Phakwe Richards Bay Gas Power 3 (Pty) Ltd

NOISE REPORT FOR SCOPING PURPOSES

for the

Proposed Development of an up to 2000 MW Gas to Power Plant near Richards Bay, KwaZulu Natal

Study done for:

savannah environmental

Prepared by:

EARES
Enviro Acoustic Research

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EXECUTIVE SUMMARY

INTRODUCTION AND PURPOSE

Enviro-Acoustic Research cc was commissioned to undertake a specialist study to determine the potential noise impact on the surrounding environment due to the proposed development of a Gas-fired Power Plant near Richards Bay, KwaZulu-Natal.

This report is the result of the (desktop) scoping phase study of the Environmental Impact Assessment (EIA) process investigating the potential noise impact that such a facility may have on the surrounding environment, highlighting methodologies, potential issues to be investigated as well as preliminary findings and recommendations. The report considers a preferred site identified during the screening phase for development in terms of acoustics.

PROJECT DESCRIPTION

Phakwe Richards Bay Gas Power 3 (Pty) Ltd intend on developing an up to 2000MW combined cycle gas to power plant located on various erven within the Richards Bay IDZ phase 1F, Richards Bay, KwaZulu Natal.

The power plant will operate to supply base load and mid-merit duty, and could include several combined cycle gas and steam turbines as well as the required support and ancillary infrastructure.

NOISE IMPACT DETERMINATION AND FINDINGS

With the preliminary data available, this assessment indicated that there is a risk of a noise impact during the construction and operational phases due to the proximity of noise-sensitive receptors to the project site (where noise generating activities may take place).

NEED AND DESIRABILITY OF PROJECT

The proposed activities (worse-case evaluated) may raise the ambient sound levels at the receptors staying within 2,000 m from the closest activities, whether construction or operational. Therefore, in terms of acoustics there may be 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, including direct impacts (noise, air quality, increased traffic, security and safety concerns, etc) and potential benefits (potential employment, other business opportunities).

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 could have a positive perception of the project.

RECOMMENDATIONS

It is recommended that the noise impact be investigated in more detail during the EIA phase, including further ambient sound measurements. Additional information required would be:

- Project design and layout;
- A more accurate description of equipment to be used in and around the proposed power plant and ancillary activities. This would include data such as the type of equipment, but also the number of that equipment to be used.

Information not provided or available will be estimated using internet sources.

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 1**
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	**Section 2** *(also separate document to this report)*
(c) an indication of the scope of, and the purpose for which, the report was prepared; - an indication of the scope of, and age of base data used for the specialist report; - a description of existing impacts of the site, cumulative impacts of the proposed development and levels of acceptable change.	**Section 3.3.1** and **5 Ambient sound levels to be discussed in detail in the Environmental Noise Impact Assessment**
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	**Section 3.3.1**
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	**Section 3.5** and **8.2**
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives;	**Sections 3.4**
(g) an identification of any areas to be avoided, including buffers;	**Figure 3-2**
(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;	**Figure 3-2**
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	**Section 8**
(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 or activities;	**Sections 10** and **12**
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	No comments received (**Section 3.5**)
(q) any other information requested by the competent authority.	Nothing requested

This report should be sited as:

De Jager, M. (2021): "*Noise Report for Scoping Purposes for the Proposed Development of an 1800 MW Gas to Power Plant near Richards Bay, KwaZulu Natal*". Enviro-Acoustic Research CC, Pretoria

Client:

Savannah Environmental (Pty) Ltd
for Phakwe Richards Bay Gas Power 3 (Pty) Ltd

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Report no:

SE-RBSP3/SNR/202110-Rev 0

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Review:

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Date:

October 2021

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GLOSSARY OF ABBREVIATIONS

AADT	Annual Average Daily Traffic
AZSL	Acceptable Zone Sound Level (Rating Level)
EARES	Enviro Acoustic Research cc
ECA	Environment Conservation Act (Act 78 of 1989)
EMP	Environmental Management Plan
FEL	Front End Loader
IDZ	Industrial Development Zone
i.e.	that is
IFC	International Finance Corporation
km	kilometres
LHD	Load haul dumper
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
UTM	Universal Transverse Mercator
WHO	World Health Organisation

1 THE AUTHOR

The Author, Morné de Jager, 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 20 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 13 years, and was involved with the following projects in the last few years:

Wind Energy Facilities	*Full Environmental Noise Impact Assessments for - Bannf (Vidigenix), iNCa Gouda (Aurecon SA), Kangnas (Aurecon), Plateau East and West (Aurecon), Wolf (Aurecon), Outeniqwa (Aurecon), Umsinde Emoyeni (ARCUS) , Komsberg (ARCUS), Karee and Kolkies Wind Farms (ARCUS), Canyon Springs (Canyon Springs), Perdekraal (ERM), Zen (Savannah Environmental – SE), Goereesoe (SE), Springfontein (SE), Garob (SE), Project Blue (SE), ESKOM Kleinzee (SE), Walker Bay (SE), Oyster Bay (SE), Hidden Valley (SE), Happy Valley (SE), Deep River (SE), Tsitsikamma (SE), AB (SE), West Coast One (SE), Hopefield II (SE), Namakwa Sands (SE), VentuSA Gouda (SE), Dorper (SE), Amakhala Emoyeni (SE), Klipheuwel (SE), Cookhouse (SE), Cookhouse II (SE), Rheboksfontein (SE), Suurplaat (SE), Karoo Renewables (SE), Koningaas (SE), Eskom Aberdene (SE), Spitskop (SE), Castle (SE), Khai Ma (SE), Poortjies (SE), Korana (SE), IE Moorreesburg (SE), Gunstfontein (SE), Vredenburg (Terramanzi), Loeriesfontein (SiVEST), Rhenosterberg (SiVEST), Noupoort*

	(SiVEST), Prieska (SiVEST), Dwarsrug (SiVEST), Msenge Emoyeni (Windlab), Isivunguvungu Wind Farm (Aurecon), Graskoppies (SiVEST), Hartebeest Leegte (SiVEST), Ithemba (SiVEST), !Xha Boom (SiVEST), Kokerboom 1 (Aurecon), Kokerboom 2 (Aurecon), Teekloof (Mainstream), Sutherland (CSIR), Rietrug (CSIR), Sutherland 2 (CSIR), Spitskop West (Terramanzi)
Mining and Industry	*Full Environmental Noise Impact Assessments for – Delft Sand (AGES), BECSA – Middelburg (Golder Associates), Kromkrans Colliery (Geovicon Environmental), SASOL Borrow Pits Project (JMA Consulting), Lesego Platinum (AGES), Tweefontein Colliery (Cleanstream Environmental), Evraz Vametco Mine and Plant (JMA), Goedehoop Colliery (Geovicon), Hacra Project (Prescali Environmental), Der Brochen Platinum Project (J9 Environment), Brandbach Sand (AGES), Verkeerdepan Extension (CleanStream Environmental), Dwaalboom Limestone (AGES), Jagdlust Chrome (MENCO), WPB Coal (MENCO), Landau Expansion (CleanStream Environmental), 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 Environmental), EastPlats (CleanStream Environmental), Chapudi Coal (Jacana Environmental), Generaal Coal (JE), Mopane Coal (JE), Glencore Boshoek Chrome (JMA), Langpan Chrome (PE), Vlakpoort Chrome (PE), Sekoko Coal (SE), Frankford Power (REMIG), Strahrae Coal (Ferret Mining), Transalloys Power Station (Savannah), Pan Palladum Smelter, Iron and PGM Complex (Prescali Environmental), Fumani Gold (AGES), Leiden Coal (EIMS), Colenso Coal and Power Station (SiVEST/EcoPartners), Klippoortjie Coal (Gudani), Rietspruit Crushers (MENCO), Assen Iron (Tshikovha), Transalloys (SE), ESKOM Ankerlig (SE), Pofadder CSP (SE), Nooitgedacht Titano Project (EcoPartners), Algoa Oil Well (EIMS), Spitskop Chrome (EMAssistance), Vlakfontein South (Gudani), Leandra Coal (Jacana), Grazvalley and Zoetveld (Prescali), Tjate Chrome (Prescali), Langpan Chromite (Prescali), Vereeniging Recycling (Pro Roof), Meyerton Recycling (Pro Roof), Hammanskraal Billeting Plant 1 and 2 (Unica), Development of Altona Furnace, Limpopo Province (Prescali Environmental), Haakdoorndrift Opencast at Amandelbult Platinum (Aurecon), Landau Dragline relocation (Aurecon), Stuart Coal Opencast (CleanStream Environmental), Tetra4 Gas Field Development (EIMS), Kao Diamonds – Tiping Village Relocation (EIMS), Kao Diamonds – West Valley Tailings Deposit (EIMS), Upington Special Economic Zone (EOH), Arcellor Mittal CCGT Project near Saldanha (ERM), Malawi Sugar Mill Project (ERM), Proposed Mooifontein Colliery (Geovicon Environmental), Goedehoop North Residue Deposit Expansion (Geovicon Environmental), Mutsho 600MW Coal-Fired Power Plant (Jacana Environmentals), Tshivhaso Coal-Fired Power Plant (Savannah Environmental), Doornhoek Fluorspar Project (Exigo)*
Road and Railway	*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), Transnet Apies-river Bridge Upgrade (Transnet), Gautrain Due-diligence (SiVest), N2 Piet Retief (SANRAL), Atterbury Extension, CoT (Bokomoso Environmental)*
Airport	*Oudtshoorn Noise Monitoring (AGES), Sandton Heliport (Alpine Aviation), Tete Airport Scoping (Aurecon)*
Noise monitoring and Audit Reports	*Peerboom Colliery (EcoPartners), Thabametsi (Digby Wells), Doxa Deo (Doxa Deo), Harties Dredging (Rand Water), Xstrata Coal – Witbank Regional (Xstrata), Sephaku Delmas (AGES), Amakhala Emoyeni WEF (Windlab Developments), Oyster Bay WEF (Renewable Energy Systems), Tsitsikamma WEF Ambient Sound Level study (Cennergi and SE), Hopefield WEF (Umoya), Wesley WEF (Innowind), Ncora WEF (Innowind), Boschmanspoort (Jones and Wagner), Nqamakwe WEF (Innowind), Hopefield WEF Noise Analysis (Umoya), Dassiesfontein WEF Noise Analysis (BioTherm), Transnet Noise Analysis (Aurecon), Jeffries Bay Wind Farm (Globeleq), Sephaku Aganang (Exigo), Sephaku Delmas (Exigo), Beira Audit (BP/GPT), Nacala Audit (BP/GPT), NATREF (Nemai), Rappa Resources (Rayten),*

	Measurement Report for Sephaku Delmas (Ages), Measurement Report for Sephaku Aganang (Ages), Development noise measurement protocol for Mamba Cement (Exigo), Measurement Report for Mamba Cement (Exigo), Measurement Report for Nokeng Fluorspar (Exigo), Tsitsikamma Community Wind Farm Pre-operation sound measurements (Cennergi), Waainek WEF Operational Noise Measurements (Innowind), Sedibeng Brewery Noise Measurements (MENCO), Tsitsikamma Community Wind Farm Operational noise measurements (Cennergi), Noupoort Wind Farm Operational noise measurements (Mainstream),
Small Noise Impact Assessments	*TCTA AMD Project Baseline (AECOM), NATREF (Nemai Consulting), Christian Life Church (UrbanSmart), Kosmosdale (UrbanSmart), Louwlardia 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), Ilangalethu Solar (SE), Pofadder Solar (SE), Flagging Trees WEF (SE), Uyekraal WEF (SE), Ruuki Power Station (SE), Richards Bay Port Expansion 2 (AECOM), Babalegi Steel Recycling (AGES), Safika Ladium (AGES), Safika Cement Isando (AGES), RareCo (SE), Struisbaai WEF (SE), Perdekraal WEF (ERM), Kotula Tsatsi Energy (SE), Olievenhoutbosch Township (Nali), , HDMS Project (AECOM), Quarry extensions near Ermelo (Rietspruit Crushers), Proposed uMzimkhulu Landfill in KZN (nZingwe Consultancy), Linksfield Residential Development (Bokomoso Environmental), Rooihuiskraal Ext. Residential Development, CoT (Plandev Town Planners), Floating Power Plant and LNG Import Facility, Richards Bay (ERM), Floating Power Plant project, Saldanha (ERM), Vopak Growth 4 project (ERM), Elandspoort Ext 3 Residential Development (Gibb Engineering)*
Project reviews and amendment reports	*Loperberg (Savannah), Dorper (Savannah), Penhoek Pass (Savannah), Oyster Bay (RES), Tsitsikamma Community Wind Farm Noise Simulation project (Cennergi), Amakhala Emoyeni (Windlab), Spreeukloof (Savannah), Spinning Head (SE), Kangra Coal (ERM), West Coast One (Moyeng Energy), Rheboksfontein (Moyeng Energy), De Aar WEF (Holland), Quarterly Measurement Reports – Dangote Delmas (Exigo), Quarterly Measurement Reports – Dangote Lichtenburg (Exigo), Quarterly Measurement Reports – Mamba Cement (Exigo), Quarterly Measurement Reports – Dangote Delmas (Exigo) Quarterly Measurement Reports – Nokeng Exigo), Proton Energy Limited Nigeria (ERM), Hartebeest WEF Update (Moorreesburg) (Savannah Environmental), Modderfontein WEF Opinion (Terramanzi), IPD Vredenburg WEF (IPD Power Vredenburg)*

Contact details for the Author are:

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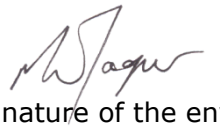
2 DECLARATION OF INDEPENDENCE

I, Morné de Jager declare that:

- I act as the 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 noise measurement reports, environmental noise impact assessments, including knowledge of the National Environmental Management Act (107 of 1998), the Environmental Impact Assessment Regulations of 2010, and any regulations and guidelines that have relevance to the proposed activity or work;
- I will comply with the Act, regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in regulation 8 of the regulations when preparing the application and any report relating to the application;
- 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 project or 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;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
- I will provide the competent authority with access to all information at my disposal regarding the project or application, whether such information is favourable to the applicant or not
- all the particulars furnished by me in this report are true and correct;
- will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations; 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 environmental practitioner:

Enviro-Acoustic Research cc
Name of company:

2021 / 10 / 18
Date:

3 INTRODUCTION

3.1 INTRODUCTION AND PURPOSE

Enviro-Acoustic Research cc was commissioned to undertake a specialist study to determine the potential noise impact on the surrounding environment with the development of a 1060MW simple cycle gas to power plant located within the Richards Bay IDZ.

This report is the result of the scoping (desktop) phase study of the Environmental Impact Assessment (EIA) process investigating the potential noise impact that such a facility may have on the surrounding environment, highlighting methodologies, potential issues to be investigated, as well as preliminary findings and recommendations.

It is important to note this document is only the Scoping Level report. The potential noise impact is investigated using a conceptual scenario.

3.2 BRIEF PROJECT DESCRIPTION

Phakwe Richards Bay Gas Power 3 (Pty) Ltd intend on developing a 2000MW combined cycle (CC) gas to power plant located on various erven within the Richards Bay IDZ phase 1F, Richards Bay, KwaZulu Natal (refer to **Figure 3-1** for regional location).

The power plant will operate at peak and mid-merit duty and will include the following main infrastructure:

- A number of gas turbines for the generation of electricity through the use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 30% H2) as fuel source, operating all turbines at mid-merit or baseload (estimated 16 to 24 hours daily operation).
- Exhaust stacks associated with each gas turbine.
- A number of Heat Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust.
- A number of steam turbines to generate additional electricity by means of the steam generated by the HRSG.
- The water treatment plant will demineralise incoming water from municipal or similar supply, to the gas turbine and steam cycle requirements. The water treatment plant will produce two parts demineralised water and reject

one-part brine, which will be discharged to the R IDZ stormwater system.

- Steam turbine water system will be a closed cycle with air cooled condensers. Make-up water will be required to replace blow down.
- Air cooled condensers to condensate used steam from the steam turbine.
- Compressed air station to supply service and process air.
- Water pipelines and water tanks for storage and distributing of process water. (Potential sourcing of alternative water outside RB IDZ supply (Municipality))
- Water retention pond
- Closed Fin-fan coolers to cool lubrication oil for the gas turbines
- Gas generator Lubrication Oil System.
- Gas pipeline supply conditioning process facility. Please note, gas supply will be via dedicated pipeline from the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed) or, alternatively directly from the Regasification facilities at RB Harbour. The gas pipeline will be separately authorized.
- Site water facilities including potable water, storm water, waste water
- Fire water (FW) storage and FW system
- Diesel emergency generator for start-up operation.
- Onsite fuel conditioning including heating system.
- All underground services: This includes stormwater and wastewater.
- Ancillary infrastructure including:
    - Roads (access and internal);
    - Warehousing and buildings;
    - Workshop building;
    - Fire water pump building;
    - Administration and Control Building;
    - Ablution facilities;
    - Storage facilities;
    - Guard House;
    - Fencing;
    - Maintenance and cleaning area;
    - Operational and maintenance control centre;
- Electrical facilities including:
    - Power evacuation including GCBs, GSU transformers, MV busbar, HV cabling and 1x275kV or 400kV GIS Power Plant substation.

- Generators and auxiliaries;
- Subject to a separate environmental authorisation application:
  - Eskom 275 or 400kV GIS interface Substation
  - Underground 275 or 400kV power cabling connecting Power Plant GIS substation and Eskom GIS Interface substation.
  - an overhead 275kV or 400kV power line connecting the ESKOM interface substation to the selected Eskom grid connection point;

Service infrastructure including:

- Stormwater channels;
- Water pipelines
- Temporary work areas during the construction phase (laydown areas)

Fuel supply

- A dedicated pipeline to connect into an on-site gas receiving and conditioning station will provide the natural gas or the mixture of natural gas and Hydrogen. The pipeline will be connected to the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed), or it will extend directly to the Regasification facilities in the RB Harbour

The dedicated pipeline will be separately environmentally authorized.

3.3 STUDY AREA

The facility is proposed in the vicinity of Richards Bay within the boundaries of the City of uMhlathuze Local Municipality and the King Cetshwayo District Municipality. A site locality map is presented in **Figure 3-1** illustrating the location of the preferred site. The preferred site is further described in terms of environmental components that may contribute or change the sound character in the area.

3.3.1 Existing Ambient Sound and Noise Levels

Sound levels were measured during July 2020 with the results summarized in section 5. With the sound levels measured in winter, the ambient sound levels are expected to be slightly less than annualized average day and night-time levels. This is due to the colder weather suppressing faunal communication during the day and night-time periods.

3.3.2 Topography

ENPAT[1] (1998) describes the topography as *"Plains"* , while Musina L. & Rutherford (The vegetation of South Africa, Lesotho and Swaziland)[2] delineates the area as *"flat coastal plain".* There are little natural features that could act as noise barriers considering practical distances at which sound propagates.

3.3.3 Surrounding Land Use

The project is proposed close to Richards Bay area with mainly industrial uses taking place in the area. The site is also located within Phase 1F of the Richards Bay Industrial Development Zone (IDZ).

3.3.4 Roads

The R619 pass between the project focus area and the closest residential suburbs.

3.3.5 Other Industrial Activities

The preferred site is proposed in an existing industrial area.

3.3.6 Ground conditions and vegetation

The preferred site falls within the Savanna biome, with the vegetation type being Coastal Forest and Thornveld. Considering GoogleEarth ® imagery it appears that the vegetation has been significantly disturbed by anthropogenic activities.

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

An assessment of the preferred site 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 NSDs were identified. Potential noise-sensitive developments identified are highlighted in **Figure 3-2**. This include the residential suburb of "*Wild en Weide*" where ambient sound levels (see section **5**) is ideal for residential use.

[1] Van Riet, W. Claassen, P. van Rensburg, J. van Viegen & L. du Plessis, "*Environmental Potential Atlas for South Africa"*, Pretoria, 1998.
[2] Musina L. & Rutherford." The vegetation of South Africa, Lesotho and Swaziland". Strelitzia 19, South African National Biodiversity Institute, Pretoria. 2006.

Figure 3-1: Locality map indicating the proposed project site

Figure 3-2: Aerial image indicating potentially noise-sensitive receptors close to the proposed project site

3.5 COMMENTS RECEIVED DURING THE SCOPING PHASE

At the time of writing this report the Author was not aware of any comments received from any Interested and Affected Party about the project regarding noise.

3.6 TERMS OF REFERENCE

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

- If there are potential noise-sensitive receptors staying within 1,000m from industrial activities (SANS 10328:2008)
- If there are potential noise-sensitive receptors staying within 2,000m from a source of low frequency sounds (SANS 10328:2008)
- It is generally required by the local or district authority as part of the environmental authorization or planning approval in terms of the Noise Control Regulations (Regulation 2(d) of GN R154 of 1992).
- There is a General prohibition in terms of Noise Control Regulations (Regulation 3(c) of GN R154 of 1992) unless precautionary measures to prevent the disturbing noise have been taken to the satisfaction of the local authority.
- It is a controlled activity in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA) 2014 Environmental Impact Assessment (EIA) Regulations and an ENIA is required, because:
    - It may cause a disturbing noise that is prohibited in terms of the Noise Control Regulations (Regulation 4 of Government Notice R154 of 1992);
    - It is an environmental theme to be further assessed as identified by the National Web-based Environmental Screening Tool as required by Government Gazette No. 42451 of 10 May 2019 (proposed procedures for noise assessments).

3.6.1 Requirements as per GG 43110

The Department of Environment, Forestry and Fisheries (DEFF) also promulgated Regulation 320, dated 20 March 2020 as published in Government Gazette No. 43110. The Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation would be applicable to this project.

This regulation defines the requirements for undertaking a site sensitivity verification, specialist assessment and the minimum report content requirements for environmental

impact where a specialist assessment is required but no protocol has been prescribed. It requires that the current land use be considered using the national web based environmental screening tool to confirm the site sensitivity available at: https://screening.environment.gov.za.

If an applicant intending to undertake an activity identified in the scope of this protocol for which a specialist assessment has been identified on the screening tool on a site identified as being of:

- "very high" sensitivity for noise, must submit a Noise Specialist Assessment; or
- "low" sensitivity for noise, must submit a Noise Compliance Statement.

On a site where the information gathered from the site sensitivity verification differs from the designation of "very high" sensitivity on the screening tool and it is found to be of a "low" sensitivity, a Noise Compliance Statement must be submitted. On a site where the information gathered from the initial site sensitivity verification differs from the designation of "low" sensitivity on the screening tool and it is found to be of a "very high" sensitivity, a Noise Specialist Assessment must be submitted.

If any part of the proposed development footprint falls within an area of "very high" sensitivity, the assessment and reporting requirements prescribed for the "very high" sensitivity apply to the entire footprint excluding linear activities for which noise impacts are associated with construction activities only and the noise levels return to the current levels after the completion of construction activities, in which case a compliance statement applies. In the context of this protocol, development footprint means the area on which the proposed development will take place and includes any area that will be disturbed.

Considering preliminary layout, the potential areas identified to have a "very high" sensitivity to noise and the identified noise-sensitive receptors, a noise specialist assessment will be completed as an ENIA. The minimum requirements for an ENIA are also covered in **Section 13.4**.

3.6.2 Requirements as per South African National Standards

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

The SANS 10328:2008 specifies the methodology to assess the potential noise impacts on the environment due to a proposed activity that might impact on the environment. This standard also stipulates the minimum requirements to be investigated for Scoping purposes.

In addition, the Scoping report should contain sufficient information to allow the Environmental Assessment Practitioner (EAP) to compile the Plan of Study for future Environmental Impact Assessment (EIA), including the Noise component.

In this regard the following will be included to assist the EAP in the compilation of the Plan of Study (PoS) for the EIA, discussed in general in **section 13** and defined in **section 13.2**.

4 LEGAL CONTEXT, POLICIES AND GUIDELINES

4.1 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 particular circumstances. The subjectivity of this approach can be problematic, which has led to the development of noise standards (see **Section 4.6**).

"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.

4.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT 107 OF 1998)

The National Environmental Management Act, 1998 (Act 107 of 1998), as amended ("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 to:

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

Regulations have been promulgated in GN R982, R983, R984 and R985 in GG 38282, dated 4 December 2014, which came into effect on 8 December 2014. These were amended in April 2017, specifically promulgated in GN R326, R327, R325 and R324 in GG 40772, dated 7 April 2017.

Furthermore, Protocols were published in Government Gazette 43110 / GNR 320 on 20 March 2020 for specific environmental themes, including noise. "Requirements for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation". These Protocols prescribe the general requirements for undertaking site sensitivity verification and the level of specialist assessment required as well as the assessment reporting requirements per environmental theme. The requirements of the Noise Protocol for the undertaking of a Noise Specialist Assessment have been adhered to. The national web-based Environmental Screening Tool identified the site to be of high noise sensitivity and therefore full Noise Specialist Assessment has been undertaken.

When the requirements of a protocol apply, the requirements of Appendix 6 of the Environmental Impact Assessment Regulations, as amended, (EIA Regulations), promulgated under sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), are replaced by the requirements of GNR 320.

4.3 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 Environmental Affairs) to make regulations regarding noise, among other concerns. See also **section 4.3.1**.

4.3.1 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, 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 but not in KwaZulu-Natal province and therefore the National Regulations will be in effect.

The National Noise Control Regulations (GN R154 1992) defines:
"**controlled area**" as:

a piece of land designated by a local authority where, in the case of-

c) industrial noise in the vicinity of an industry-

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 meters, but not more than 1,4 meters, above the ground for a period of 24 hours, exceeds 61 dBA.

"**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.

"**zone sound level**" as:

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 the same as the Rating Level as defined in SANS 10103.*

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".

4.4 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:

7. to investigate, assess and evaluate the impact on the environment;
8. 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;
9. to cease, modify or control any act, activity or process causing the pollution or degradation;
10. to contain or prevent the movement of the pollution or degradation;
11. to eliminate any source of the pollution or degradation; and
12. to remedy the effects of the pollution or degradation.

In addition, Appendix 6 of the EIA Regulations (GN 326) of December 2014, as amended on 07 April 2017 (Gov. Gaz. 40772), issued in terms of this Act, have general requirements for Environmental Assessment Practitioners (EAPs) and specialists. It also defines minimum information requirements for specialist reports.

4.5 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.

4.5.1 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 (Act No. 32 of 2000) when adopting and adapting the model by-law to its local jurisdictions.

4.6 NOISE STANDARDS

There are a few South African national scientific standards (SANS) 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;
- SANS 10181:2003. The Measurement of Noise Emitted by Road Vehicles when Stationary; and
- SANS 10205:2003. The Measurement of Noise Emitted by Motor Vehicles in Motion.

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.*

4.7 WHITE PAPER ON 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.

4.8 INTERNATIONAL GUIDELINES

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

4.8.1 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. It discusses the specific effects of noise on communities including:

- Interference with communication, noise-induced hearing impairment, sleep disturbance effects, cardiovascular and psychophysiological effects, mental health effects, effects on performance, annoyance responses and effects on social behavior.

It further discusses how noise can affect (and propose guideline noise levels) specific environments such as residential dwellings, schools, preschools, hospitals, ceremonies, festivals and entertainment events, sounds through headphones, impulsive sounds from toys, fireworks and firearms, and parklands and conservation areas.

To protect the majority of people from being affected by noise during the daytime, it proposes that sound levels at outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the day, the outdoor sound pressure level should not exceed 50 dB L_{Aeq}. At night, equivalent sound levels at the outside façades of the living spaces should not exceed 45 dBA and 60 dBA L_{Amax} so that people may sleep with bedroom windows open. It is critical to note that this guideline requires the sound level measuring instrument to be set on the "fast" detection setting.

4.8.2 European Parliament Directive 200/14/EC (2000)

Directive 2000/14/EC relating to the noise emission in the environment by equipment for use outdoors was adopted by the European Parliament and the Council and first published in May 2000 and applied from 3 January 2002. The directive placed sound power limits on

equipment to be used outdoors in a suburban or urban setting. Failure to comply with these regulations may result in products being prohibited from being placed on the EU market. Equipment list is vast and includes machinery such as compaction machineries, dozers, dumpers, excavators, etc. Manufacturers as a result started to consider noise emission levels from their products to ensure that their equipment will continue to have a market in most countries.

4.8.3 Equator Principles (2003)

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 EPs were developed by private sector banks and were launched in June 2003. The banks chose to model the EPs on the environmental standards of the World Bank and the social policies of the International Finance Corporation (IFC). As of March 2021, one hundred and sixteen (116) financial institutions (in 37 different countries) have adopted the EPs, 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 IFC Environmental, Health and Safety (EHS) Guidelines.

4.8.4 IFC: General EHS Guidelines – Environmental Noise Management (2007)

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

It states that noise prevention and mitigation measures should be applied where predicted or measured noise impacts from project facilities/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/m^2 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 **Error! Reference source not found.**) and highlights 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. Therefore, it is EARE's 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 4-1: 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 $L_{Aeq,1hr}$ 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 in Europe.

4.8.5 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."

4.8.6 Environmental Noise Guidelines for the European Region (2018)

This document identifies levels at which noise has significant health impacts and recommends actions to reduce exposure. Compared to previous WHO guidelines on noise, this version contains five significant developments:

- Stronger evidence of the cardiovascular and metabolic effects of environmental noise;
- Inclusion of new noise sources, namely wind turbine noise and leisure noise, in addition to noise from transportation (aircraft, rail, and road traffic);
- Use of a standardized approach to assess the evidence;
- A systematic review of evidence, defining the relationship between noise exposure and risk of adverse health outcomes;
- Use of long-term average noise exposure indicators to better predict adverse health outcomes.

5 SOUND CHARACTER AND AMBIENT SOUND LEVELS

5.1 AMBIENT SOUND MEASUREMENTS

Ambient sound levels were measured at a number of locations previously during July 2020 in accordance with the South African National Standard SANS 10103:2008 "***The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication***". Together with GNR 320 of 20 March 2020, the standard specifies the acceptable techniques for sound measurements including:

- type of equipment (Class 1);
- minimum duration of measurement;
- microphone positions and height above ground level;
- calibration procedures and instrument checks; and
- supplementary weather measurements and observations.

Long-term measurements were collected over a period of two (2) nights at three location in the "Wild en Weide" residential suburb. This data was augmented with 4 short-term (10-minutes) sound level measurements collected within the Alton Industrial area over the same 2-night period. The data collected is summarized in **Table 5-1**.

Table 5-1: Summary of average sound levels measured

Monitoring location	GPS Co-ordinate	Night-time average sound level ($L_{Aeq,f}$) - dBA	Daytime average sound level ($L_{Aeq,f}$) - dBA	Night-time rating level i.t.o SANS 10103	Daytime rating level i.t.o SANS 10103
RBGPLTSL01	-28.735179°, 32.043652°	42.6	50.4	Sub-urban to urban	Sub-urban
RBGPLTSL02	-28.736250°, 32.045824°	43.4	52.8	Urban	Sub-urban to urban
RBGPLTSL03	-28.736305°, 32.047195°	39.2	57.7	Sub-urban	Busy urban
RBGPSTSL11	-28.764698°, 32.020459°	53.3	Not measured	Busy urban to central business district	-

Considering the results of the measurement data:

- Ambient sound levels in the closest residential area are typical of a sub-urban to urban noise district and within the noise limits recommended for residential use by the WHO and IFC;
- Ambient noise levels in the Alton Industrial area are elevated and typical of a busy urban to central business noise district. It should be noted that SANS 10103 highlights that ambient sound levels in an industrial noise district (appropriately zoned) up to 70 dBA is expected and typical.

6 POTENTIAL NOISE SOURCES

Increased noise levels are directly linked with the various activities associated with the construction of the proposed power station and related infrastructure, as well as the operation phase of the activity.

6.1 POTENTIAL NOISE SOURCES: CONSTRUCTION NOISES

6.1.1 Construction Activities

Construction activities could 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 operation 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 6-1**. 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 6-2**.

6.1.2 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 specialised 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 areas in close proximity to 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 relatively fast and 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.

6.2 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 and high temperature steam in order to clean the pipe internals of all welding debris and mill scale. The high-pressure steam would be vented to the atmosphere, generating high noise levels for around 2 - 4 hours per day over 2 – 4 days.
- hot commissioning of steam piping running from the heat recovery steam generator (HRSG) to the 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 the 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 as 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 operation 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 a lower concern than noises at night.

6.3 POTENTIAL NOISE SOURCES: OPERATION NOISES

Figure 6-1 illustrated potential sources of noise associated with a gas-fired power plant, with the main sources of noise being:

- 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 6-2**.

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.

6.4 POTENTIAL NOISE SOURCES: DECOMMISSIONING

Being located within an industrial area, once power-generation activities cease it is more likely that the area be repurposed, with existing infrastructure repurposed, upgraded or modified where possible before decommissioning takes place. For the purpose of this report, decommissioning will start when power generation stops, signalling the beginning of the dismantling of the equipment. Activities that may take place include:

- 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;
- (Potential) Seeding of disturbed areas (if necessary, to re-establish vegetation); and
- 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 operation 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; and
- There is a lower urgency of completing this phase and less equipment remains onsite (and are used simultaneously) to affect the final decommissioning.

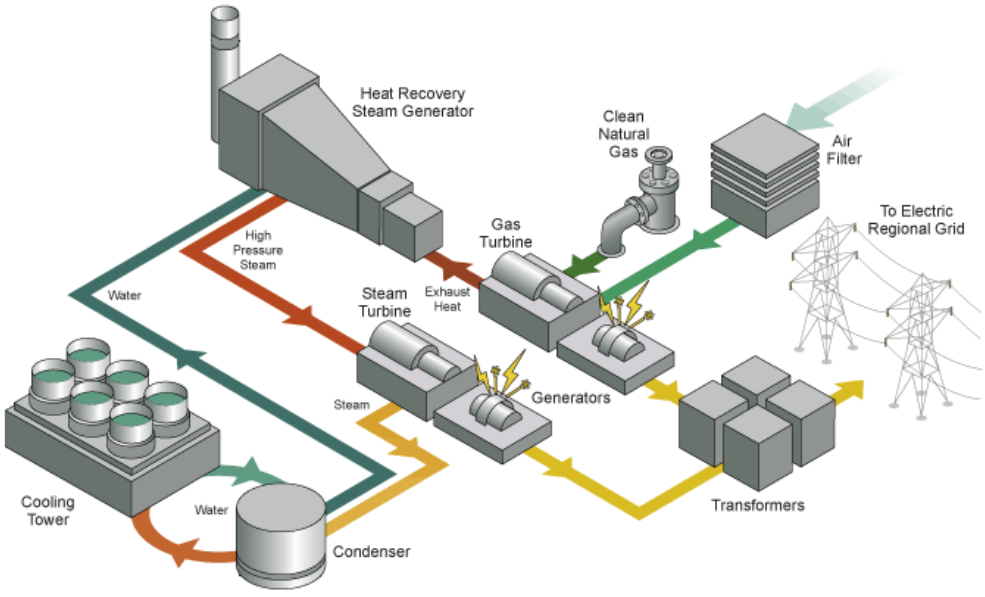


Figure 6-1: Combined Cycle Gas-fired Power Generation Process

Table 6-1: Potential maximum noise levels generated by construction equipment

Equipment Description[3]	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

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

Table 6-2: 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

7 METHODS: NOISE IMPACT ASSESSMENT AND SIGNIFICANCE

7.1 WHY NOISE CONCERNS COMMUNITIES[4]

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.

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).

[4]World Health Organization, 1999; Noise quest, 2010; Journal of Acoustical Society of America, 2009

7.2 IMPACT ASSESSMENT CRITERIA

7.2.1 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 the 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.

7.2.2 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 EIA Regulations (2014), SANS 10103:2008, as well as guidelines from the WHO.

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 7-1**.
- *Zone Sound Levels:* Previously referred to as the acceptable rating levels, it sets acceptable noise levels for various areas. See also **Table 7-1**.
- *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.

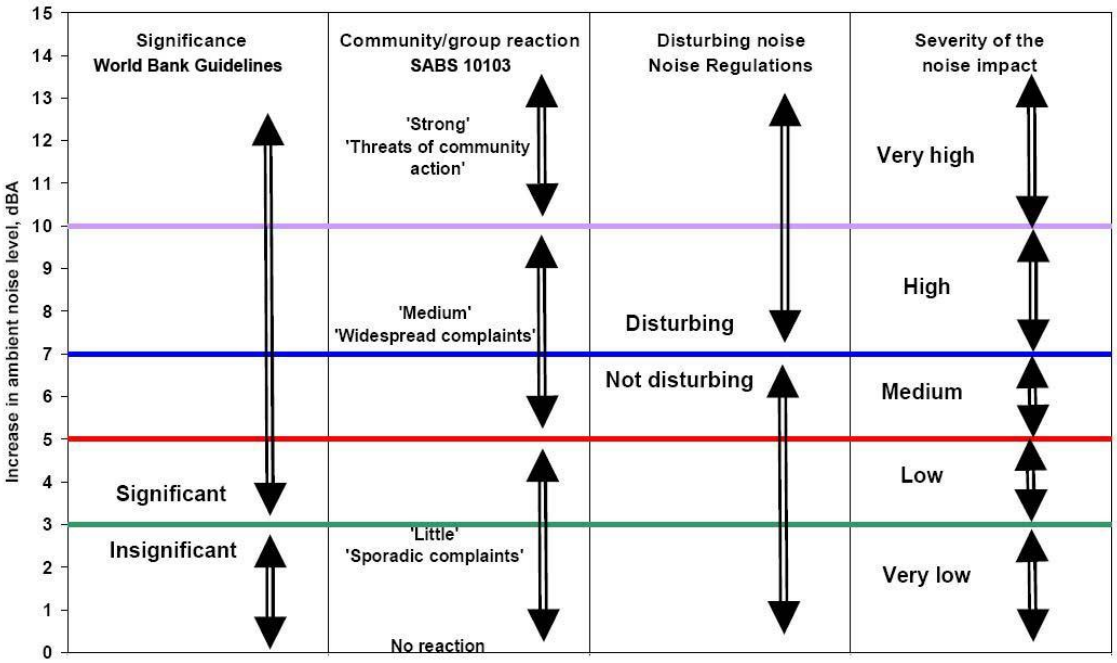


Figure 7-1: Criteria to assess the significance of impacts stemming from noise

In South Africa, the document that addresses the issues concerning environmental noise is SANS 10103:2008 (See also **Table 7-1**). 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.

Acoustical measurements indicate an area where the ambient sound levels are very high, typical of an industrial area and the following study area rating levels are proposed:

- "Equator principles" (55 and 45 dBA day/night-time Rating i.t.o. IFC Noise Limits).

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:

- **Δ ≤ 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 < Δ ≤ 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 < Δ ≤ 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 Noise Control Regulations).

Table 7-1: 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

7.2.3 Other noise sources of significance

In addition, other noise sources that may be present should also be considered. During the day, people are generally bombarded with the sounds from numerous sources considered "normal", such as animal sounds, conversation, amenities and appliances (TV/Radio/CD playing in background, computer(s), freezers/fridges, etc.). This excludes activities that may generate additional noise associated with normal work.

At night, sounds that are present are natural sounds from animals, wind as well as other sounds we consider "normal", such as the hum from a variety of appliances (magnetostriction - transformer noises) drawing standby power, freezers and fridges. However: As the plant mainly operates during daylight hours this study will not investigate the night-time scenario.

7.2.4 Determining the Significance of the Noise Impact

The level of detail as depicted in the 2014 EIA regulations, as amended on 07 April 2017, was fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to

establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value as defined in the third column in the tables below.

The impact consequence is determined by summing the scores of Magnitude (**Table 7-2**), Duration (**Table 7-3**) and Spatial Extent (**Table 7-4**). The impact significance (see **Sections 7.2.5**) is determined by multiplying the Consequence result with the Probability score (**Table 7-5**). An explanation of the impact assessment criteria is defined in the following tables.

Table 7-2: Impact Assessment Criteria – Magnitude

This defines the impact as experienced by any receptor. In this report the receptor is defined as any resident in the area, but excludes faunal species.		
Rating	**Description**	**Score**
Minor	Increase in average sound pressure levels between 0 and 3 dB from the expected ambient sound levels. Ambient sound levels are defined by the lower of the measured $L_{AIeq,8hr}$ or $L_{AIeq,16hr}$ during measurement dates. Total projected noise level is less than the Zone Sound Level and/or Equator Principle in wind-still conditions.	2
Low	Increase in average sound pressure levels between 3 and 5 dB from the expected ambient sound levels. Total projected noise levels between 3 and 5 above the Zone Sound Level and/or Equator Principle (wind-less conditions).	4
Moderate	Increase in average sound pressure levels between 5 and 7 dB from the ambient sound levels. Increase in sound pressure levels between 5 and 7 above the Zone Sound Level and/or Equator Principle (wind less conditions). Sporadic complaints expected.	6
High	Increase in average sound pressure levels between 7 and 10 from the ambient sound level. Total projected noise levels between 7 and 10 dBA above the Zone Sound Level and/or Equator Principle (wind-less condition). Medium to widespread complaints expected.	8
Very High	Increase in average ambient sound pressure levels higher than 10 dBA. Total projected noise levels higher than 10 dB above the Zone Sound Level and/or Equator Principle (wind less-conditions). Change of 10 dBA is perceived as 'twice as loud', leading to widespread complaints and even threats of community or group action. Any point where instantaneous noise levels exceed 65 dBA at any receptor.	10

Table 7-3: Impact Assessment Criteria - Duration

The lifetime of the impact that is measured in relation to the lifetime of the proposed development (construction, operation and closure phases). Will the receptors be subjected to increased noise levels for the lifetime duration of the project, or only infrequently.		
Rating	**Description**	**Score**
Temporary	Impacts are predicted to be of very short duration (portion of construction period) and intermittent/occasional (0 – 1 year).	1
Short term	Impacts that are short, predicted to last only for the duration of the construction period (2 - 5 years).	2
Medium term	Impacts that will continue for the life of the Project, but ceases when the Project stops operating (5 - 15 years).	3
Long term	Impacts that will continue for the life of the Project, but ceases when the Project stops operating (>15 years).	4
Permanent	Impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.	5

Table 7-4: Impact Assessment Criteria – Spatial extent

Classification of the physical and spatial scale of the impact		
Rating	**Description**	**Score**
Site	The impacted area extends only as far as the activity, such as the footprint occurring within the total site area.	1
Local	The impact could affect the local area (within 1,000 m from site).	2
Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns (further than 1,000 m from site).	3
National	The impact could have an effect that expands throughout the country (South Africa).	4
International	Where the impact has international ramifications that extend beyond the boundaries of South Africa.	5

Table 7-5: Impact Assessment Criteria - Probability

This describes the likelihood of the impacts actually occurring, and whether it will impact on an identified receptor. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:		
Rating	**Description**	**Score**
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).	1
Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined to be up to 25 %.	2
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined to be between 25% and 50 %.	3
Highly Likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined between 50 % to 75 %.	4
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined to be between 75% and 100 %.	5

In order to assess each of these factors for each impact, the following ranking scales as contained in **Table 7-6** will be used.

Table 7-6: Assessment Criteria: Ranking Scales

PROBABILITY		**MAGNITUDE**	
Description / Meaning	**Score**	**Description / Meaning**	**Score**
Definite/don't know	5	Very high/don't know	10
Highly likely	4	High	8
Likely	3	Moderate	6
Possible	2	Low	4
Improbable	1	Minor	2
DURATION		**SPATIAL SCALE**	
Description / Meaning	**Score**	**Description / Meaning**	**Score**
Permanent	5	International	5
Long Term	4	National	4
Medium Term	3	Regional	3

Short term	2	Local	2
Temporary	1	Footprint	1

7.2.5 Identifying the Potential Impacts

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned probabilities, resulting in a Significance Rating (SR) value for each impact (prior to the implementation of mitigation measures).

Significance without mitigation is rated on the following scale:

SR<30	Low (L)	Impacts with little real effect and which should not have an influence on or require modification of the project design or alternative mitigation. No mitigation is required.
30<**SR** <60	Medium (M)	Where it could have an influence on the decision unless it is mitigated. An impact or benefit which is sufficiently important to require management. Of moderate significance - could influence the decisions about the project if left unmanaged.
SR>60	High (H)	Impact is significant, mitigation is critical to reduce impact or risk. Resulting impact could influence the decision depending on the possible mitigation. An impact which could influence the decision about whether or not to proceed with the project.

7.3 REPRESENTATION OF NOISE LEVELS

Noise rating levels will be calculated in detail in this report using the appropriate sound propagation models as defined. It is therefore 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 level at a specific moment in time.

8 ASSUMPTIONS AND LIMITATIONS

8.1 MEASUREMENTS 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. Therefore, trying to define ambient sound levels using the result of one 10-minute measurement will be very inaccurate (very low confidence level in the results) for the reasons mentioned above. The more measurements that can be collected at a location the higher the confidence levels in the ambient sound level determined. The more complex the sound environment, the longer the required measurement. Ambient sound levels for this project will be measured over a 2-night period at a minimum of 2 locations.
- Ambient sound levels are dependent not only time of day and meteorological conditions, but also the change due to seasonal differences. Ambient sound levels are generally higher in summer months when faunal activity is higher and lower during the winter due to reduced faunal activity. Winter months unfortunately also coincide with lower temperatures and very stable atmospheric conditions, ideal conditions for the propagation of noise. Many faunal species are more active during warmer periods than colder periods. Certain cicada species can generate noise levels of up to 120 dB for mating or distress purposes, sometimes singing in synchronisation magnifying noise levels they produce from their tymbals[5]; 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. TVs and Radios). The result is that ambient sound levels will increase as an area matures.

8.2 CALCULATING NOISE EMISSIONS – ADEQUACY OF PREDICTIVE METHODS

The noise emissions into the environment from the various sources as defined will be estimated for the construction phase using a basic noise propagation model using the SANS

[5] Clyne, D. *"Cicadas: Sound of the Australian Summer, Australian Geographic"* Oct/Dec Vol 56. 1999.

10357 model. The operation phase was modelled in detail, using the sound propagation model described by ISO 9613-2.

The following will be 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;
- The operational details of the proposed project, such as projected areas where activities will be taking place;
- Acoustical characteristics of the ground. Hard ground conditions will be modelled.

The noise emission into the environment due to additional traffic will not be considered during this scoping phase but only generalized, due to the limited extent of traffic noises (due to expected low traffic volumes).

8.3 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 results 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.

8.4 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 processes and equipment will be operational (and when 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 are frequently overestimated. The result is that projected noise levels would likely over-estimate 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.

9 PROJECTED NOISE RATING LEVELS

9.1 CONSTRUCTION PHASE NOISE IMPACT

Noise levels associated with potential construction activities will only be evaluated during the future noise impact assessment. However, based on **Table 6-1**, maximum noise levels could be in the region of 90 – 105 dBA when working in close quarters to equipment (within 10 m), but noise levels will reduce the further a conceptual receptor (such as a employee) is from a noise-generating activity. For all construction work, workers working with or in close proximity to noise-generating activities or equipment will be exposed to high levels of noise as can be seen from **Table 6-1** (when working within 10 m of noisy equipment).

While maximum noise levels may reach up to 60 dBA at 1,000 meters (worst-case scenario for a pile driver), such noise levels are not a constant, and equivalent (average) A-weighted night-time noise levels of up to 49 dBA may be expected at 2,000 meters (rock breaker - refer also **Table 6-2**).

There are number of potential NSDs identified living within and adjacent to the properties where construction activities can take place. The construction activities can increase the ambient sound levels at these receptors, with the levels either changing the ambient sound levels with more than 7 dB or resulting in noise levels higher than the acceptable night-time rating levels (potentially exceeding the levels recommended by international guidelines such as IFC - see also **section** Error! Reference source not found. or the recommended rating levels as per SANS 10103).

9.2 OPERATIONAL PHASE NOISE IMPACT

Considering the location of potential noisy activities, this assessment indicates that:

- Considering maximum noise emission levels, operating activities could be well audible over a distance of more than 2,000 meters (refer **Table 6-1**);
- Considering equivalent (average) noise emission levels, activities could influence the ambient sound levels up to a distance of 2,000 meters at night (refer **Table 6-2**).

As with the construction phase, the operational activities will increase noise levels in the surrounding area. This can however only be assessed in detail with a noise model.

10 SIGNIFICANCE OF THE NOISE IMPACT

10.1 CONSTRUCTION PHASE NOISE IMPACT

The impact assessment for the various activities defined in **Section 6.1** and discussed in **Section 9.1** that can create noise and may impact on the surrounding environment during the construction phase of development is summarized in the following **Table 10-1**.

Table 10-1: Impact Assessment: Potential Construction Activities

Impacts: Increases in noise levels at closest receptors.		
Desktop Sensitivity Analysis (worst-case due to the precautionary principle): Urban area with daytime $L_{R,d}$ acceptable rating level of 55 dBA. Urban area with night-time $L_{R,n}$ acceptable rating level of 45 dBA.		
Issue	**Nature of Impact**	**Extent of Impact**
Increase in noise level at receptors. Disturbing noises.	Increased noises or disturbing noises may increase annoyance levels with project.	Multiple night-time construction activities taking place simultaneously may impact an area within 2,000m from the activities
Significance level for scoping: Medium to low (also see **Figure 3-2**)		
Gaps in Knowledge: Noise modelling will calculate potential noise levels considering topography, ground surface constants and potential noise-emitting activities.		
Comments: Low confidence in assessment.		
Mitigation Measures: Mitigation will depend on the noise levels calculated at the closest receptors.		
Recommendations: Scoping level assessment is not sufficient, full Environmental Noise Impact Assessment is required.		

10.2 OPERATIONAL PHASE NOISE IMPACT

The impact assessment for the various activities defined in **Section 6.2** and discussed in **section 9.2** will increase the ambient noise levels in the area. The operational noise impact is assessed and summarized in the following **Table 10-2**. Only the night-time scenario was assessed as this is the most critical time period when a quiet environment is desired.

Table 10-2: Impact Assessment: Operational Activities

Impacts: Increases in noise levels at closest receptors.		
Desktop Sensitivity Analysis (worst-case due to the precautionary principle): Urban area with daytime $L_{R,d}$ acceptable rating level of 55 dBA. Urban area with night-time $L_{R,n}$ acceptable rating level of 45 dBA.		
Issue	**Nature of Impact**	**Extent of Impact**
Increase in noise level at receptors. Potential disturbing noise levels.	Increased noises or disturbing noises may increase annoyance levels with project.	Multiple night-time operational activities taking place simultaneously may impact an area within 2,000m from the activities
Significance level for scoping: Medium to low (also see **Figure 3-2**)		
Gaps in Knowledge: Noise modelling will calculate potential noise levels considering topography, ground surface constants and potential noise-emitting activities.		
Comments: Low confidence in assessment.		
Mitigation Measures: Mitigation will depend on the layout of infrastructure, status of surrounding receptors and the significance of the potential noise impact. Mitigation measures can only be defined with more information.		
Recommendations: Scoping level assessment is not sufficient, full Environmental Noise Impact Assessment is required.		

10.3 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.

11 EVALUATION OF ALTERNATIVES

11.1 ALTERNATIVE 1: NO-GO OPTION

The ambient sound levels will remain as is, that being, typical of an industrial noise district with the existing ambient sound levels being elevated.

11.2 ALTERNATIVE 2: PROPOSED POWER GENERATION ACTIVITIES

The proposed activities (worse-case evaluated) could raise the noise levels in the area up to 2,000 m from the closest activities, whether construction or operational. There are residential suburbs in the potential zone of influence and the residents may not have a positive opinion (in terms of acoustics) about the project.

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, including direct impacts (noise, air quality, increased traffic, security and safety concerns, etc) and potential benefits (potential employment, other business opportunities).

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 could have a positive perception of the project.

12 CONCLUSIONS AND RECOMMENDATIONS

This report is a scoping level Noise Assessment of the potential noise environment due to the development of a Combined Cycle Gas-fired Power Plant near Richards Bay, Kwa-Zulu Natal.

With the preliminary data available, this assessment indicated that there is a risk of a noise impact during the construction and operational phases due to the proximity of noise-sensitive receptors to the project site (where noise generating activities may take place).

It is therefore recommended that the noise impact be investigated in more detail during the EIA phase, including further ambient sound measurements. Additional information required would be:

- Project design and layout;
- A more accurate description of equipment to be used in and around the proposed power plant and ancillary activities. This would include data such as the type of equipment, but also the number of that equipment to be used.

Information not provided or available will be estimated using internet sources.

Further study is required and it is recommended that a full Environmental Noise Impact Assessment study be conducted for the Angora WEF.

13 TERMS OF REFERENCE FOR THE ENVIRONMENTAL NOISE IMPACT PHASE

Work that will take place during the ENIA phase is defined in section 8 of SANS 10328:2008.

13.1 PURPOSE OF THE ENVIRONMENTAL NOISE IMPACT ASSESSMENT

The purpose of an environmental noise impact investigation and assessment is to determine and quantify the acoustical impact of, or on a proposed development.

13.2 PLAN OF STUDY FOR ENVIRONMENTAL NOISE IMPACT INVESTIGATION AND ASSESSMENT

In this regard the following will be included to assist the EAP in the compilation of the Plan of Study (PoS) for the EIA:

- Ambient sound level measurements as collected onsite will be evaluated and processed to classify the area in terms of typical noise districts and to motivate appropriate noise limits;
- Data as received from the developer will be used to model the potential noise impact. The following information will be considered:
    - The Sound Power Emission details of a selected generator that may be considered at this facility;
    - The surface contours (topography) of the project focus area;
    - Surface and meteorological constants;
- The potential impact will be evaluated (where possible) in terms of the nature (description of what causes the effect, what/who might be affected and how it/they might be affected) as well as the extent of the impact;
- The potential significance of the identified issues will be calculated based on the evaluation of the issues/impacts;
- The development of an Environmental Management Plan and a proposal of potential mitigation measures (if required); and
- Recommendations.

13.3 ENVIRONMENTAL NOISE IMPACT INVESTIGATION

13.3.1 Sound emission from the identified noise sources

Sound emission data as provided by the developer or, alternatively sources from internet resources would be used to calculate the potential noise emissions from the development.

The operating cycle and nature of the sound emission (impulsiveness, tonal character or potential low frequencies) would, where relevant, be considered when the expected noise rating level in the target area is calculated.

13.3.2 Determination of Rating levels

The sound propagation model defined by ISO 9613-2:1996 for both the construction and operational phases to calculate projected equivalent noise levels.

Other input parameters used would include:

- Appropriate meteorological parameters for the area (air pressure, temperature and relative humidity);
- Layout of the proposed facility as provided by the developer;
- Topography details;
- Projected outside equivalent noise levels at Potentially Sensitive Receptors at height above sea-level (plus 1.5 meters);
- 50% hard ground surface.

13.3.3 Assessment of the noise impact: No mitigation

The significance will be determined considering the defined magnitude of the noise level, the extent as well as the duration of the projected noise impact, as well as the probability that this impact may take place.

The magnitude of the noise impact will be assessed by considering:

- The total projected cumulative noise level compared to the appropriate acceptable rating levels as defined in Table 2 of SANS 10103:2008;
- The potential community response from Table 5 of SANS 10103:2008. In addition, other relevant and suitable literature may be consulted as defined in the scoping report. In particular the likely ambient sound levels due to wind induced noises will be estimated at the wind speed under investigation and considered; and
- The likely and projected ambient sound levels.

Likely ambient sound levels associated with wind speeds as well as the projected change in ambient sound levels would also be considered when estimating the probability that a NSD may be impacted by increased noise levels.

13.3.4 Assessment of the noise impact: With Implementation of Mitigation

Should the significance of the impact be medium or high, the potential significance will be estimated considering that the developer would be implementing reasonable mitigation measures. Potential viable mitigation measures will be included.

13.4 ENVIRONMENTAL NOISE IMPACT REPORT

The Environmental Noise Impact Report will cover the following points:

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

- a list of all the interested or affected parties that offered any comments with respect to the environmental noise impact investigation (if comments are received);
- 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 (if comments are received);
- conclusions that were reached;
- proposed recommendations including potential mitigation measures;
- any follow-up investigation which should be conducted at completion of the project as well as at regular intervals after the commissioning of the project so as to ensure that the recommendations of this report will be maintained in the future.

14 REFERENCES

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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 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; (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 (c) industrial noise in the vicinity of an industry- (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	(1) Averaging detection time used in sound level meters. (2) Fast setting has a time constant of 125 milliseconds and provides a fast 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.

End of Report