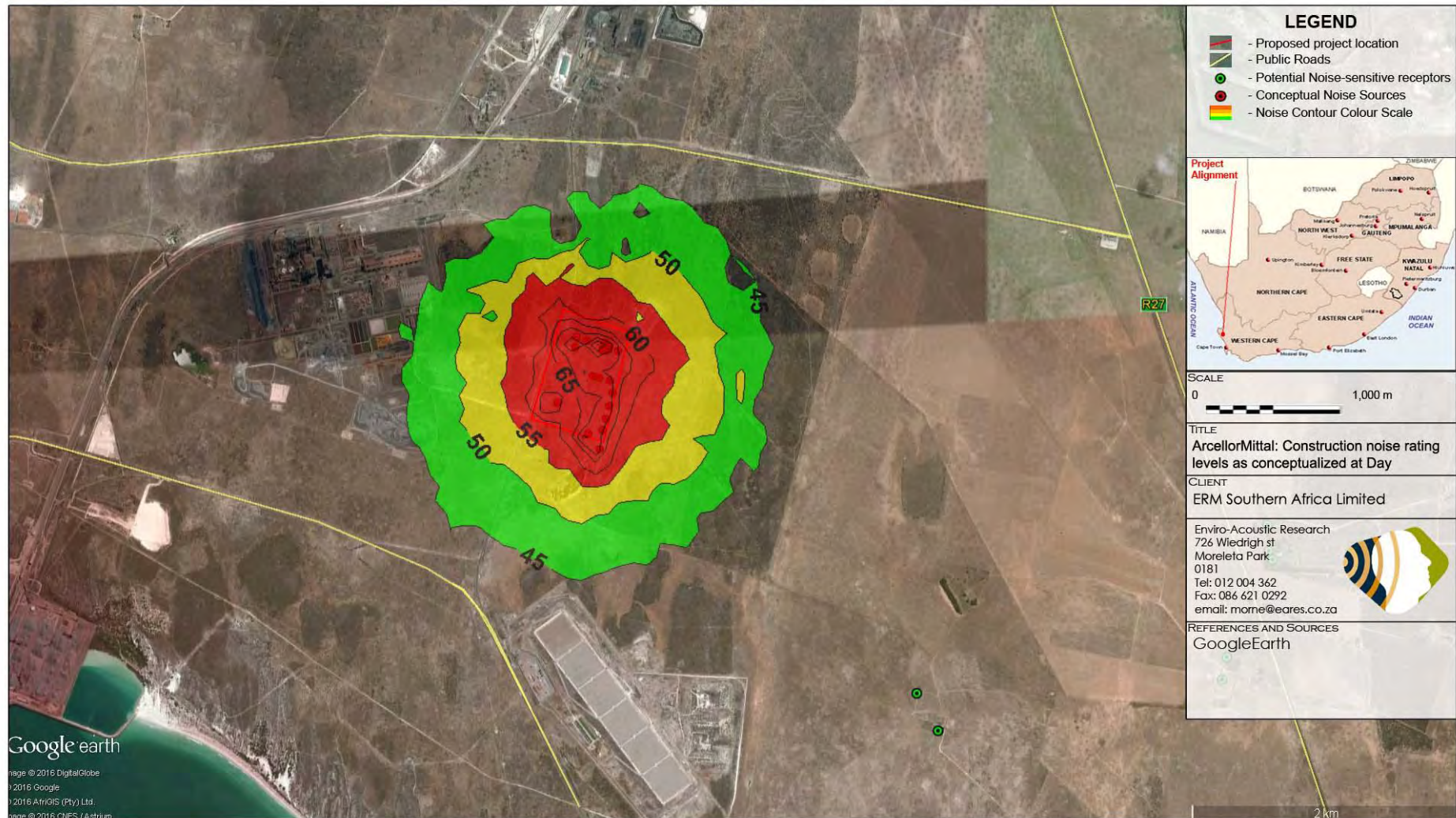


Figure 7-3: Contours of Noise Rating Levels for daytime construction activities

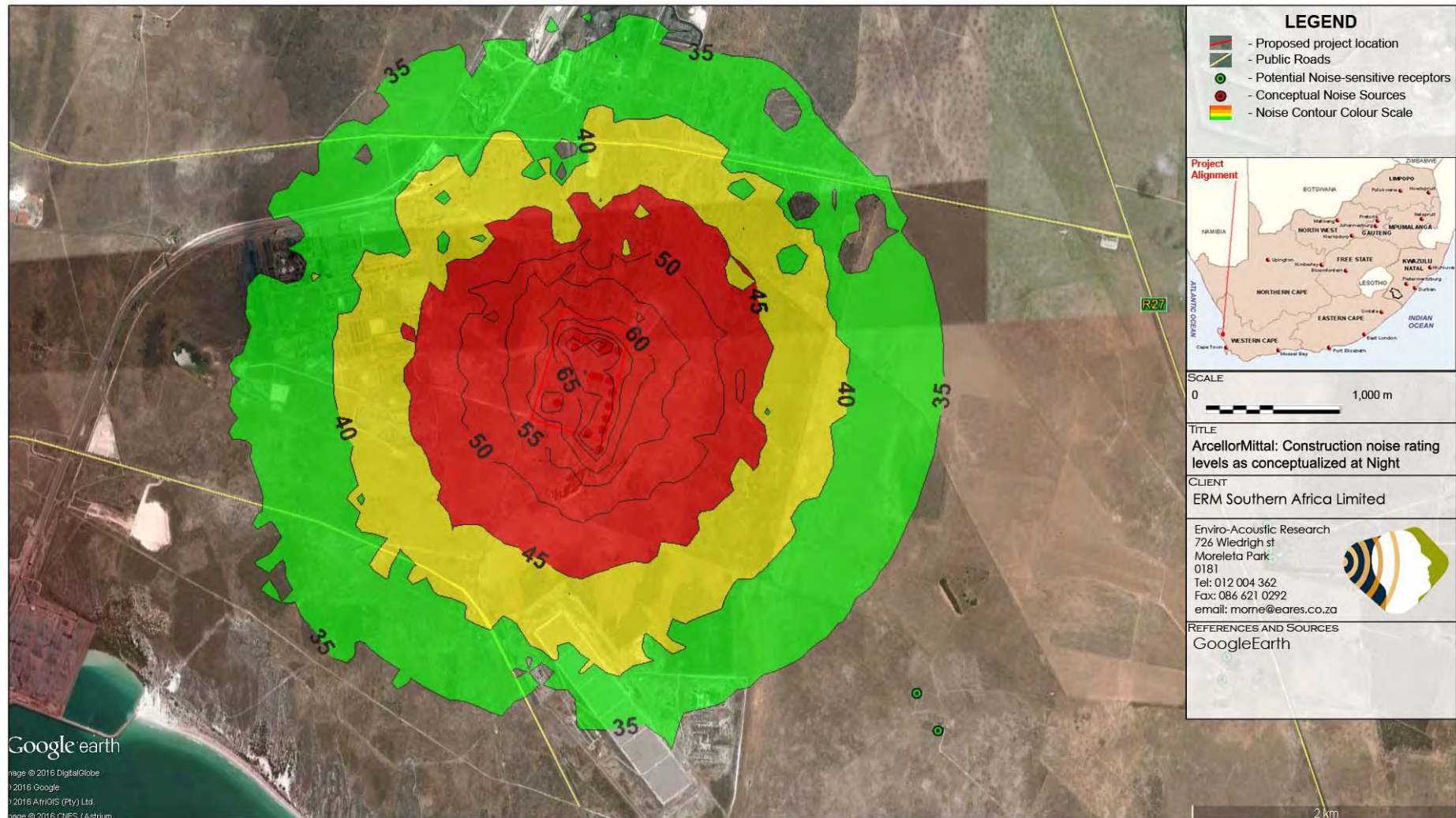


Figure 7-4: Contours of Noise Rating Levels for night-time construction activities

7.2 OPERATIONAL PHASE NOISE IMPACT

The project will be developed in two phases, with phase one including the construction and operation of:

- Five Siemens Trent60 50MW open cycle gas turbines for peak power generation (six will be constructed with one turbine as backup) and ancillary equipment.

Phase 2 will be the addition of:

- Three complete Siemens SGT5-4000F combined cycle power plant (gas turbines, heat recovery boilers, steam turbines, steam turbine condensers) and ancillary equipment.

The daytime period however, was not considered for the EIA because noise generated during the day by the power plant may be masked by other noises from a variety of sources surrounding potentially noise-sensitive developments. However, times when a quiet environment is desired (at night for sleeping, weekends etc.) ambient sound levels are more critical. The time period investigated therefore would be a quieter period, normally associated with the 22:00 – 06:00 timeslot.

The model considers the following input constants:

- Air temperature of 20°C, humidity of 80% and air pressure of 100 kPa;
- Ground surface is 50% acoustically absorbent for the entire area, and;
- Windless conditions (worst-case scenario as the predominant wind will increase ambient sound levels and assist in the refraction of noise away from the closest NSD).

7.2.1 Worse-case scenario – Peak Power

This scenario consider the operation of all the turbines simultaneously, including all three Siemens SGT5-4000F 435 MW open cycle power plants and the five Trent60 gas turbines. Noise sources include:

- Intake air filters (assuming a bank of fans) on the SGT5 and the Trent60 plants;
- Cooling fans located on the enclosed water-to-air coolers on the SGT5 plant;
- The exhaust stack on the SGT5 and the Trent60 plants
- Fans located at the Turbine Inlet Air Chilling Units, and;
- The gas turbine and generator (located inside a structure).

Conceptual noise sources are represented in **Figure 7-5** with the projected contours of noise rating levels presented in **Figure 7-6**.

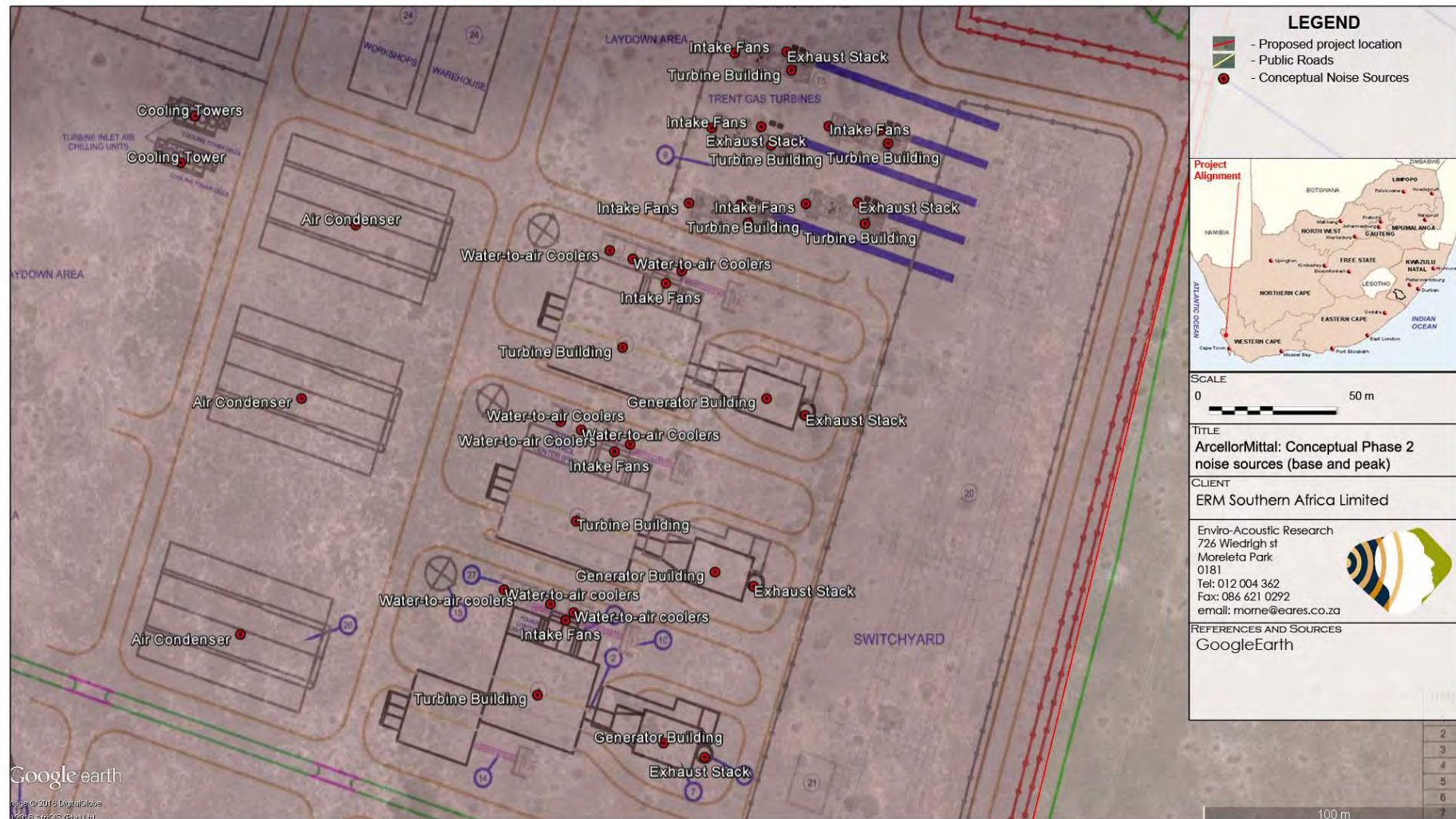


Figure 7-5: Conceptual Noise Sources – Operation Phase 2 (Peak Power with all equipment operating at night)

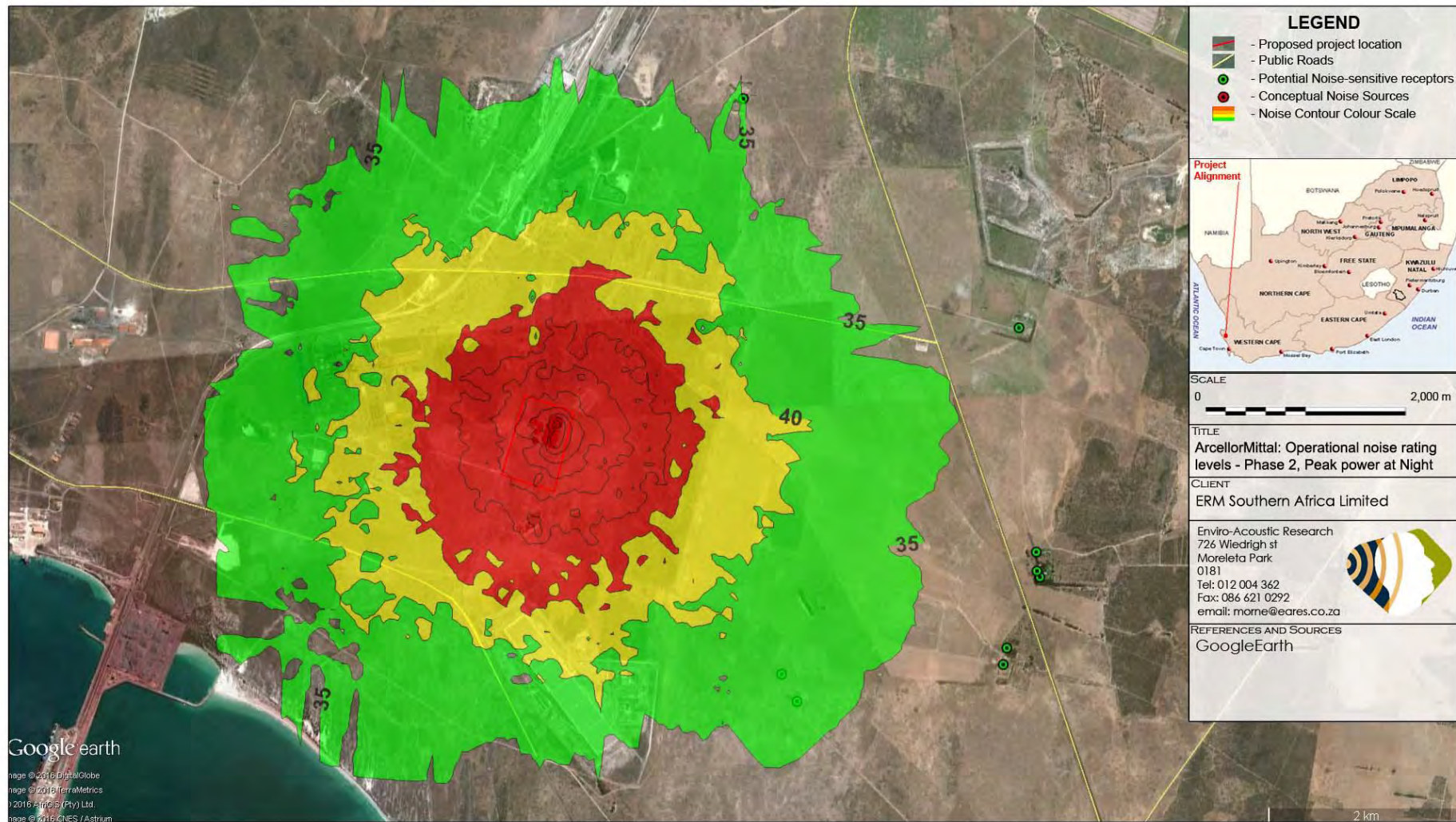


Figure 7-6: Contours of constant noise levels – Operational activities for peak power generation, phase 2

8 SIGNIFICANCE OF THE NOISE IMPACT

8.1 CONSTRUCTION PHASE NOISE IMPACT

The impact assessment for the various activities defined in **Section 4.1** and assessed in **Section 7.1** that can create noise and may impact on the surrounding environment is summarized in **Table 8-1**.

Table 8-1: Impact Assessment: Daytime Construction Activities at Power Plant

Construction activities may increase the ambient sound levels in the vicinity of the project during the day.		
Criterion	Rating	Comment
Nature	Negative	The project will result in changes in the ambient sound levels in the vicinity of project.
Type	Direct	Construction sounds will affect the project and surrounding areas.
Duration	Short-term	The impact will be short-term (construction phase), but will extent into the operational of phase 1.
Extent	Local	The sound will be audible up to 1,000m (quiet times) from potential construction activities.
Scale	Low	Increases in sound levels will impact the project footprint and up to 1,000m from the construction activities. It will impact the surrounding area.
Frequency	Constant	Construction noises will occur as long as construction activities take place.
Magnitude	Negligible	The change in ambient sound levels at the surrounding potential noise-sensitive receptors will be negligible.
Receptor Sensitivity	Medium to high	It is assumed that receptors in the area are sensitive to noise.
Confidence in assessment	High	Considering the conceptualized construction activities, the location of the activities and the worst-case scenario as evaluated confidence levels is high.
Significance	Negligible	The significance of the noise impact during daytime construction activities will be negligible.

Table 8-2: Impact Assessment: Night-time Construction Activities

Construction activities may increase the ambient sound levels in the vicinity of the plant.		
Criterion	Rating	Comment
Nature	Negative	The project will result in changes in the ambient sound levels in the vicinity of project.
Type	Direct	Construction sounds will affect the project and surrounding areas.
Duration	Short-term	The impact will be short-term (construction phase), but will extent into the operational of phase 1.
Extent	Local	The sound will be audible up to 3,000 m (quiet times) from potential construction activities, especially impulsive noises.
Scale	Low	Increases in sound levels will impact the project footprint and up to 2,500m from the construction activities. It will impact the surrounding area.
Frequency	Constant	Construction noises will occur as long as construction activities take place.
Magnitude	Negligible	The change in ambient sound levels at the surrounding potential noise-sensitive receptors will be negligible.
Receptor Sensitivity	Medium to high	The receptors in the area are sensitive to noise.
Confidence in assessment	High	Considering the conceptualized construction activities, the location of the activities and the worst-case scenario as evaluated confidence levels is high.
Significance	Negligible	The significance of the noise impact during night-time construction activities will be negligible.

8.2 OPERATIONAL PHASE NOISE IMPACT

The impact assessment for the various activities defined in **Section 4.2** and calculated in **section 7.2** could increase the ambient noise levels in the area. The noise impact is assessed and summarized in the following **Table 8-3**. Only the night-time scenario was assessed as this is the most critical time period when a quiet environment is desired.

Table 8-3: Impact Assessment: Operational Activities – Phase 1, Base Power

Operational noise from night-time power generation may increase the ambient sound levels at night.		
Criterion	Rating	Comment
Nature	Negative	The project may result in slight changes in the ambient sound levels in the surrounding environment.
Type	Direct	Power generation sounds will affect the area around the project.
Duration	Long-term	The impact will be long-term (full operational phase).
Extent	Local	The sound could be audible up to 3,000 m from the power plant.
Scale	Low	Increases in sound levels will impact the project footprint and an area up to 3,000m from the activity.
Frequency	Constant	Operational noises will occur for the duration of power generation activities.
Magnitude	Negligible	The change in ambient sound levels will be negligible at the closest noise-sensitive receptors.
Receptor Sensitivity	Medium to high	The receptors are in the area are likely sensitive to noise.
Confidence in assessment	High	Worse-case scenario assessed that project noise levels would be 3 – 5 dBA higher than the actual operational noise level.
Significance	Negligible	The noise impact during operation will be negligible for the closest noise-sensitive receptors.

Table 8-4: Impact Assessment: Operational Activities – Phase 1, Peak Power

Operational noise from night-time power generation may increase the ambient sound levels at night.		
Criterion	Rating	Comment
Nature	Negative	The project may result in slight changes in the ambient sound levels in the surrounding environment.
Type	Direct	Power generation sounds will affect the area around the project.
Duration	Long-term	The impact will be long-term (full operational phase).
Extent	Local	The sound could be audible up to 3,000 m from the power plant.
Scale	Low	Increases in sound levels will impact the project footprint and an area up to 3,000m from the activity.
Frequency	Constant	Operational noises will occur for the duration of power generation activities.
Magnitude	Negligible	The change in ambient sound levels will be negligible at the closest noise-sensitive receptors.
Receptor Sensitivity	Medium to high	The receptors are in the area are likely sensitive to noise.
Confidence in assessment	High	Worse-case scenario assessed that project noise levels would be 3 – 5 dBA higher than the actual operational noise level.
Significance	Negligible	The noise impact during operation will be negligible for the closest noise-sensitive receptors.

Table 8-5: Impact Assessment: Operational Activities – Phase 2, Base Power

Operational noise from night-time power generation may increase the ambient sound levels at night.		
Criterion	Rating	Comment
Nature	Negative	The project may result in slight changes in the ambient sound levels in the surrounding environment.
Type	Direct	Power generation sounds will affect the area around the project.
Duration	Long-term	The impact will be long-term (full operational phase).
Extent	Local	The sound could be audible up to 3,000 m from the power plant.
Scale	Low	Increases in sound levels will impact the project footprint and an area up to 3,000m from the activity.
Frequency	Constant	Operational noises will occur for the duration of power generation activities.
Magnitude	Negligible	The change in ambient sound levels will be negligible (just higher than 35 dBA at NSD01 and NSD02) compared to ambient sound levels of around 40 – 45 dBA.
Receptor Sensitivity	Medium to high	The receptors are in the area are likely sensitive to noise.
Confidence in assessment	High	Worse-case scenario assessed that project noise levels would be 3 – 5 dBA higher than the actual operational noise level.
Significance	Minor	The noise impact during operation will be minor for the closest noise-sensitive receptors.

Table 8-6: Impact Assessment: Operational Activities – Phase 2, Peak Power

Operational noise from night-time power generation may increase the ambient sound levels at night.		
Criterion	Rating	Comment
Nature	Negative	The project may result in slight changes in the ambient sound levels in the surrounding environment.
Type	Direct	Power generation sounds will affect the area around the project.
Duration	Long-term	The impact will be long-term (full operational phase).
Extent	Local	The sound could be audible up to 3,000 m from the power plant.
Scale	Low	Increases in sound levels will impact the project footprint and an area up to 3,000m from the activity.
Frequency	Constant	Operational noises will occur for the duration of power generation activities.
Magnitude	Negligible	The change in ambient sound levels will be small (just higher than 35 dBA at NSD01 (36 dBA) and NAS02 (37 dBA)).
Receptor Sensitivity	Medium to high	The receptors are in the area are likely sensitive to noise.
Confidence in assessment	High	Worse-case scenario assessed that project noise levels would be 3 – 5 dBA higher than the actual operational noise level.
Significance	Minor	The noise impact during operation will be minor for the closest noise-sensitive receptors.

8.3 DECOMMISSIONING PHASE NOISE IMPACT

Final decommissioning activities will have a noise impact lower than either the construction or operational phases. This is because decommissioning and closure activities normally take place during the day using minimal equipment (due to the decreased urgency of the project). While there may be various activities, there is a very small risk for a noise impact.

8.4 CUMULATIVE NOISE IMPACT

Ambient sound levels is the cumulative effect of sound from sources both near and far, natural and man-made, with each sound being a complex mix of air pressure in different phases (with various interaction) with different spectral or transient character. As such the sounds we hear are generally the cumulative effect of numerous other sounds, with certain sounds dominating.

However, audibility does not necessary mean that there is a noise impact. In reality, sound sources only contribute significant levels to the soundscape if the levels are at least 3 dBA higher than the typical ambient sound levels. For an industrial activity or road traffic it requires the activity to be relative close to a receptor (depends on the character and magnitude of the noise source).

If noise-generating activities are further than 2,000 – 4,000m from a potential noise-sensitive receptor, the magnitude of noises levels are generally low, decreasing the further the activity are located from the receptor(s) up to a point where it becomes inaudible at all times (when further than 10,000m it should be inaudible for most industry). Therefore, to significantly contribute to the soundscape, or the cumulative sound level, activities should be located closer than 2,000m.

At the closest receptor (NSD02), the dominating sounds were due to noises from the house as well as natural sounds. Sounds of passing traffic (on the R27) and from the Saldanha Steel operation was audible at times but not dominant (definitely less than 3 dBA from the typical ambient sound levels).

Other industries that may contribute sounds include:

- The Namakwa Sands plant (source of broadband noises mainly);
- SALKOR railway shunting yard (potential source of transient noises);

- Saldanha Oil Storage (quiet, broadband noises at times during pumping).

These activities however are all further then 2,000m from receptor NSD02, with the proposed Saldanha Power Plant being almost 4,000m from NSD09. At NSD09 the dominant sound will be from the SALKOR and Namakwa Sands operations, less from the R27 with the proposed power plant being too far from NSD09 to cumulatively add any significant sound levels to the ambient levels at NSD09.

Considering the ambient sound levels (between 40 and 45 dBA) measured at NSD02 as well as the projected noise levels from the proposed power plant (around 37 dBA at peak) and the potential cumulative noises levels from other industries in the area will even be less. The risk of cumulative noise impacts will be low as defined in **Table 8-7**.

Table 8-7: Impact Assessment: Operational Activities – Potential Cumulative

Operational noises from the power plant will, together with noises from various other activities (industry and roads), cumulatively increase the ambient sound levels		
Criterion	Rating	Comment
Nature	Negative	The project may cumulatively add to the ambient sound levels in the surrounding environment.
Type	Direct	Power generation sounds will affect the area around the project.
Duration	Long-term	The impact will be long-term (full operational phase).
Extent	Local	The sound could cumulatively add the ambient sound levels up to 4,000m from the power plant (NSD02 and NSD09).
Scale	Low	Cumulatively increases in sound levels could impact the project footprint and up to 4,000m from the activity.
Frequency	Constant	Operational noises will occur for the duration of power generation activities.
Magnitude	Negligible	The cumulative addition will be low at NSD02 and NSD09 and insignificant to people located further from the activity.
Receptor Sensitivity	Medium to high	The receptors are in the area are likely sensitive to noise.
Confidence in assessment	High	Worse-case scenario assessed that project noise levels would be 3 – 5 dBA higher than the actual operational noise level.
Significance	Minor	The noise impact during operation will be minor for the closest noise-sensitive receptors.

9 EVALUATION OF ALTERNATIVES

9.1 ALTERNATIVE 1: NO-GO OPTION

The ambient sound levels will remain as is.

9.2 ALTERNATIVE 2: PROPOSED POWER GENERATION ACTIVITIES

The proposed activities (worse-case evaluated) will likely be audible. Therefore, in terms of acoustics there is no benefit to the surrounding environment (closest receptors). It is however difficult to assume how surrounding receptors may perceive the project, as there are numerous factors that will influence the attitude of receptors to the project.

However, the project will greatly assist in the economic growth and development challenges South Africa is facing by means of assisting in providing electricity, employment and other business opportunities. People in the area that is not directly affected by increased noises will have a positive perception of the project.

10 MITIGATION OPTIONS

10.1 CONSTRUCTION PHASE MITIGATION MEASURES

The study considers the potential noise impact on the surrounding environment due to construction activities during the day and potentially the night-time periods. It was determined that the potential noise impact would be of negligible significance and mitigation measures are not required or recommended.

10.1.1 Mitigation options available to reduce Construction Noise Impact

No mitigation options are proposed due to the low risk of a noise impact to occur during the construction phase. The developer is implementing the following mitigation measures to minimize construction noises:

- During construction the larger steam pipelines, being uncoated, will be internally ‘steel-brushed’ before being assembled. This may reduce total ‘blow-out’ time.
- For safety valve testing, there is no mitigation procedure other than advising people, close to the facility a day in advance, of the times during which high noise levels would be generated, and recommending any recommended ear safety procedures if warranted.

10.2 OPERATIONAL MITIGATION MEASURES

10.2.1 Mitigation options available to reduce Operational Noise Impact

The significance of noise during the operational phase is negligible and additional mitigation measures are not required. The developer will implement the following mitigation measures to minimise potential operational noises:

- Proper stack and ducting design, verified by finite element analysis of the various exhaust path sections;
- Nullifying the potential amplification of pulsating exhaust disturbances by incorporating sound attenuation lining within the flue stacks itself;
- Increased stack diameter and reduced exhaust stack temperature through better, more efficient heat recovery and HRSG design.
- The power plant is located in a slight depression. Areas outside the 1.5 km circle are shielded from any potential noise by rising land.
- The use of sound attenuation in the buildings that will house noise generating equipment.

10.3 MITIGATION MEASURES TO MANAGE CUMULATIVE IMPACTS

The mitigation of potential impacts due to cumulative noises is mainly a function of government. It is generally managed with strategic development frameworks and long-term planning that can define acceptable areas for certain land uses, considering the feasibility of existence close to each other.

This can include, amongst others the planning and development of special industrial zones where heavy industry can be developed with a buffer area of at least 2,000m around these zones. No residential developments should be allowed within these buffer areas without special permission.

10.4 DECOMMISSIONING PHASE MITIGATION MEASURES

10.4.1 Mitigation options available to reduce Decommissioning Noise Impact

The significance of noise during the decommissioning phase would be similar as the construction phase, if the development character stays similar as the current character. It would remain low and additional mitigation measures will not be required.

10.5 SPECIAL CONDITIONS

10.5.1 Mitigation options that should be included in the EMP

No mitigation measures are recommended for inclusion in the Environmental Management Programme.

10.5.2 Special conditions that should be included in the Environmental Authorization

No special conditions are recommended for inclusion in the Environmental Authorization.

11 ENVIRONMENTAL MANAGEMENT OBJECTIVES

Environmental Management Objectives are difficult to be defined for noise because ambient sound levels would in any event slowly increase as developmental pressures increase in the area. This is due to increased traffic associated with increased development, human habitation, agriculture and even eco-tourism. While these increases in ambient sound levels may be low (and insignificant) it has the effect of cumulatively increasing the ambient sound levels.

The moment the power generation plant stops operation, ambient sound levels will drop to levels similar to the pre-plant levels, or to new levels (typical of other areas with a similar developmental character) if other development has occurred in the interim.

12 ENVIRONMENTAL MONITORING PLAN

Environmental Noise Measurement can be divided into two distinct categories, namely:

- Passive measuring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active measuring – the measurement of noise levels at identified locations.

No active environmental noise monitoring is recommended due to the low significance for a noise impact to develop. Currently there are no people living sufficiently close (within 2,000m) to the power plant where increased sound levels may impact significantly on them, although, this may change in the future. Then, should a reasonable and valid complaint about noise be registered, it is the responsibility of the developer to investigate this complaint as per the following sections. It is recommended that the noise investigation be done by an independent acoustic consultant.

While this section recommends a noise monitoring programme, it should be used as a guideline as site specific conditions may require that the monitoring locations, frequency or procedure be adapted.

12.1 MEASUREMENT LOCALITIES AND PROCEDURES

12.1.1 Measurement Localities

No routine noise measurements or locations are recommended. Noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint. The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading. A second instrument should ideally be deployed at a control point close to the potential noise source during the measurement period.

12.1.2 Measurement Frequencies

Once-off measurements if and when a reasonable and valid noise complaint is registered. Results and feedback must be provided to the complainant. If required and recommended by an acoustic consultant, there may be follow-up measurements or a noise monitoring programme can be implemented.

12.1.3 Measurement Procedures

Ambient sound measurements should be collected as defined in SANS 10103:2008. Due to the variability that naturally occurs in sound levels at most locations, it is recommended that semi-continuous measurements are conducted over a period of at least 24 hours, covering at least a full day- (06:00 – 22:00) and night-time (22:00 – 06:00) period. Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{Aeq,l}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit). Spectral frequencies should also be measured to define the potential origin of noise. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

12.2 RELEVANT STANDARD FOR NOISE MEASUREMENTS

Noise measurements must be conducted as required by the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008. It should be noted that the SANS standard also refers to a number of other standards.

12.3 DATA CAPTURE PROTOCOLS

12.3.1 Measurement Technique

Noise measurements must be conducted as required by the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008.

12.3.2 Variables to be analysed

Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{Aeq,l}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit). Noise levels should be co-ordinated with the 10-m wind speed. Spectral frequencies should also be measured to define the potential origin of noise.

12.3.3 Database Entry and Backup

Data must be stored unmodified in the electronic file saved from the instrument. This file can be opened to extract the data to a spread sheet system to allow the processing of

the data and to illustrate the data graphically. Data and information should be safeguarded from accidental deletion or corruption.

12.3.4 Feedback to Receptor

A measurement report must be compiled considering the requirements of the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008. The facility must provide feedback to the potential noise-sensitive receptors using the channels and forums established in the area to allow interaction with stakeholders, alternatively in a written report.

12.4 STANDARD OPERATING PROCEDURES FOR REGISTERING A COMPLAINT

When a noise complaint is registered, the following information must be obtained:

- Full details (names, contact numbers, location) of the complainant;
- Date and approximate time when this non-compliance occurred;
- Description of the noise or event;
- Description of the conditions prevalent during the event (if possible).

13 CONCLUSIONS AND RECOMMENDATIONS

Enviro-Acoustic Research CC was contracted to conduct an Environmental Noise Impact Assessment (ENIA) to determine the potential noise impact on the surrounding environment due to the development of Independent Gas Power Plant near Saldanha, Western Cape Province.

Ambient sound levels were measured at one location for a two night-time period during May 2016 using a class-1 Sound Level Meter. The sound level meters would measure **“average” sound levels over a 10 minutes period, save the data and start with a new 10 minute measurement** till the instrument was stopped. This data was also augmented with additional measurements at three locations during the day and night.

Longer term measurements indicated a location with a complex sound character, where the cumulative combination of natural (ocean and wind) and anthropogenic (sounds from the house, road traffic and Saldanha Steel) sounds resulted in an elevated ambient sound level more typical of an urban area.

Short term measurements indicated ambient sound levels typical of an urban noise district (with main roads, business and workshops) closer to the project site. Daytime ambient sound levels are higher, mainly due to road traffic, although wind-induced noises also contributed to the ambient sound levels. Short term measurements away from roads, business and residential dwellings indicate an area with the potential to be very quiet.

A SANS 10103:2008 rating typical of an urban noise district (at the closest receptors) was assigned due to the character of the area. Therefore, the criteria used to evaluate the potential of a noise impact included:

- The projected noise rating levels when compared to the SANS 10103:2008 rating level of 45 dBA (52 dBA for a disturbing noise);
- The potential change in ambient sound levels, with a change less than 3 dB ideal.

The projected noise rating levels were calculated using a sound propagation model. Conceptual scenarios were developed for a construction and four scenarios during the operational phase with the output of the modelling exercise indicated that there is

negligible risk of a noise impact for both the construction and operational phases. This would be even less for the decommissioning phase.

While the maximum projected noise rating level could be as high as 36 dBA (at NSD02) during peak operation once fully commissioned, this is significantly less than the night-time ambient sound level and the potential noise impact is considered insignificant. The change in ambient sound levels is expected to be significantly less than 3 dBA at all the surrounding noise-sensitive receptors.

Mitigation is not required due to the low significance of a noise impact, neither is a routine noise measurement programme recommended. Measurement locations, frequencies and procedures are provided as a guideline for the developer to consider should there be a noise complaint if people in the future settle closer than 2,000m from the plant (unlikely as the land belongs to ArcelorMittal).

Due to economic and environmental advantages, power generation does provide valuable employment and business opportunities. It must be noted when such projects are close to potential noise-sensitive receptors, consideration must be given to ensuring a compatible co-existence.

This does not suggest that the sound from the facility should not be audible under all circumstances as this is an unrealistic expectation that is not required or expected from any other agricultural, commercial, industrial or transportation related noise source, – but rather that the sound due to the power generation activities should be at a reasonable level in relation to the ambient sound levels.

While this project will have a noise impact of a number of the closest noise-sensitive receptors, these impacts are of low significance and can be considered insignificant.

It is therefore the opinion of the Author that the increases in noise levels are of minor significance. It is therefore the recommendation that the project should be authorised (from a noise impact perspective).

14 THE AUTHOR

The Author started his career in the mining industry as a bursar Learner Official (JCI, Randfontein), working in the mining industry, doing various mining related courses (Rock Mechanics, Surveying, Sampling, Safety and Health [Ventilation, noise, illumination etc] and Metallurgy. He did work in both underground (Coal, Gold and Platinum) as well as opencast (Coal) for 4 years. He changed course from Mining Engineering to Chemical Engineering after his second year of his studies at the University of Pretoria.

After graduation he worked as a Water Pollution Control Officer at the Department of Water Affairs and Forestry for two years (first year seconded from Wates, Meiring and Barnard), where duties included the perusal (evaluation, commenting and recommendation) of various regulatory required documents (such as EMPR's, Water Licence Applications and EIA's), auditing of licence conditions as well as the compilation of Technical Documents.

Since leaving the Department of Water Affairs, Morné has been in private consulting for the last 15 years, managing various projects for the mining and industrial sector, private developers, business, other environmental consulting firms as well as the Department of Water Affairs. During that period he has been involved in various projects, either as specialist, consultant, trainer or project manager, successfully completing these projects within budget and timeframe. During that period he gradually moved towards environmental acoustics, focusing on this field exclusively since 2007.

He has been interested in acoustics as from school days, doing projects mainly related to loudspeaker design. Interest in the matter brought him into the field of Environmental Noise Measurement, Prediction and Control. He has been doing work in this field for the past 8 years, and was involved with the following projects in the last few years:

Wind Energy Facilities

Zen (Savannah Environmental – SE), Goereesoe (SE), Springfontein (SE), Garob (SE), Project Blue (SE), ESKOM Kleinzee (SE), iNca Gouda (Aurecon SA), Kangnas (Aurecon), Walker Bay (SE), Oyster Bay (SE), Hidden Valley (SE), Happy Valley (SE), Deep River (SE), Saldanha WEF (Terramanzi), Loeriesfontein (SiVEST), Noupoot (SiVEST), Prieska (SiVEST), Plateau East and West (Aurecon), Saldanha (Aurecon), Veldrift (Aurecon), Tsitsikamma (SE), AB (SE), West Coast One (SE), Namakwa Sands (SE), Dorper (SE), VentuSA Gouda (SE), Amakhala Emoyeni (SE), Klipheuwel (SE), Cookhouse (SE), Cookhouse II (SE), Canyon Springs (Canyon Springs), Rhebokfontein (SE), Suurplaat (SE), Karoo Renewables (SE), Outeniqua (Aurecon), Koningaas (SE), Eskom Aberdene (SE), Spitskop (SE), Rhenosterberg (SiVEST), Bannf (Vidigenix), Wolf WEF (Aurecon), Umsinde

	<i>Emoyeni (ARCUS, Komsberg (ARCUS)</i>
Mining and Industry	<i>BECSA – Middelburg (Golder Associates), Kromkrans Colliery (Geovicon Environmental), SASOL Borrow Pits Project (JMA Consulting), Lesego Platinum (AGES), Tweefontein Colliery (Cleanstream), Evraz Vametco Mine and Plant (JMA), Goedehoop Colliery (Geovicon), Hakra Project (Prescali Environmental), Der Brochen Platinum Project (J9 Environment), Delft Sand (AGES), Brandbach Sand (AGES), Verkeerdepan Extension (CleanStream), Dwaalboom Limestone (AGES), Jagdlust Chrome (MENCO), WPB Coal (MENCO), Landau Expansion (CleanStream), Stuart Coal – Weltevreden (CleanStream), Otjikoto Gold (AurexGold), Klipfontein Colliery (MENCO), Imbabala Coal (MENCO), ATCOM East Expansion (Jones and Wagner), IPP Waterberg Power Station (SE), Kangra Coal (ERM), Schoongesicht (CleanStream), EastPlats (CleanStream), Chapudi Coal (Jacana Environmental), Generaal Coal (JE), Mopane Coal (JE), Boshhoek Chrome (JMA), Langpan Chrome (PE), Vlakpoort Chrome (PE), Sekoko Coal (SE), Frankford Power (REMIG), Strahrae Coal (Ferret Mining), Transalloys Power Station (Savannah), Pan Palladium Smelter, Iron and PGM Complex (Prescali)</i>
Road and Railway	<i>K220 Road Extension (UrbanSmart), Boskop Road (MTO), Sekoko Mining (AGES), Davel-Swaziland-Richards Bay Rail Link (Aurecon), Moloto Transport Corridor Status Quo Report and Pre-Feasibility (SiVEST), Postmasburg Housing Development (SE), Tshwane Rapid Transport Project, Phase 1 and 2 (NRM Consulting/City of Tshwane)</i>
Airport	<i>Oudtshoorn Noise Monitoring (AGES), Sandton Heliport (Alpine Aviation), Tete Airport Scoping</i>
Noise monitoring	<i>Peerboom Colliery (EcoPartners), Thabametsi (Digby Wells), Doxa Deo (Doxa Deo), Harties Dredging (Rand Water), Xstrata Coal – Witbank Regional, Sephaku Delmas (AGES), Amakhala Emoyeni WEF (Windlab Developments), Oyster Bay WEF (Renewable Energy Systems), Tsitsikamma WEF (Cennergi and SE), Hopefield WEF (Umoya), Wesley WEF (Innowind), Ncora WEF (Innowind), Boschmanspoort (Jones and Wagner), Nqamakwe WEF (Innowind), Dassiesfontein WEF Noise Analysis (BioTherm), Transnet Noise Analysis (Aurecon), Jeffries Bay Wind Farm (Globeleq)</i>
Small Noise Impact Assessments	<i>TCTA AMD Project Baseline (AECOM), NATREF (Nemai Consulting), Christian Life Church (UrbanSmart), Kosmosdale (UrbanSmart), Louwlandia K220 (UrbanSmart), Richards Bay Port Expansion (AECOM), Babalegi Steel Recycling (AGES), Safika Slag Milling Plant (AGES), Arcelor Mittal WEF (Aurecon), RVM Hydroplant (Aurecon), Grootvlei PS Oil Storage (SiVEST), Rhenosterberg WEF, (SiVEST), Concerto Estate (BPTrust), Ekuseni Youth Centre (MENCO), Kranskop Industrial Park (Cape South Developments), Pretoria Central Mosque (Noman Shaikh), Soshanguve Development (Maluleke Investments), Seshego-D Waste Disposal (Enviroxcellence), Zambesi Safari Equipment (Owner), Noise Annoyance Assessment due to the Operation of the Gautrain (Thornhill and Lakeside Residential Estate), Upington Solar (SE), Ilangaletu Solar (SE), Pofadder Solar (SE), Flagging Trees WEF (SE), Uyekraal WEF (SE), Ruuki Power Station (SE), Richards Bay Port Expansion (AECOM), Babalegi Steel Recycling (AGES), Safika Ladium (AGES), Safika Cement Isando (AGES), Natref (NEMAI), RareCo (SE), Struisbaai WEF (SE), Paulputs CSP (SE)</i>
Project reviews and amendment reports	<i>Loperberg (Savannah), Dorper (Savannah), Penhoek Pass (Savannah), Oyster Bay (RES), Tsitsikamma (Cennergi), Amakhala Emoyeni (Windlab), Spreeukloof (Savannah), Spinning Head (Savannah), Kangra Coal (ERM), West Coast One (Moyeng Energy), Rheboksfontein (Moyeng Energy)</i>

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APPENDIX A

Glossary of Acoustic Terms, Definitions and General Information

1/3-Octave Band	A filter with a bandwidth of one-third of an octave representing four semitones, or notes on the musical scale. This relationship is applied to both the width of the band, and the centre frequency of the band. See also definition of octave band.
A – Weighting	An internationally standardised frequency weighting that approximates the frequency response of the human ear and gives an objective reading that 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 (of proposal). 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 Noise	The all-encompassing sound at a point being composed of sounds from many sources both near and far. It includes the noise from the noise source under investigation.
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. In this report the term Background Ambient Sound Level will be used.
Amplitude Modulated Sound	A sound that noticeably fluctuates in loudness over time.
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.
Attenuation	Term used to indicate reduction of noise or vibration, by whatever method necessary, usually expressed in decibels.
Audible frequency Range	Generally assumed to be the range from about 20 Hz to 20,000 Hz, the range of frequencies that our ears perceive as sound.
Ambient Sound 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.
Broadband Noise	Spectrum consisting of a large number of frequency components, none of which is individually dominant.
C-Weighting	This is an international standard filter, which can be applied to a pressure signal or to a SPL or PWL spectrum, and which is essentially a pass-band filter in the frequency range of approximately 63 to 4000 Hz. This filter provides a more constant, flatter, frequency response, providing significantly less adjustment than the A-scale filter for frequencies less than 1000 Hz.
Controlled area (as per National Noise Control Regulations)	a piece of land designated by a local authority where, in the case of- (a) road transport noise in the vicinity of a road- (i) the reading on an integrating impulse sound level meter, taken outdoors at the end of a period extending from 06:00 to 24:00 while such meter is in operation, exceeds 65 dBA; or (ii) the equivalent continuous “A”-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period extending from 06:00 to 24:00 as calculated in accordance with SABS 0210-1986, titled: “Code of Practice for

	<p>calculating and predicting road traffic noise", published under Government Notice No. 358 of 20 February 1987, and projected for a period of 15 years following the date on which the local authority has made such designation, exceeds 65 dBA;</p> <p>(b) aircraft noise in the vicinity of an airfield, the calculated noisiness index, projected for a period of 15 years following the date on which the local authority has made such designation, exceeds 65 dBA; or</p> <p>(c) industrial noise in the vicinity of an industry-</p> <ul style="list-style-type: none"> (i) the reading on an integrating impulse sound level meter, taken outdoors at the end of a period of 24 hours while such meter is in operation, exceeds 61 dBA; or (ii) the calculated outdoor equivalent continuous "A"-weighted sound pressure level at a height of at least 1,2 metres, but not more than 1,4 metres, above the ground for a period of 24 hours, exceeds 61 dBA;
dB(A)	Sound Pressure Level in decibel that 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	The process whereby an acoustic wave is disturbed and its energy redistributed in space as a result of an obstacle in its path, Reflection and refraction are special cases of diffraction.
Direction of Propagation	The direction of flow of energy associated with a wave.
Disturbing noise	Means a noise level that exceeds the zone sound level or, if no zone sound level has been designated, a noise level that 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 manages 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 that requires authorisation of permission by law and that 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 ($L_{Aeq,T}$)	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 for which the level varies with time.
Equivalent continuous A-weighted rating level ($L_{Req,T}$)	The Equivalent continuous A-weighted sound exposure level ($L_{Aeq,T}$) to which various adjustments has been added. More commonly used as ($L_{Req,d}$) over a time interval 06:00 – 22:00 ($T=16$ hours) and ($L_{Req,n}$) over a time interval of 22:00 – 06:00 ($T=8$ hours). It is a calculated value.
F (fast) time weighting	<p>(1) Averaging detection time used in sound level meters.</p> <p>(2) Fast setting has a time constant of 125 milliseconds and provides a fast</p>

	reacting display response allowing the user to follow and measure not too rapidly fluctuating sound.
Footprint area	Area to be used for the construction of the proposed development, which does not include the total study area.
Free Field Condition	An environment where there is no reflective surfaces.
Frequency	The rate of oscillation of a sound, measured in units of Hertz (Hz) or kiloHertz (kHz). One hundred Hz is a rate of one hundred times per second. The frequency of a sound is the property perceived as pitch: a low-frequency sound (such as a bass note) oscillates at a relatively slow rate, and a high-frequency sound (such as a treble note) oscillates at a relatively high rate.
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 Brownfield suggests that an investigation should be made to determine if environmental damage exists.
G-Weighting	An International Standard filter used to represent the infrasonic components of a sound spectrum.
Harmonics	Any of a series of musical tones for which the frequencies are integral multiples of the frequency of a fundamental tone.
I (impulse) time weighting	(1) Averaging detection time used in sound level meters as per South African standards and Regulations. (2) Impulse setting has a time constant of 35 milliseconds when the signal is increasing (sound pressure level rising) and a time constant of 1,500 milliseconds while the signal is decreasing.
Impulsive sound	A sound characterized by brief excursions of sound pressure (transient signal) that significantly exceed the ambient sound level.
Infrasound	Sound with a frequency content below the threshold of hearing, generally held to be about 20 Hz. Infrasonic sound with sufficiently large amplitude can be perceived, and is both heard and felt as vibration. Natural sources of infrasound are waves, thunder and wind.
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.
Key issue	An issue raised during the Scoping process that has not received an adequate response and that requires further investigation before it can be resolved.
L_{A90}	the sound level exceeded for the 90% of the time under consideration
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.
L_{Amin} and L_{AMax}	Is the RMS (root mean squared) minimum or maximum level of a noise source.
Loudness	The attribute of an auditory sensation that 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 that 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.
Noise-sensitive development	developments that could be influenced by noise such as: a) districts (see table 2 of SANS 10103:2008) 1. rural districts, 2. suburban districts with little road traffic, 3. urban districts, 4. urban districts with some workshops, with business premises, and with main roads, 5. central business districts, and 6. industrial districts; b) educational, residential, office and health care buildings and their surroundings; c) churches and their surroundings; d) auditoriums and concert halls and their surroundings; e) recreational areas; and f) nature reserves. In this report Noise-sensitive developments is also referred to as a Potential Sensitive Receptor
Octave Band	A filter with a bandwidth of one octave, or twelve semi-tones on the musical scale representing a doubling of frequency.
Positive impact	A change that improves the quality of life of affected people or the quality of the environment.
Property	Any piece of land indicated on a diagram or general plan approved by the Surveyor-General intended for registration as a separate unit in terms of the Deeds Registries Act and includes an erf, a site and a farm portion as well as the buildings erected thereon
Public Participation Process	A process of involving the public in order to identify needs, address concerns, choose options, plan and monitor in terms of a proposed project, programme or development
Reflection	Redirection of sound waves.
Refraction	Change in direction of sound waves caused by changes in the sound wave velocity, typically when sound wave propagates in a medium of different density.
Reverberant Sound	The sound in an enclosure which results from repeated reflections from the boundaries.
Reverberation	The persistence, after emission of a sound has stopped, of a sound field within an enclosure.
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, provides reasonable grounds for mitigating measures to be included in the environmental management report. The onus will 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.
S (slow) time weighting	(1) Averaging times used in sound level meters. (2) Time constant of one [1] second that gives a slower response which helps average out the display fluctuations.
Sound Level	The level of the frequency and time weighted sound pressure as determined by

	a sound level meter, i.e. A-weighted sound level.
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 values for the reference sound pressure level are 20 micropascals in air and 100 millipascals in water. SPL is reported as L_p in dB (not weighted) or in various other weightings.
Soundscape	Sound or a combination of sounds that forms or arises from an immersive environment. The study of soundscape is the subject of acoustic ecology. The idea of soundscape refers to both the natural acoustic environment, consisting of natural sounds, including animal vocalizations and, for instance, the sounds of weather and other natural elements; and environmental sounds created by humans, through musical composition, sound design, and other ordinary human activities including conversation, work, and sounds of mechanical origin resulting from use of industrial technology. The disruption of these acoustic environments results in noise pollution.
Study area	Refers to the entire study area encompassing all the alternative routes as indicated on the study area map.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs (Brundtland Commission, 1987).
Tread braked	The traditional form of wheel brake consisting of a block of friction material (which could be cast iron, wood or nowadays a composition material) hung from a lever and being pressed against the wheel tread by air pressure (in the air brake) or atmospheric pressure in the case of the vacuum brake.
Zone of Potential Influence	The area defined as the radius about an object, or objects beyond which the noise impact will be insignificant.
Zone Sound Level	Means a derived dBA value determined indirectly by means of a series of measurements, calculations or table readings and designated by a local authority for an area. This is similar to the Rating Level as defined in SANS 10103:2008.

APPENDIX B

Photos of measurement locations



Photo 1: Measurement location AMSGLTASL01



Photo 2: Measurement location AMSGSTASL01



Photo 3: Measurement location AMSGSTASL02



Photo 4: Measurement location AMSGSTASL03

End of Report