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Clanwilliam Dam Crusher Plant Project: Environmental Noise Impact Assessment

Prepared for:

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Revision History

Issue/revision	Remarks	Date	Prepared by	Checked by	Authorised by
Rev 2	Report	18/11/2025	Duduzile Skhosana BA. Env.Sc	Oliver Knoppersen AMIOA	Oliver Knoppersen AMIOA

DETAILS OF SPECIALIST & DECLARATION OF INTEREST

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I, Duduzile Skhosana , declare that –

General declaration:

I act as the independent specialist;

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 no, and will not engage in, conflicting interests in the undertaking of the activity;

Signature of the specialist:

Name of company: Acoustech Consulting

Date: 18/11/2025

National Environmental management Act (Act no. 107 of 1998), GN No. 326 of 07 April 2017 Regulations, Appendix 7

Relevant referencing to the Appendix 6 of the National Environmental, Management Act, 1998 (Act No. 107 of 1998) is made below:	
Information requirements	**Reference**
(1) A specialist who prepared the report (a) details of- (i) the specialist who prepared the report; (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page 2 and **Appendix D**.
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 2
(c) an indication of the scope of, and the purpose for which, the report was prepared; (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section **1**
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section **6**
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section **5**
(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;	Section **7**
(g) an identification of any areas to be avoided, including buffers;	Section **7**
(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;	Section **7**
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section **5.3**
(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;	Section **7**
(k) any mitigation measures for inclusion in the EMPr;	Section **7,8**
(l) any conditions for inclusion in the environmental authorisation;	Section **7**
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section **7,8**
(n) a reasoned opinion— (i) As to whether the proposed activity, activities or portions thereof should be authorised; (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section **7**
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section **2.5**
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto;	Section **2.5**
(q) any other information requested by the competent authority.	None

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Acoustic Glossary of Terms & Acronyms

To ensure that there is a clear interpretation of this report the following meanings should be applied to the acoustic terminology.

- **Ambient sound level** or **ambient noise** means that the totally encompassing sound in a given situation at a given time, and usually composed of sound from many sources, both near and far. Note that ambient noise includes the noise from the noise source under investigation. The use of the word *ambient* should however always be clearly defined (compare with *residual noise*).

- **A-weighted sound pressure level (SPL) (noise level) (L_{pA}), in decibels:**

  The sound pressure level of A-weighted sound pressure is given by the equation:

  $L_{pA} = 10 \log (p_A/P_o)^2$ where:

  P_A is the A-weighted sound pressure, in Pascals; and

  P_o is the reference sound pressure (p_o = 20 micro Pascals (µPa))

  Note: The internationally accepted symbol for sound pressure level, dB(A), is used.

- **dB(A)** means the value of the sound pressure level in decibels, determined using a frequency weighting network A. (The "A"-weighted noise levels/ranges of noise levels that can be expected in some typical environments are given in Table A1 at the end of this appendix).

- **Disturbing noise** means a noise level that exceeds the outdoor equivalent continuous rating level of the time period and neighbourhood as given in Table 2 of SANS 10103:2004. For convenience, the latter table is reproduced in this appendix as Table A1.

- **Equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$)** means the value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, has the same mean-square should pressure as a sound under consideration whose level varies with time.

- **Equivalent continuous rating level ($L_{Req,T}$)** means the equivalent continuous A-weighted sound pressure level during a specified time interval, plus specified adjustments for tonal character and impulsiveness of the sound and the time of day.

- **Equivalent continuous day/night rating level ($L_{R,dn}$)** means the equivalent continuous A-weighted sound pressure level during a reference time interval of 24-hours, plus specified adjustments for tonal character and impulsiveness of the sound and the time of day. (An adjustment of 10dB is added to the night-time rating level).

- **Integrating sound level meter** means a device that integrates a function of the root mean square value of sound pressure over a period of time and indicates the result in dBA.

- **LoP –** means Life of Project.

- **Min.** means minimum.
- **Noise** means any acoustic phenomenon producing any aural sensation perceived as disagreeable or disturbing by an individual or group. Noise may therefore be defined as any *unwanted* sound or sound that is *loud, unpleasant or unexpected*.
- **Noise climate** is a term used to describe the general character of the environment with regard to sound. As well as the ambient noise level (quantitative aspect), it includes the qualitative aspect and the character of the fluctuating noise component.
- **Noise Control Regulations** means the regulations as promulgated by the Department of Environmental Affairs and Tourism and to be used by the provincial authorities to prepare their specific regulations. The Gauteng and Free State Provinces have promulgated their own regulations and thus sections of the project are governed by the Gauteng Noise Control Regulations and the Noise Control Regulations for the Free State Province.
- **Noise impact criteria** means the standards applied for assessing noise impact.
- **Noise level** means the reading on an integrating impulse sound level meter taken at a measuring point in the presence 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, and, if the alleged disturbing noise has a discernible pitch, for example, a whistle, buzz, drone or music, to which 5dBA has been added. (the "A" weighted noise levels/ranges of noise levels that can be expected in some typical environments are given in Table A2 at the end of this appendix).
- **Noise nuisance** means any sound which disturbs or impairs or may disturb or impair the convenience or peace of any reasonable person considering the quantitatively measurable such as barking dogs, etc. (compared with disturbing noise which is measurable).
- **Noise-sensitive Development** means and Interested or Affected Party (I&AP), receptor or any other party that has a concern about an activity.
- **Residual sound level** means the ambient noise that remains at a position in a given situation when one or more specific noises are suppressed (compare with *ambient noise).*

Sound exposure level or SEL means the level of sound accumulated over a given time interval or event. Technically the sound exposure level is the level of the time-integrated mean square A-weighted sound for stated time or event, with a reference time of one second.

- **Sound power level** indicates the total acoustic energy that a machine, or piece of equipment, radiates to its environment.
- **Sound (pressure) level** means the reading on a sound level meter taken at a measuring point.

- SANS 10103 means the latest edition of the South African Bureau of Standards Code of Practice SANS 10103 titled The Measurement and Rating of Environmental Noise with Respect to Land *Use, Health, Annoyance and to Speech Communication.*
- **SANS 0210** means the latest edition of the South African Bureau of Standards Code of Practice SANS 0210 entitled *Calculating and Predicting Road Traffic Noise.*
- **SANS 10328** means the latest edition of the South African Bureau of Standards Code of Practice SANS 10328 titled *Methods for Environmental Noise Impact Assessments.*
- **SEL** - Sound Exposure Level
- **Sound** means the aural sensation caused by rapid, but very small, pressure variations in the air. In quantifying the subjective aural sensation, "loudness", the letters dBA after a numeral denote two separate phenomena:

  "dBA", short for decibel, is related to the human's subjective response to the change in amplitude (or largeness) of the pressure variations.

  The "A" denotes the ear's different sensitivity to sounds at different frequencies. The ear is very much less sensitive to low (bass) frequency pressure variations compared to mid-frequencies.

  The level of environmental sound usually varies continuously with time. A human's subjective response to varying sounds is primarily governed by the total sound energy received. The total sound energy is the average level of the fluctuating sound, occurring during a period of time, multiplied by the total time period. In order to compare the effects of different fluctuating sounds, one compares the average sound level over the time period with the constant level of a steady, non-varying sound that will produce the same energy during the same time period. The average energy of sound varying in amplitude is thus equivalent to the continuous, non-varying sound. The two energies are equivalent.

Refer also the various South African National Standards referenced above and the Noise Control Regulations for additional, in some instances, more detailed definitions.

ABSTRACT AND EXECUTIVE SUMMARY

Acoustech Consulting was appointed by Zitholele Consulting (main consultant) to undertake an Environmental Noise Impact Assessment (ENIA) for the crusher plant development near the Clanwilliam Dam in the Western Cape.

The project forms part of the Clanwilliam Dam wall raising and associated construction works, supported by the on-site crusher plant established to process the required rock and aggregate materials.

The scope of works of this Environmental Noise Impact Assessment (ENIA) is to determine if the project complies with the Western Cape Noise Control Regulations (PN 200,2013) in terms of the Environmental Conservation Act, 1989 (Act No.73 of 1989) detailed in section 4. The methodologies applied in this report comply with the GN 320 of 20 March 2020 requirements.

One noise measurement was conducted at Point 1, located at the property boundary of the crusher plant , directly opposite the nearest noise sensitive receptor (the complainant's residence).

Based on the measurements the following Rating Level was selected for receptor:

- A typical rating level (i.t.o SANS 10103:2008) highlights a Rural District within the study area.

The outcome of the assessment indicates that noise mitigation is required for the crusher plant during the construction phase. The assessment was conducted considering the temporary operation of the crusher plant, as well as procedural and procurement constraints that may influence the timing of implementing the recommended mitigation measures.

Key mitigation options:

- Construction Phase: Due to the high noise levels emitted from the crusher plant, an acoustically engineered enclosure is required to significantly reduce noise emissions. The enclosure must be designed by an acoustic engineer to ensure compliance with applicable noise regulations and minimise impacts on nearby receptors.
- In addition to the technical mitigation measures, DWS has outlined several alternative management options (See Section 8.2) which may be implemented depending on feasibility and stakeholder agreement.

1. INTRODUCTION

Acoustech Consulting was appointed by Zitholele Consulting (main consultant) to determine the noise impact of the crusher plant development near the Clanwilliam dam in the Western Cape.

The scope of works of this Environmental Noise Impact Assessment (ENIA) is to determine if the project complies with the Western Cape Noise Control Regulations (PN 200,2013) in terms of the Environmental Conservation Act, 1989 (Act No.73 of 1989) detailed in **section 4**. The methodologies applied in this report comply with the GN 320 of 20 March 2020 requirements.

The assessment uses the South African National Standards (SANS) 10302:2008 and SANS10103:2008 criteria, the extent of noise levels from the project operations and at the receptors (dwelling, communities, office etc.). Reference is also made in terms of Appendix 6 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

2. INDICATIVE PROJECT DESCRIPTION

2.1. Basic Project Overview

The Department of Water and Sanitation has undertaken the raising of the Clanwilliam Dam wall, located near the town of Clanwilliam in the Olifants River Valley of the Western Cape. Approximately 230 kilometres north of Cape Town, Clanwilliam serves as the administrative hub of the Cederberg Local Municipality.

The Clanwilliam Dam, originally commissioned in 1935 and raised in 1964 to a height of 43 metres, provides a critical water resource for downstream irrigation and remains central to regional water management. With a current storage capacity of 121.8 million cubic metres, the dam supports both agricultural activity and local livelihoods.

The current project entails raising the dam wall to a maximum height of 49 metres and extending its length to approximately 370 metres. At full supply level, the reservoir will cover approximately 2,022 hectares, increasing storage capacity to 344.3 million cubic metres. Works include downstream concrete additions, apron extensions, a free-standing intake tower, river outlet control house, small hydropower facility, a short tunnel, upstream coffer dam works, and new outlet structures. All activities must be carried out without interrupting the dam's operation.

A key component of the construction operations is the on-site crusher plant, which has been established to process rock and aggregate materials required for the dam raising. The plant is currently generating noise that may affect the surrounding environment and nearby communities. The crusher plant includes:

- Four Crushers
  - Jaw Crusher
  - Primary Cone Crusher
  - Secondary Cone Crusher

    - Vertical Inclined Crusher
- Two Aggregate screens
- Three 570 kVA Generators

Consequently, an environmental noise impact assessment has been commissioned to evaluate the sound emissions, identify sensitive receptors, and recommend appropriate mitigation measures to minimise any adverse effects.

The project Locality Map and Crusher Plant Layout is indicated in **Figure 2-1** and **Figure 2-2.**

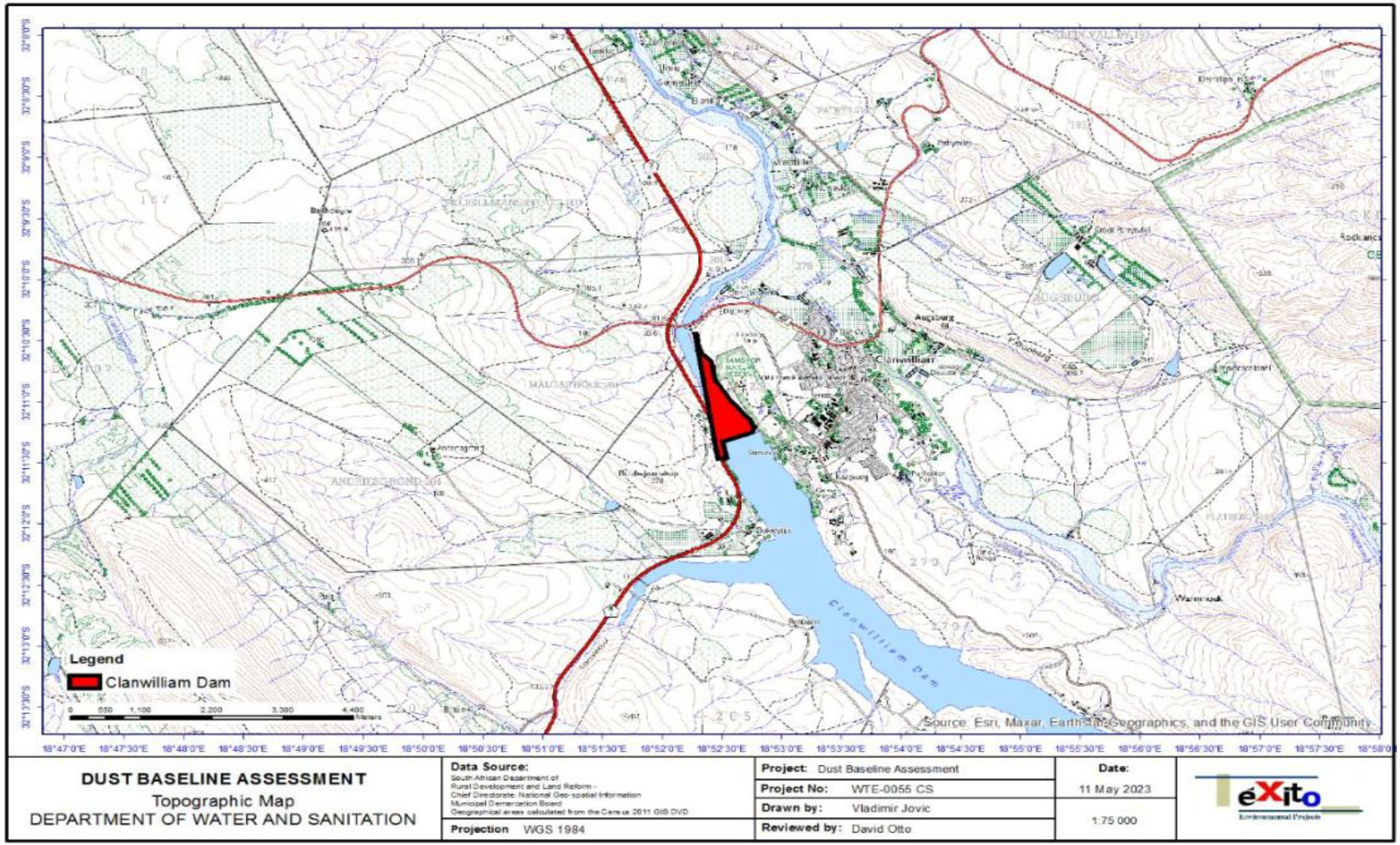


Figure 2-1: Locality Map

Figure 2-2: The Crusher Plant Layout

2.2. Study Objective

The objective of this specialist study is to assess the potential noise levels generated by the crusher plant and evaluate its impact on noise-sensitive receptors, such as homesteads, farmhouses, and other nearby properties, during construction activities.

This involves analysing the existing and predicted noise levels at various receptor locations and evaluating compliance with relevant noise regulations and standards. Additionally, the assessment aims to propose appropriate noise mitigation strategies to minimise negative impacts on the community and the environment.

The report layout and terms of reference for the study are as follows:

- The measurements of existing noise levels. The subsequent determination of the baseline setting (SANS 10103:2008 Rating Level) within the study area;
- The estimated noise emission from the project, and assessment of the construction phase noise impacts;
- Mitigation requirements and recommendations where applicable; and
- Conclusions and recommendations

2.3. Interested & Affected Parties (I&AP's)

The closest noise-sensitive receptor was identified through a desktop assessment, supported by information provided by the project team, and is illustrated in **Figure 2.3**. This receptor, located directly opposite the crusher plant, was selected as the focus for the noise impact assessment, as it reflects the location from which the complaint originated.

The measurement localities are presented in **Appendix C** in WGS 84 coordinates.

2.4. Transportation Network

Clanwilliam is located in proximity to the N7 national road, which forms a key transport corridor between Cape Town and the Namibian border, as well as the R364 regional road linking Lamberts Bay and Calvinia. The town further serves as the origin of Regional Route R363, providing connectivity to Nuwerus via Klawer and Vredendal. A network of both tarred and gravel local roads also exists, particularly in the vicinity of the Clanwilliam Dam, facilitating access to centre-pivot irrigated agricultural areas.

Rail infrastructure is provided by the Cape Town Bitterfontein line, with the nearest railway station situated at Graafwater, approximately 27 km west of Clanwilliam.

Figure 2-3: Interested & Affected Parties (Noise-Sensitive Developments)

2.5. Available Information

Prior to the compilation of this report, an official noise complaint was lodged by Mr. Stone, a resident living directly across from the crusher plant. The main consultant provided the Department of Water and Sanitation (DWS) noise baseline assessment conducted in July 2023, and the Clanwilliam Dam Environmental Management Plan (EMP) was sourced online.

Available information as sources from the project main consultant is presented below in **Table 2-1**.

Table 2-1 : Comments received- information gathered relating to the project

Source	Comment or Information
Project Team	DWS Noise Baseline Assessment 2023
Online	Clanwilliam Dam EMP

3. FUNDAMENTALS AND KEY CONCEPTS OF NOISE

3.1. Background to the propagation of sound and frequency

3.1.1 Frequency and Sound Waves

Sound is defined as any pressure variation in (air, water, or other mediums) detectable by the human ear, while noise is unwanted or disruptive, often characterised by its unpleasantness or potential to interfere with normal activities which can lead to health impacts and negatively affect people's quality of life.

When an object vibrates, it creates sound waves by causing the surrounding particles to move back and forth. These particles collide with adjacent particles, transferring energy through the medium in a wave-like motion. This process continues, allowing the sound wave to travel outward from the source. The speed of sound propagation depends on the medium's properties, such as temperature, density, and elasticity. In general, sound travels faster in denser and more elastic mediums. The intensity of noise is measured in Decibels (dB).

Sound waves are longitudinal waves meaning that there are regions of compression and rarefaction, where particles are alternately pushed together and pulled apart. The combination of a compression and a rarefaction in a sound wave is also known as a wavelength or cycle. Frequency is a fundamental aspect of sound waves, representing the number of vibrations or cycles per second that a wave undergoes, measured in Hertz (Hz). It determines the pitch of a sound: higher frequencies produce higher-pitched sounds, while lower frequencies produce lower-pitched sounds. Human hearing typically ranges from about 20 Hz to 20,000 Hz, with the most sensitive range being between 1,000 Hz and 5,000 Hz.

Figure 3- 1 below illustrates the difference between a high frequency sound wave and low frequency sound wave.

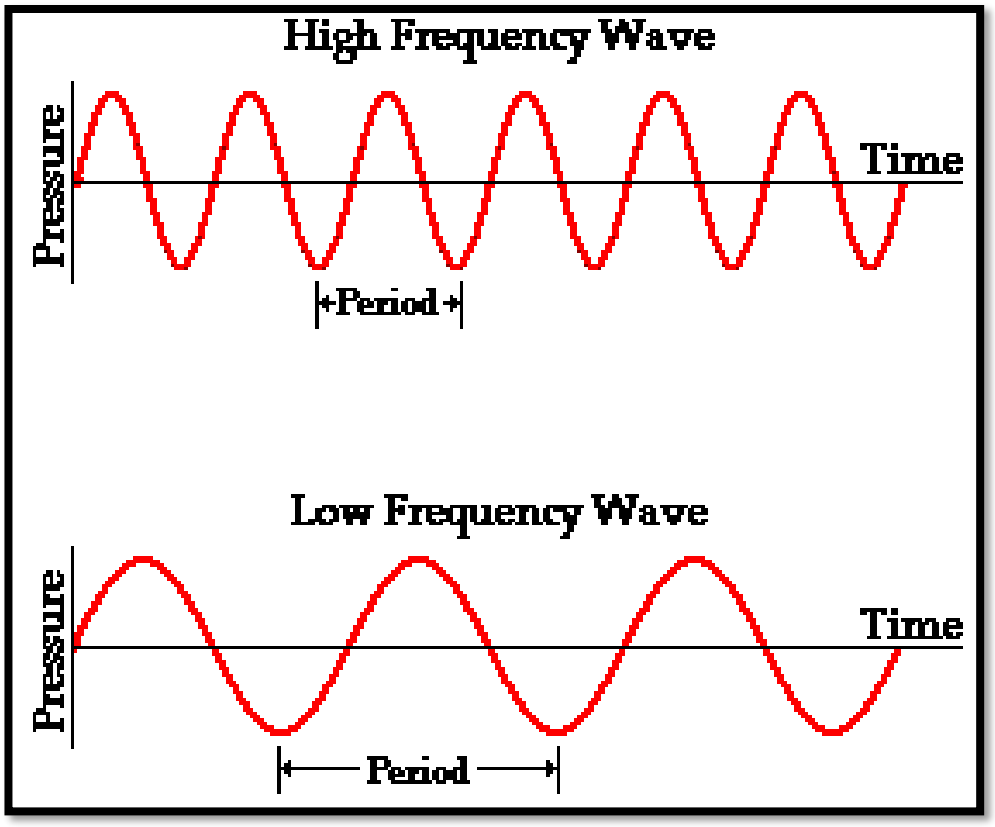


Figure 3-1: High vs Low Frequency sound waves

The instrument used to measure noise, which replicates the human ear's sensitivity to sound, is called a sound level meter (SLM). The frequency weighting applied to the sound level meter during measurements is known as A-weighting. This tuning adjusts the measurement to mimic the way the human ear functions. The measurements taken with this weighting applied are expressed in dBA.

3.1.2 Frequency Weightings

The human ear simultaneously receives sound (normal un-weighted sound or Z-weighting dB(Z) at many frequencies (octave bands) at different amplitudes. The ear then adjusts its sensitivity based on the amplitude of the sound observed. This focuses the sound and makes it audible by adjusting the amplitude of the low, middle and high frequencies. To measure how a person experiences sound, an electronic weighting adjusted to the Z-weighted sound was developed, including three different weighting curves, namely:

- **A-weighting** - this measurement is often noted as dB(A) and this weighting curve attempts to make the sound level meter respond *closely to the characteristics of a human ear*. It attenuates the frequencies at low frequencies. Various national and international standards relate to measurements recorded in the A- weighting of sound pressure levels.
- **C-weighting** - is intended to represent how the ear perceives sound at high decibel levels. C-weighted measurements are reported as dB(C)

- **Z-weighting** - this refers to linear, unweight noise levels (instantaneous readings are displayed on the sound level meter as such), prior to any weighting.

3.1.3 Comparative examples of noise levels

The magnitude of sound and the typical noise range experienced by humans, from the softest to the loudest, is from 0dBA, known as the threshold of hearing, to 130dBA, termed as the threshold of pain. Table 3-1 illustrates the magnitude of sound levels as perceived by humans.

Table 3-1: Typical noise ranges in dB(A)/ Subjective human interpretation

Sound Pressure Level (SPL – dBA)	Typical Source	Subjective Evaluation
130	threshold of pain	intolerable
120 **110**	heavy rock concert grinding on steel	extremely noisy
100 **90**	loud car horn at 3m construction site with pneumatic hammering	very noisy
80 **70**	kerbside of busy street loud radio or television	loud
60 **50**	department store general office	moderate to quiet
40 **30**	inside private office inside bedroom	quiet to very quiet
20	unoccupied recording studio	almost silent

4. LEGAL FRAMEWORK

4.1. South African Legislation & Guidelines

4.1.1 The Constitution of the Republic of South Africa Act, 1996 (Act No. 108 of 1996)

This act lists noise pollution as a matter which falls under the jurisdiction of local government with assistance from the provincial government.

4.1.2 The Environmental Conservation Act, 1989 (Act No 73 of 1989)

This act makes provision for the National Noise Control Regulations, but these relate only to local authorities that request the application of such regulations. In 1996, the responsibility of administering the Noise Control Regulations was devolved to provincial level but only Gauteng, Free State and Western Cape provinces have promulgated their regulations. Although this act has been largely superseded by the National Environmental Management Act (Act No

107 of 1998), the Noise Regulations will still be promulgated in terms of the original Act.

4.1.3 The Air Quality Management by-law in Cederberg Municipality, 2025

The Cederberg Municipality's Air Quality Management By-law, enacted in 2025, provides a local regulatory framework aimed at managing and mitigating air pollution within its jurisdiction. This by-law aligns with the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), and incorporates provisions for controlling various environmental pollutants, including noise. Specifically, *Section 18 of* the by-law addresses noise pollution, establishing measures to prevent, minimise, or mitigate noise emissions from various sources .

Complementing this, the Western Cape Noise Control Regulations (PN 200 of 2013), promulgated under Section 25 of the Environment Conservation Act, 1989 (Act No. 73 of 1989), provide a provincial framework for managing noise pollution. These regulations define key terms such as 'ambient noise' and 'disturbing noise,' and set forth permissible noise levels for different land-use zones. They also outline procedures for noise impact assessments and establish penalties for non-compliance .

Together, these legislative instruments create a comprehensive framework for managing noise pollution in the Cederberg Municipality. The Air Quality Management By-law provides local enforcement mechanisms and specific provisions tailored to the municipality's context, while the Western Cape Noise Control Regulations offer a provincial standard that ensures consistency across the region. This integrated approach facilitates effective noise management, promoting a healthy and sustainable environment for residents and aligning with national environmental objectives.

4.1.4 Western Cape Noise Control Regulations (PN200 of 2013)

The Western Cape Noise Control Regulations, promulgated under Section 25 of the Environment Conservation Act, 1989 (Act No. 73 of 1989), establish the legal framework for managing and controlling noise pollution within the province. These regulations are applicable to all activities and operations that generate noise, with specific provisions for different land-use zones.

Key Definitions:

Ambient Noise: The total encompassing sound in a given situation at a given time, measured as the reading on an integrating impulse sound level meter for a period of at least 10 minutes.

Disturbing Noise: Any noise, excluding the unamplified human voice, which exceeds the rating level by 7 dBA, exceeds the residual noise level by 3–5 dBA

where applicable, or exceeds the low-frequency limits specified in SANS 10103.

Regulatory Provisions:

- **Land Use and Noise Impact:** The noise impact rating of any proposed land use or activity may not exceed the appropriate rating level for a particular district as indicated in SANS 10103 or exceed residual noise levels by 5 dBA or more.
    - **Exemptions:** The regulations do not apply where the emission of sound is for warning people of a dangerous situation or occurs during an emergency.
    - **Offences and Penalties:** Individuals who contravene the regulations may face fines or imprisonment as prescribed by law.

Application to Noise Impact Assessments:

The definition of disturbing noise (+7 dBA from Rating Level SANS 10103:2008) forms the basis upon which a non-compliance in terms of South African legislation is made. This threshold is critical in assessing the potential impact of noise-generating activities, such as those from crusher plants, on surrounding noise-sensitive receptors.

4.1.5 SANS Guidelines (SABS)

SANS 10103:2008, the Measurement and Rating of Environmental Noise with Respect to Annoyance, and to Speech Communication. Besides measurement techniques etc, this document provides noise levels that are expected in various areas (Rating Level). These are used by the Noise Regulations as limits of noise in the various areas. The acceptable rating levels for various districts are given in **Table 4-1,** being the maximum noise level that is acceptable at the boundary of the property for any district. It should be noted that for industries operating in an industrial zone a 24-hour 70 dBA L_{Aleq} is acceptable.

SANS 10328:2008, Methods for environmental noise impact assessments. The document sets out the methodology to compile a comprehensive Environmental Nosie Impact Assessment. Stipulations include methodologies and minimum requirements, as well as various noise sources for investigations.

SANS10210:2004, Calculating and predicting road traffic noise. The document defines the prediction and measurement relating to road traffic noise.

Table 4-1 : Acceptable external noise levels within a district according to SANS 10103:2008

Type of District	Equivalent Continuous Rating Level for Noise ($L_{Req,T}$) (dBA)					
	Outdoors			Indoors with open windows		
	Day-night ($L_{Req,dn}$)	Daytime ($L_{Req,d}$)	Night-time ($L_{Req,n}$)	Day-night ($L_{R,Dn}$)	Daytime ($L_{Req,d}$)	Night-time ($L_{Req,n}$)
a) Rural districts	45	45	35	35	35	25
b) Suburban districts (little road traffic)	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts (with 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

If the ambient noise level is exceeded due to construction noise, the community may respond with noise nuisance claims. To evaluate potential noise nuisance claims, refer to the table below from SANS 10103 of 2008.

Table 4-2: Categories of community or group response

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

4.1.6 Appendix 6 of the National Environmental, Management Act, 1998 (Act No. 107 of 1998)

The Appendix 6 of the National Environmental, Management Act, 1998 (Act No. 107 of 1998) regulations sets out minimum requirements from the authorities for a specialist to conduct an Environmental Study. The legislation checklist relevant for an ENIA has been compiled and is presented at the start of the document.

The new draft legislation promulgated on the 10th of May 2019 "Procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes in terms of Section 24(5)(a) and (h) of the National Environmental Management Act, 1998, when applying for environmental authorisation." was applied to this assessment.

4.1.7 The National Environmental Management Air Quality Act,2004 (Act No.39 of 2004)

In NEMAQA, the noise control provisions are mentioned in Section 34, as follows:

"(1) The minister may prescribe essential national standards –

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

(b) for determining –

(i) a definition of noise; and

(ii) the maximum levels of noise.

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

Under NEMAQA, the noise control regulations were to be updated and are applied to all provinces in South Africa. The noise control regulations give all the responsibilities of enforcement to the local or provincial authority (dependent upon the capacity of the local authority), where location specific by-laws can be created and applied to the areas of jurisdiction with approval of provincial government.

4.2. Other Guidelines Relating to Environmental Acoustics

4.2.1 Blasting & Vibrations

Blasting and Vibrations do not have methodologies or legislation in South Africa. Blasting and vibrations is a study into the effect of earthworks blasting in terms of ground, surface and air vibrations. It also studies rock blasting into the surrounding environment. The effects of blasting vary depending on the structure under consideration, the intensity of the blast, the distance of the blast etc. The vibration depends on the frequency as well as the vibration (in millimeters). Blasting is a specialist's study and could only be considered in the

SANS10103:2008 as a +5 to 10 dBA (impulsive sound, however it should be noted that blasting only occurs irregularly). Blasts are a highly controlled event with warning prior to the noise.

5. APPROACH AND METHODS

5.1. Measurement Criterion

The procedures, as detailed in SANS 10328:2008 and SANS10103:2008 have been applied to the noise measurements and assessments made in this report. A summary of the approach to this study is outlined below.

5.1.1 Noise Policy Documents for the Region

The Air Quality Management By-law was promulgated for the Cederberg Municipality in the Western Cape Province. This by-law works in conjunction with the Western Cape Noise Control Regulations (PN 200/2013) to manage noise and other environmental disturbances within the municipality. In addition, the Public Nuisances By-law (2019) addresses noise disturbances in public spaces, while the Municipality's Events Policy provides guidelines to minimize noise impacts during organized events.

5.1.2 Field Assessments of the Site

Field assessments in and around the site were undertaken from the 26th to the 27th of August 2025. This included the identification of the noise sensitive stakeholders, existing noise sources and other baseline noise contributors. Viable and alternative measurement localities at the identified monitoring localities were further investigated to ensure measurements were not influenced by extraneous noise sources (e.g. an air-conditioning condenser unit near measured locality).

5.1.3 Existing Baseline - Noise Measurements

Ambient noise measurements at the property boundary of the crusher plant were conducted from the 26th to the 27th of August 2025. The noise measurements were analysed to compile a subjective and objective determination of the Rating levels (L_{Req}) based on the L_{Aleq} measurements.

Two Svantek SANAS calibrated type 1 sound level meters were used to perform the noise measurements. The sound level meters were calibrated before and after the noise measurements with a 01dB sound calibrator. Further details of the sound level meter and the calibration certificates can be found in Appendix D.

$L(A)_{eq}$ values of ambient noise levels were calculated for the measurement point from the readings. The $L(A)_{eq}$ value is an A-weighted noise level integrated over the period of measurement.

The approximate high and low weather conditions experienced during the measurement period is indicated in **Table 5-1**

Table 5-1: Approximate Weather Conditions

	Measurement Date	Temperature (H/L)	Wind Speeds
Point 1 (Property Boundary)	26/08/2025	25 / 10 Degrees C	15 km/h S
	27/08/2025	20 / 11 Degrees C	7 km/h WSW

- Clanwilliam typically experiences mild daytime temperatures and cool nights in August, with low rainfall, moderate humidity, and steady winds as part of the region's late winter season.

- The predominant wind directions in Clanwilliam during August consist of northerly to westerly winds, influenced by the region's late winter seasonal patterns and surrounding topography.

5.1.4 Estimation of Potential Noise Impacts

The noise impact was determined with reference to legal standards (where applicable) and the specifications and guidelines provided in the SABS standards document (SANS 10103:2008). Significance of impacts can be subjective and legal minimum requirements and good engineering practice have therefore been used in each case to determine what is reasonable.

To make the judgment, we have compared the predicted noise level (as described in preceding section) at each receptor locality with each of the following:

- The measured ambient noise levels as described in measurement section above; and
- The identified SANS 10103: 2008 "typical rating levels for noise in districts" based on the measured ambient noise levels.

The extent of potential impacts has taken into consideration the probable community response to increases in sound levels, based on SANS 10103:2008. Important components and nature of the noise, such as impulsiveness and occurrence of pure tones, have also been accounted for by including correction factors as per SANS10103:2008.

5.2. Modelled Scenario

The modelled scenario was designed and based on the layout as supplied by the project team. The significant noise sources were identified, and noise contours maps developed. The modelled scenario took into consideration the following:

- Corrections for ground conditions (obtained from site observations) and metrological conditions;
- Ground elevation contours;
- Noise modelling based on predicted noise climate Sound Power Levels (SPL) will be sourced online and on our SPL Library; refer to **Appendix B** for sound power levels of typical noise sources (The noise source of a bulldozer of A 110 dBA sound Power level was used for the model)
- The model was simulated using the Soundplan version 9 Software to predict the extent of noise levels during the construction phase.(A point source was used for the model, as it best represents the localised sound emissions from the crusher plant's operations)
- Noise contour maps are used to illustrate how far the construction noise will propagate from the study area to noise sensitive developments and nearby communities.
- The spatial data used for the modelling is sourced from Google Earth ™

5.3. Assumptions and Limitations

5.3.1 Acoustical Measurements

There are limitations and uncertainties regarding acoustical measurements. Noise levels has the potential to fluctuate based on numerous components, including:

- The noise level may change from day to day due to activities within a community (e.g. road traffic fluctuations, see point below) or even at a singular dwelling itself. Dwelling related infrastructure (e.g. air-conditioning units, swimming pool pumps etc.) that has the potential to influence noise levels in terms of dB;
- Seasonal changes have the potential to influence sound levels directly (e.g. rain) or indirectly (influence faunal communication, see point below);
- Faunal communication measurement fluctuations due to seasonal, time of day or night etc. Certain fauna communicates during certain hours e.g. cicada may only audible during night-hours, crepuscular birds are only audible during evening or night hours, crickets may be more audible active as seasons get hotter etc;
- Road traffic noise fluctuates due to time of measurement investigation (e.g. peak traffic morning or evening conditions, early morning hours etc.; and

- Metrological conditions can influence noise measurements. These include inversion and diffraction in the temperature layer, change in temperature and humidity etc.

Measurements were conducted over two days a portion of above-mentioned limitations, usually a 10min interval measurement would suffice, however the longer-term measurements enabled measurements to be analysed in terms of LAeq, percentile and octave data. Longer-term measurements are proposed in certain national and international guidelines (or legalisation), namely:

- South African GN R154 Section 1, Controlled Area (LAeq);
- ISO 1996-2:2017, Section 3 Terms and Definitions (LAeq);
- World Health Organisation Night-Time Guidelines for Europe Executive Summary, pg XVII (LNight);
- SANS 10328:2008 & SANS10103:2008 Section 3.20, Reference time interval (LAeq);
- Brüel & Kjær Environmental Noise Measurements (LAeq);
- Calculation of Road Traffic Noise 1996 (CoRTN) (L10); and
- ETS R97 (wind conditions monitoring).
- The measurements conducted on the 27th of August 2025 do not represent the plant operating at full capacity, as the primary cone crusher was under maintenance and the jaw crusher was not operational.

5.3.2 Noise Mitigation Constraints

There may be challenges in implementing the recommended noise mitigation measures due to a number of procedural and practical constraints:

- **Crusher Plant:** The crusher plant is assumed to operate until the end of March 2026, in line with the current construction programme. therefore, the noise impacts associated with the plant are regarded as temporary.
- **Procurement Constraint**: The procurement process for the Department of Water and Sanitation (DWS) to appoint a Professional Service Provider (PSP) typically takes between 3 and 6 months to complete, although in some cases this period may extend up to 12 months.
- **Design and Implementation constraints**: The proposed noise mitigation measure requires significant technical planning, regulatory approvals, and construction time, which may further delay implementation.

Taking these factors into account, it is recognised that compliance with the recommendations may only be achievable once the above procurement, design and practical constraints have been resolved, it is possible that the

recommendations may not be implemented before the crusher plant ceases operation.

6. BASELINE SOUND PRESSURE MEASUREMENTS

The measurement point is presented in **Figure 2-2** in Section 2.

6.1. Baseline Noise Measurement Results

Equivalent values (Fast setting) are presented in Table 6-1 for Point 1. The detailed noise histograms are shown in Appendix A.

Table 6-1: Rating level – Noise Measurements at Point 1

Measurement Point	Date	Time	Recorded Ambient Noise Level (L_{Aeq})	Comparative Rating Level (SANS10103:2008)
Point 1 (Property Boundary)	**26/08/2025**	Daytime 18:01 – 22:00	46.3 dBA	Rural District (Daytime = 45 dBA)
		Night-Time 23:05 – 04:25	35.8 dBA	Rural District (Night-time = 35dBA)
	27/08/2025	Daytime 06:00 – 22:00	46.9 dBA	Rural District (Daytime = 45 dBA)
		Night-Time 23:50 – 03:00	35.3 dBA	Rural District (Night-time = 35dBA)

6.2. Noise level results at Point 1 with Crusher Plant Operational

Measurement Point	Date	Time	Measured Noise Level with the Crusher Plant Operating dBA	SANS 10103:2008 Rating Level dBA (Daytime / Night-time)	Daytime Noise Level Exceedance dBA
Point 1 (Property Boundary)	26/08/2025	Daytime	80.2 dBA	Rural District 45 dBA / 35 dBA	35.2 dBA

Noise measurements were conducted at Point 1 while the crusher plant was operational. During the daytime period on 26 August 2025 between 15:14 – 17:00, the measured noise level at Point 1 was 80.2 dBA. When compared to the SANS 10103:2008 rural district guideline of 45 dBA for daytime and 35 dBA for night-time, this represents a significant exceedance of approximately 35.2 dBA above the recommended daytime noise level.

6.3. Existing Noise Sources

The existing noise sources for Clanwilliam Dam are as follows: the crusher plant on-site, traffic noise from vehicles on the N7 and local roads, noise from construction activities related to the dam raising project, residential noise from nearby households, agricultural noise from farming operations in the surrounding areas, and natural sounds such as wind, water movement in the dam, and wildlife.

7. NOISE IMPACT ASSESSMENTS

A worst-case controlled scenario was used to illustrate a visual representation of the extent of noise experienced in the area, identify the significance rating, and assess potential noise impacts in terms of legislation.

7.1. Construction Phase

7.1.1 Construction Noise Sources

The assessment made use of the primary cone crusher (Nordberg HP400), which had an on-site measured sound pressure level of 99.6 dBA at 1.5 m, corresponding to a calculated Sound Power Level of 114 dBA.

The following construction activities have been identified below:

- Material Handling - Feeding of raw rock or aggregate into the plant (typically by dump trucks, loaders, or excavators)
- Primary Crushing - Breaking down large rocks using a jaw crusher or similar primary unit.
- Secondary crusher - Further size reduction using cone crushers or impact crushers.
- Screening & Sorting - Separation of crushed material into size fractions using vibrating screens.
- Conveying systems - Continuous movement of material between crushers, screens, and stockpiles via conveyor belts.

7.1.2 Impact due to construction noise

Table 7-1 presents the noise levels measured from the construction site, while Figure 7-1 provides a visual representation of the noise experienced in the surrounding area.

The measured ambient noise levels were used to identify the SANS district noise levels of the area and were therefore applied in predicting construction noise.

Table 7-1: Prediction of the Construction Noise at the closest noise sensitive receptors

Site	Measured Ambient Noise Levels dBA (Daytime)	Predicted Construction Noise Levels **LReq (dBA)**	Predicted Daytime Excess Ambient Noise levels **($\Delta L_{Req, d}$) (dBA)**
NSR (Mr Stone's Property)	46.3	70 dBA	23.7 dBA

- The results above indicate that current construction noise is likely to cause vigorous (Strong) or group action from the community **(see Table 4.2 in section 4)**

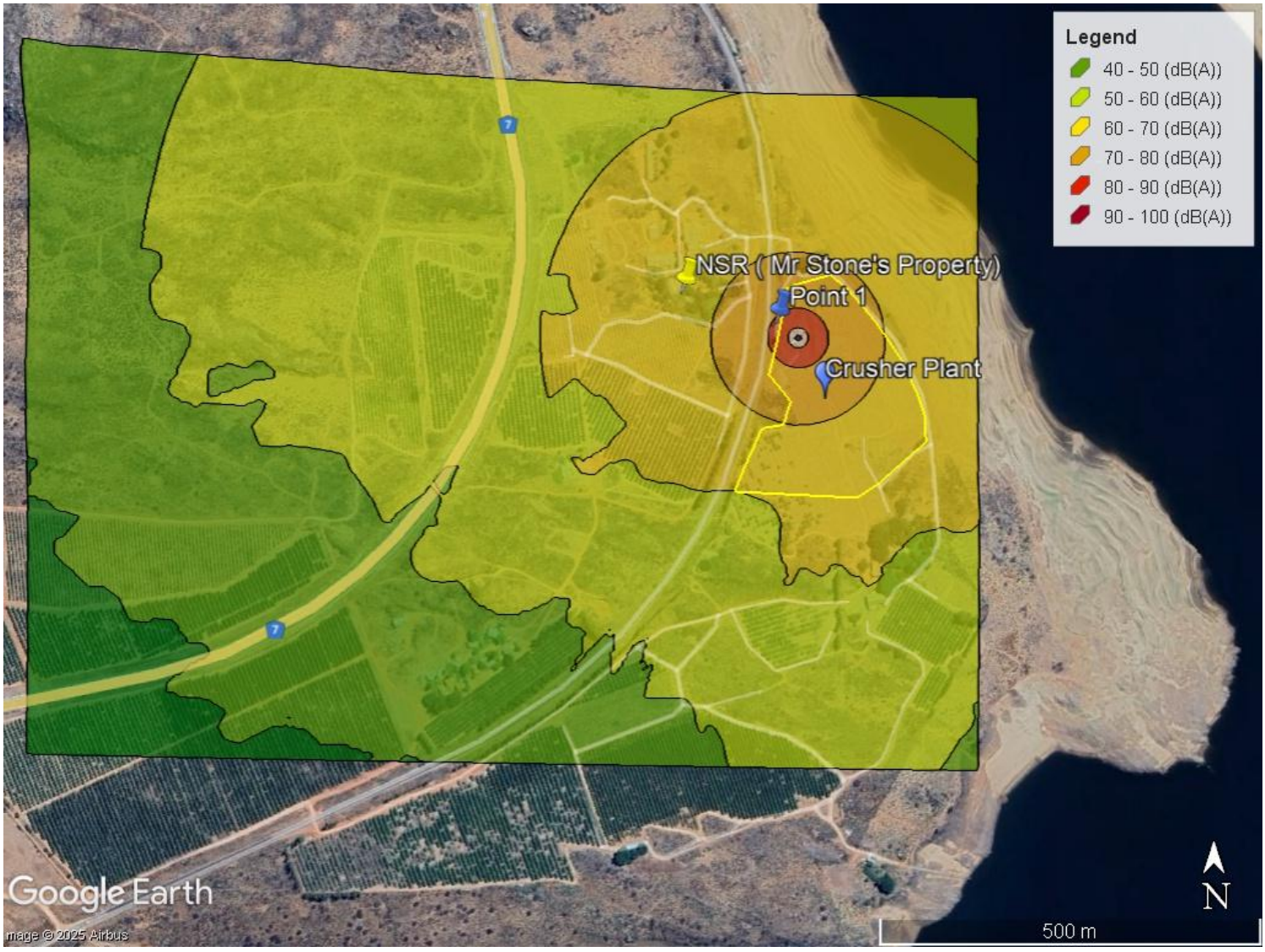


Figure 7-1 : Simulation of noise levels from the crusher plant based on construction activity

7.1.3 Discussion

The construction site noise exceeds the baseline ambient levels by 23.7 dB during the daytime period (07:00 – 17:00) , indicating that construction activities are clearly audible and constitute a noise disturbance. Limiting construction to daytime hours ensures that there is no disturbance from the crusher plant during the night-time period.

Although the construction phase is temporary, the Environmental Management Programme (EMP) should be taken into consideration. In accordance with the Clanwilliam Dam EMP (October 2014), construction noise should be managed with the aim of keeping site boundary levels within 7 dB above ambient, ensuring that Interested and Affected Parties (I&APs) are informed of excessive noise, and that community complaints are addressed promptly.

It should be noted that the EMP provides guidance on best practices, while compliance with the Western Cape Noise Control Regulations and the Cederberg Municipality By-law constitutes the legal requirement. The assessment presented here considers both the EMP recommendations and the statutory noise limits to provide an objective evaluation of potential impacts from the crusher plant and to support the implementation of appropriate mitigation measures.

7.1.4 Mitigation Requirements

Given the significant noise reduction required for the crusher plant, an enclosure designed by an **acoustic engineer** is recommended. Such an enclosure would help to contain and reduce the noise emissions from the plant's operations, therefore mitigating potential impacts on nearby noise-sensitive receptors and ensuring compliance with relevant noise regulations.

7.1.5 Conclusion

The crusher plant generates high noise levels at the property boundary. Despite measurements not being taken directly at the nearest receptor, the Rural District classification (SANS 10103:2008) highlights potential propagation concerns. Without mitigation, significant disturbance to nearby residents is likely.

Noise mitigation is essential to comply with the Western Cape Noise Control Regulations (PN 200 of 2013) and minimize impacts. The recommended measure is the design and installation of an acoustically engineered enclosure for the crusher plant by a qualified acoustic engineer.

Implementing this measure will allow construction activities to proceed in alignment with environmental legislation while minimizing impacts on nearby receptors. It is further noted that DWS has proposed several alternative management options to address interim noise impacts on the affected resident. These options fall outside the scope of acoustical engineering mitigation but may influence project implementation timelines.

8. RECOMMENDATIONS FOR IMPACT MANAGEMENT AND MITIGATION

8.1. Mitigation Options for Construction Phase

Recommendations for mitigation and management are provided in Table 8.1.

Table 8-1: Recommended mitigation measures

Potential Impact	Mitigation, management and control measure(s)
Project Phase: Construction	

Potential Impact	Mitigation, management and control measure(s)
Construction Noise	• Ensure construction activities are restricted to daytime hours (07:00 – 17:00) to avoid night-time disturbance. • Design and install an acoustically engineered enclosure for the crusher plant. • Maintain open communication with I&APs, responding promptly to noise complaints.

8.2. DWS alternative Mitigation Proposals

The Department of Water and Sanitation (DWS) has identified three alternative management options to address the noise impacts associated with the operation of the crusher plant, based on the ongoing engagement with the affected resident (Mr. Stone) and the project team. These options are separate from the acoustical mitigation requirements outlined in Section 8.1 and represent operational or logistical measures that may be implemented depending on feasibility, timing, and stakeholder agreement.

Option 1: Alternative Accommodation for the Affected Party

DWS may provide alternative accommodation for the affected party for the remaining five-month period of crushing activities. The cost of accommodation would be borne by the Department. This option would only proceed following proper engagement and mutual agreement with the affected resident. At present, this is considered the most viable and preferred option by DWS as it enables continuation of the construction programme while temporarily removing the receptor from exposure to elevated noise levels.

Option 2: Relocation of the Crusher Plant

DWS investigated several potential alternative locations for the crusher plant prior to installation; however, no suitable or feasible sites were available within the project boundary. The project area has limited space, and renting adjacent farmland would be highly costly and may trigger additional environmental impacts such as vegetation clearance, loss of agricultural land, and increased traffic from transporting material. Relocating the plant would also introduce significant delays to the construction schedule. For these reasons, relocation is considered the least viable and least preferred option.

Option 3: Temporary Disestablishment of the Crusher Plant

Although the crusher plant is situated on land that has been formally expropriated for the dam works, the recent court ruling requires DWS to seek an amicable resolution to the matter. This resolution process may require additional time. In the interim, DWS may choose to temporarily disestablish the crusher plant or keep it on site without operating it until an agreed solution is reached. Although this option may introduce project delays, substantial quantities of material have already been crushed and may sustain construction progress in the interim.

9. NOISE IMPACT ASSESSMENT SUMMARY

The assessment confirms that noise mitigation is required for the crusher plant during the construction phase.

Key Mitigation Option:

Due to the elevated noise levels produced by the crusher plant, an acoustically engineered enclosure designed and specified by a qualified acoustic engineer is required to achieve meaningful noise reduction, ensure alignment with the Western Cape Noise Control Regulations (PN 200 of 2013), and protect nearby receptors.

In addition to the acoustical mitigation measures recommended in this report, the Department of Water and Sanitation (DWS) has proposed several operational and management alternatives (See Section 8.2) to address the interim noise impacts while long-term solutions are being finalised. These options include:

- Providing alternative accommodation for the affected resident for the remaining construction period (preferred by DWS).
- Investigating relocation of the crusher plant, although this is considered the least feasible option due to spatial, environmental, and cost constraints.
- Temporarily disestablishing the crusher plant or suspending its operation until an agreed resolution is reached.

Collectively, the technical mitigation and the DWS alternative proposals provide a pathway for reducing noise impacts, managing community concerns, and supporting continued compliance with environmental legislation and project requirements.

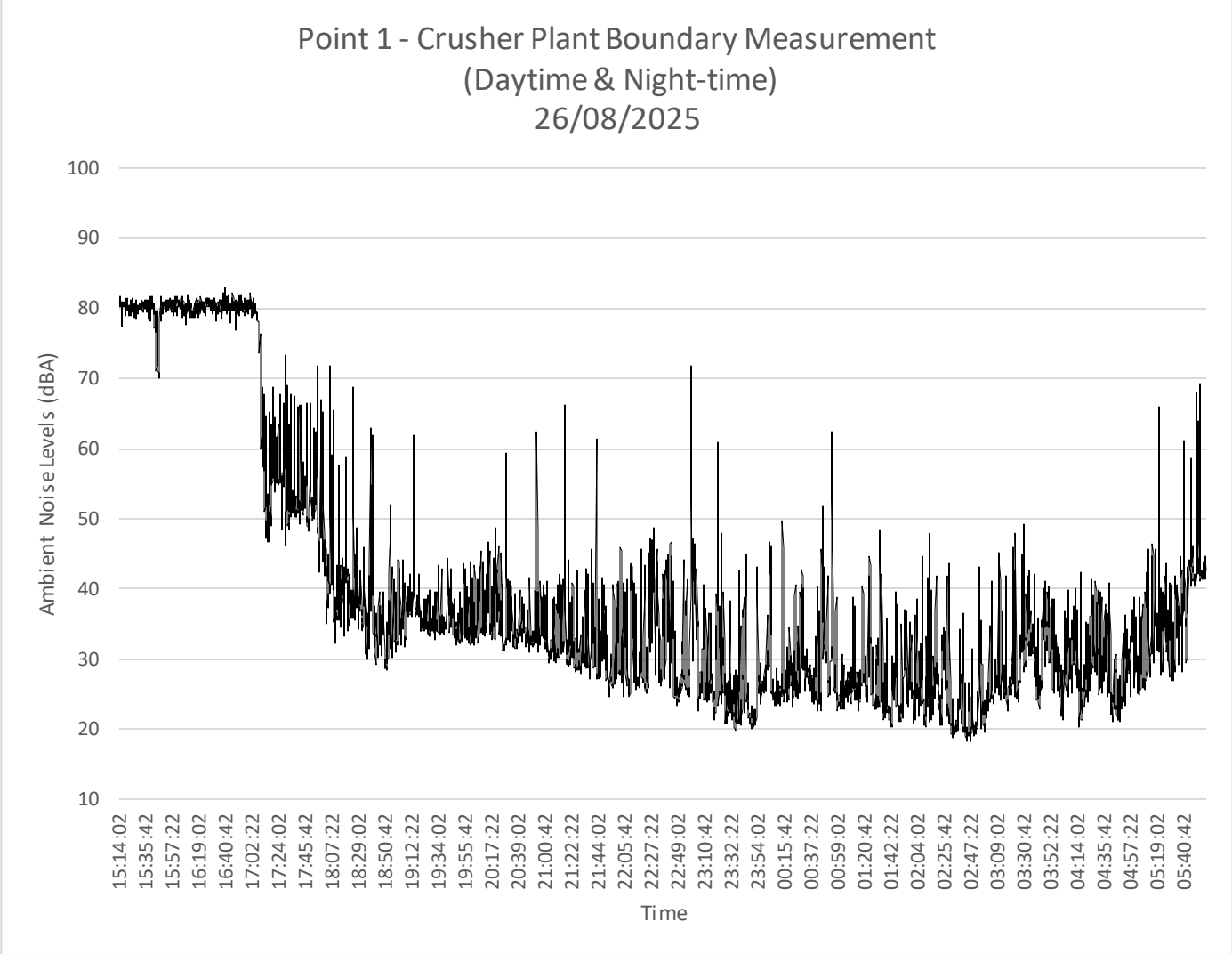
10. REFERENCES

1. Environment Conservation Act, 1989 (Act 73 of 1989).
2. National Environment Management Act (NEMA 2006).
3. Noise Control Regulations (Attached to the Act No 73 of 1989).
4. Occupational Health and Safety Act, 1993.
5. SANS 10328: 2008. 'Methods for environmental noise impact assessments.'
6. SANS 10103:2008. 'The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication.'
7. SANS 10357: 2004. 'The calculation of sound propagation by the Concawe method.'
8. "SoundPLAN, designing a sound environment." URL http://www.soundplan.com/.
9. The Constitution of the Republic of South Africa Act, 1996 (Act No. 108 of 1996).

APPENDIX A

Appendix A: Noise Histograms & Photos of measurement Points

Point 1 – Crusher Plant Boundary Measurement (26/08/2025)



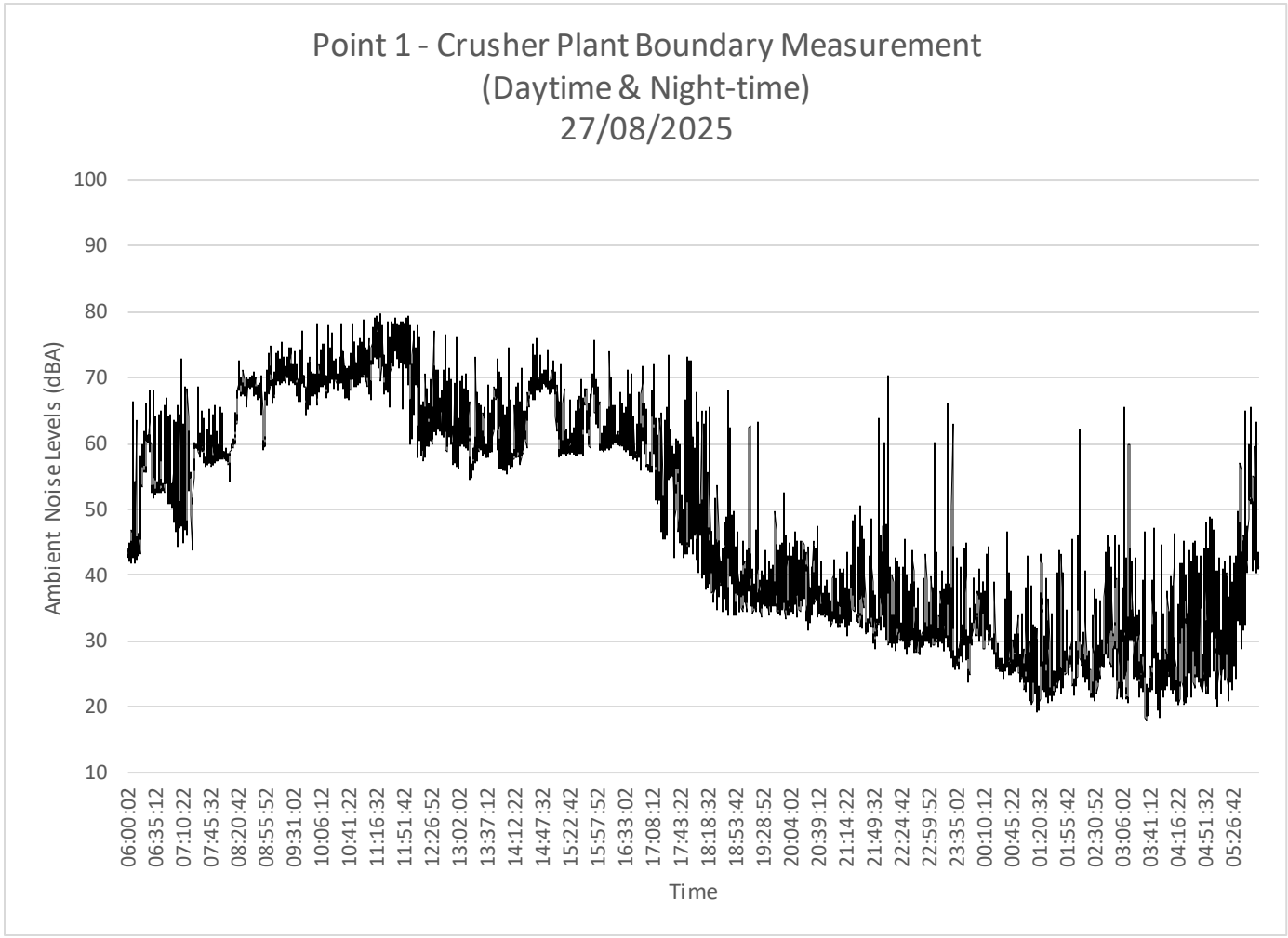

Point 1 - Crusher Plant Boundary Measurement
(Daytime & Night-time)
27/08/2025
Ambient Noise Levels (dBA)
100
90
80
70
60
50
40
30
20
10
06:00:02
06:35:12
07:10:22
07:45:32
08:20:42
08:55:52
09:31:02
10:06:12
10:41:22
11:16:32
11:51:42
12:26:52
13:02:02
13:37:12
14:12:22
14:47:32
15:22:42
15:57:52
16:33:02
17:08:12
17:43:22
18:18:32
18:53:42
19:28:52
20:04:02
20:39:12
21:14:22
21:49:32
22:24:42
22:59:52
23:35:02
00:10:12
00:45:22
01:20:32
01:55:42
02:30:52
03:06:02
03:41:12
04:16:22
04:51:32
05:26:42
Time

Photo of measurement Point

APPENDIX B

Appendix B: Sound Power Levels of Typical Noise Sources

Table 10-1: Sound power levels of construction equipment and assorted noise sources[1].

Noise Source	Sound Power (dBA)		Constant Operating Sound Power (dBA)
	Max (peak)	Min	
Pile driver (Impact noise)			132
Pneumatic chip hammer	131	121	
Jack Hammers, Rock Drills	130	112	
Rock drill			130
Trucks (All types)	127	99	
Tractors	126	108	
Front End/Wheel loader	125	70	
Backhoes	124	101	
Scrapers, Graders	124	111	
Pneumatic Wrenches	121	116	
Concrete Mixers	120	106	
Crane max	120	107	
Mechanical shovel			120
Pavers			120
Pneumatic breaker			120
Air Compressors	119	106	
Concrete joint cutter	119	116	
Portable saw	119	105	
Jawcrusher diesel ca 250 kW			118
Stud welder			118
Bulldozer			110
Breaker, mini-robot mounted			115
Piling, vibrating hammer			115
Concrete Pumps	114	109	
Roller Compactor	114	104	
Earth Tamper	113	107	
Generators	113	103	
Saws	113	101	
Concrete Vibrator	112	101	

[1] www.fhwa.dot.gov

Cutter, circular, steel (electric)			112
Hammer	112	104	
Impact crusher			112
Earthmover	111	104	
Drill rig, rotary type (diesel)			110
Road grinder (petrol)			108
Road sweeper			107
Water jetting unit (diesel)	107	94	
Dredger, Suction, Grout pumps	105	103	
Road ripper, excavator mounted			105
Paint line remover			104
Concrete crusher	103	94	
Soil pump			103
Poker, vibratory, hand-held (electric)			102
Generator, portable			100
Power pack (diesel)			100
Power swivel			100
Trucks (Typical onsite)			99

Noise Source	Constant Operating Sound Power (dBA)
Jig-saw, hand-held, wood (electric)	99
Road ripper, mini-robot mounted	97
Air blower (electric)	95
Excavator, mini-robot mounted	94
Agitator (electric)	90
Concrete buster	90
Grout mixer	90
Drill, hand-held (battery)	89
Gantry Operational Noise (onsite)	89
Pump Noise (onsite)	89
Paint line marker (low pressure)	87

Table 2: Estimated equivalent sound power levels for typical noise generated by general site operations.

General Site Operation	Sound Power (dBA)		Constant Operating Sound Power (dBA)
	Max (peak)	Min	
Construction site noise	132	N/A	112

APPENDIX C

Appendix C: Site Investigation Localities & Equipment/Calibration

: Site investigation localities (WGS 84)

Measurement Locality	Latitude	Longitude
Measurements		
Point 1	32°11'52.29"S	18°52'39.10"E

: Equipment & Calibration

Equipment	Calibration	Certification number Laboratory (M & N) Acoustic Services
Svantek 979, 69437 (SLM)	22 August 2024	2024-AS-1976
Svantek 979, 99523 (SLM)	11 -16 July 2024	2024-AS-1580
01dB Calibrator	28 November 2024	2024-AS-3134

APPENDIX D

Appendix D: Calibration Certificates

sanas
Calibration Laboratory
148
1302

M AND N ACOUSTIC SERVICES (Pty) Ltd
Co. Reg. No: 2012/123238/07 VAT NO: 4300255876 BEE Status: Level 4
P.O. Box 61713, Pierre van Ryneveld, 0045

No. 15, Mustang Avenue
Pierre van Ryneveld, 0045

Tel: 012 689-2007 (076 920 3070) • Fax: 086 211 4690
E-mail: admin@mnacoustics.co.za / marianka@mnacoustics.co.za
Website: www.mnacoustics.co.za

CERTIFICATE OF CALIBRATION

CERTIFICATE NUMBER	2024-AS-1976
ORGANISATION	ACOUSTECH CONSULTING
ORGANISATION ADRESS	P O BOX 752595, GARDENVIEW, 2047
CALIBRATION OF	SOUND & VIBRATION ANALYZER complete with built-in ⅓-OCTAVE/OCTAVE FILTER, ½" PRE-AMPLIFIER and ½" MICROPHONE
MANUFACTURERS	SVANTEK and G.R.A.S
MODEL NUMBERS	SV979, SV17 and 40AE
SERIAL NUMBERS	69437, 72724 and 617115
DATE OF CALIBRATION	22 AUGUST 2024
RECOMMENDED DUE DATE	AUGUST 2025
PAGE NUMBER	PAGE 1 OF 6

This certificate is issued in accordance with the conditions of approval granted by the South African National Accreditation System (SANAS). This Certificate may not be reproduced without the written approval of SANAS and M and N Acoustic Services.

The measurement results recorded in this certificate were correct at the time of calibration. The subsequent accuracy will depend on factors such as care, handling, frequency of use and the number of different users. It is recommended that re-calibration should be performed at an interval, which will ensure that the instrument remains within the desired limits and/or manufacturer's specifications.

The South African National Accreditation System (SANAS) is member of the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA). This arrangement allows for mutual recognition of technical test and calibration data by member accreditation bodies worldwide. For more information on the arrangement please consult www.ilac.org

Calibrated by Calibration Technician:	K.L. MONTSHO	**Clause 3.1 & 3.2**
Calibrated/Supervised by Calibration Technician:	W.S SIBANYONI	**Clause 3.1 - 3.4**
Authorized/Checked by SANAS Technical Signatory:	M. NAUDÉ	**Date of Issue: 27 AUGUST 2024**

Director: Marianka Naudé

1. PROCEDURE

The Integrating Sound Level Meter was calibrated according to procedure 1002/P/013 and to the IEC 61672-3:2006 specifications as well as the manufacturer's specifications.

The ½" Microphone was calibrated according to procedure 1002/P/002 and 1002/P/011 as well as the manufacturer's specifications.

The ⅓-Octave/Octave Filter was calibrated according to procedure 1002/P/008 and to the IEC 61260 specification as well as the manufacturer's specifications.

2. MEASURING EQUIPMENT

JFW	50BR-022	50 Ohm Step Attenuator	7343951614
Keysight	33522A	Function Generator	MY 50005443
Agilent	34461A	Digital Multimeter	MY 53223905
Major Tech	MT 669	Data Logger	150828410
B&K	4226	Multi-Frequency Calibrator	3081643
Gems	PD6000-6RO	Pressure Gauge Digital	1606-0204475
Svantek	SV 35	Acoustic Calibrator	58106
Major Tech	MT 669	Data Logger	150828469
Keysight	34461A	Digital Multimeter	MY 53223905
G.R.A.S	42 AP	Piston Phone	256092
G.R.A.S	26 AG	½" Pre-Amplifier	189056
B&K	4226	Multi-Functional Calibrator	3081643
Greysinger	80 CL	Data Logger	02304030/1/2
B&K	2829	4-Ch Microphone Power Supply	2329283
G.R.A.S	40 AQ	½" Microphone	160815

Calibrations performed by this laboratory are in terms of standards, the accuracies of which are traceable to national measuring standards as maintained by NMISA.

Calibrated by Calibration Technician:	***K.L. MONTSHO***	***Clause 3.1 & 3.2***
Calibrated/Supervised by Calibration Technician:	***W.S SIBANYONI***	***Clause 3.1 - 3.4***
Authorized/Checked by SANAS Technical Signatory:	***M. NAUDÉ***	***Date of Issue: 27 AUGUST 2024***

3. RESULTS - ACCORDING TO THE IEC 61672-3: 2006:

3.1 The following parameters of the Integrating Sound Level Meter were calibrated:

Parameter	Specification	Uncertainty of Measurement in dB
Calibration Check Frequency at 114,0 dB at 1 000 Hz at Nominal Range: High	IEC 61672-3: Clause 9	± 0,3
Self-Generated Noise: A-Weighted with Microphone 20,4 dB A-Weighted Electrical 12,0 dB C-Weighted Electrical 12,0 dB Z-Weighted Electrical 19,9 dB B-Weighted Electrical 12,0 dB	IEC 61672-3: Clause 10	-------
Level Linearity at 8 000 Hz Nominal Range: High Reference Level at 114,0 dB: (40,3 dB to 129,2 dB)	IEC 61672-3: Clause: 14	± 0,3
Level Range Control at 1 000 Hz Reference Level at 114,0 dB Nominal Range: High Low Range	IEC 61672-3: Clause: 15	± 0,3
Frequency and Time Weightings at 1 000 Hz at 114,0 dB	IEC 61672-3: Clause 13	± 0,3
Tone Burst Response (Max. Fast, Max. Slow, LA_{eq} and SEL)	IEC 61672-3: Clause 16	± 0,3

Calibrated by Calibration Technician:	*K.L. MONTSHO*	*Clause 3.1 & 3.2*
Calibrated/Supervised by Calibration Technician:	*W.S SIBANYONI*	*Clause 3.1 - 3.4*
Authorized/Checked by SANAS Technical Signatory:	*M. NAUDÉ*	*Date of Issue: 27 AUGUST 2024*

Director: Marianka Naudé | 082 727 3312

Parameter	Specification	Uncertainty of Measurement in dB
A-Weighting Network (31,5 to 20 000) Hz	IEC 61672-3: Clause 12	± 0,3
C-Weighting Network (31,5 to 20 000) Hz	IEC 61672-3: Clause 12	± 0,3
Z- Weighting Network (31,5 to 20 000) Hz	IEC 61672-3: Clause 12	± 0,3
B- Weighting Network (31,5 to 20 000) Hz	IEC 61672-3: Clause 12	± 0,3
Peak, C Low Peak Range	IEC 61672-3: Clause 17	± 0,3

Conclusion: The Integrating Sound Level Meter complied with the above-specified clauses of the IEC 61672-3:2006 specifications recommended tests and requirements according to ARP 0109:2014, **Class 1.**

3.2 The following parameters of the built-in ⅓-Octave/Octave Filter were calibrated:

Octave Frequency Response (31,5 to 16 000) Hz	IEC 61260: Sections 4.7 & 5.6
⅓-Octave Frequency response (25 to 20 000) Hz	IEC 61260: Sections 4.7 & 5.6

The uncertainty of measurement was estimated as follows: ± 0,3 dB

Conclusion: The built-in Octave Filter complied with the above-specified clauses of the IEC 61260 specifications, recommended tests and requirements according to ARP 0109:2014, **Class 1.**

Calibrated by Calibration Technician:	*K.L. MONTSHO*	*Clause 3.1 & 3.2*
Calibrated/Supervised by Calibration Technician:	*W.S SIBANYONI*	*Clause 3.1 - 3.4*
Authorized/Checked by SANAS Technical Signatory:	*M. NAUDÉ*	*Date of Issue: 27 AUGUST 2024*

3.3 The following parameters of the ½" Microphone were calibrated and the results were corrected to the ambient condition of 1 013,25 mBar:

Output Sensitivity at 250 Hz at 94,0 dB
Frequency Response (31,5 to 16 000) Hz

The uncertainty of measurements was estimated as follows: ± 0,3 dB

Conclusion: The parameters measured for the ½" Microphone, complied with the manufacturer's specification.

3.4 The ½" Microphone was calibrated Electroacoustic according to Clause 12 of IEC 61672-3: 2006 complete with Integrating Sound Level Meter and Svantek SV 17 ½" Pre-amplifier Serial No: 33273, free-field corrections were taken into consideration and the results were corrected to the ambient condition of 1 013,25 mBar:

FREQUENCY (Hz)	CALCULATED EXPECTED VALUE (dB)	MEASURED VALUE (dB)	DEVIATION (dB)	UoM (dB)
1 000 (Ref)	114,2	114,2	0,0	± 0,3
31,5	111,1	111,2	+ 0,1	± 0,3
63	113,5	113,4	- 0,1	± 0,3
125	114,1	114,0	- 0,1	± 0,3
250	114,2	114,2	0,0	± 0,3
500	114,1	114,2	+ 0,1	± 0,3
1 000	114,2	114,2	0,0	± 0,3
2 000	113,6	113,6	0,0	± 0,3
4 000	112,2	112,2	0,0	± 0,3
8 000	108,4	108,3	- 0,1	± 0,3
12 500	102,3	102,6	+ 0,3	± 0,3
16 000	97,3	98,5	+ 1,2	± 0,3

Calibrated by Calibration Technician:	*K.L. MONTSHO*	*Clause 3.1 & 3.2*
Calibrated/Supervised by Calibration Technician:	*W.S SIBANYONI*	*Clause 3.1 - 3.4*
Authorized/Checked by SANAS Technical Signatory:	*M. NAUDÉ*	*Date of Issue: 27 AUGUST 2024*

4. REMARKS

4.1 The reported expanded uncertainties of measurements are based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately 95,45%, the uncertainties of measurements have been estimated in accordance with the principles defined in the GUM (Guide to Uncertainty of Measurement) ISO, Geneva, 1993

4.2 The environmental conditions during calibration for items in Section 3 were:
Temperature: (23 ± 3) °C
Relative Humidity: (50 ± 15) %RH

The Environmental Conditions specified in the relevant IEC and ISO standards took precedence.

4.3 Calibration labels bearing cal date, due date (if requested), certificate number and serial number have been affixed to the instrument.

4.4 The above statement of conformance is based on the measurement values obtained, extended by the estimated uncertainty of measurement, being within the appropriate specification limits.

4.5 The above specified Sound & Vibration Analyser and ½" Microphone must be used as a unit. The ½" Microphone's frequency range determines the useful frequency range of the instrument vice versa.

4.6 The result on this Certificate relates only to the items and parameters calibrated.

4.7 Abbreviation:
UoM = Uncertainty of Measurement

----------SECTION 4.7 THE END OF CERTIFICATE----------

Calibrated by Calibration Technician:	*K.L. MONTSHO*	*Clause 3.1 & 3.2*
Calibrated/Supervised by Calibration Technician:	*W.S SIBANYONI*	*Clause 3.1 - 3.4*
Authorized/Checked by SANAS Technical Signatory:	*M. NAUDÉ*	*Date of Issue: 27 AUGUST 2024*

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Calibration Laboratory
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M AND N ACOUSTIC SERVICES (Pty) Ltd
Co. Reg. No: 2012/123238/07 VAT NO: 4300255876 BEE Status: Level 4
P.O. Box 61713, Pierre van Ryneveld, 0045
No. 15, Mustang Avenue
Pierre van Ryneveld, 0045
Tel: 012 689-2007 (076 920 3070) • Fax: 086 211 4690
E-mail: admin@mnacoustics.co.za / marianka@mnacoustics.co.za
Website: www.mnacoustics.co.za

CERTIFICATE OF CALIBRATION

CERTIFICATE NUMBER	2024-AS-1580
ORGANISATION	ACOUSTECH CONSULTING
ORGANISATION ADRESS	P O BOX 752595, GARDENVIEW, 2047
CALIBRATION OF	SOUND & VIBRATION ANALYZER complete with built-in ⅓-OCTAVE/OCTAVE FILTER, ½" PRE-AMPLIFIER and ½" MICROPHONE
MANUFACTURERS	SVANTEK and G.R.A.S
MODEL NUMBERS	SV979, SV17 and 40AE
SERIAL NUMBERS	99523, 52178 and 242169
DATE OF CALIBRATION	11 - 16 JULY 2024
RECOMMENDED DUE DATE	JULY 2025
PAGE NUMBER	PAGE 1 OF 6

This certificate is issued in accordance with the conditions of approval granted by the South African National Accreditation System (SANAS). This Certificate may not be reproduced without the written approval of SANAS and M and N Acoustic Services.

The measurement results recorded in this certificate were correct at the time of calibration.
The subsequent accuracy will depend on factors such as care, handling, frequency of use and the number of different users. It is recommended that re-calibration should be performed at an interval, which will ensure that the instrument remains within the desired limits and/or manufacturer's specifications.

The South African National Accreditation System (SANAS) is member of the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA).
This arrangement allows for mutual recognition of technical test and calibration data by member accreditation bodies worldwide. For more information on the arrangement please consult www.ilac.org

Calibrated by Calibration Technician:	N.J. BLIGNAUT	**Clause 3.1 & 3.2**
Calibrated/Supervised by Calibration Technician:	W.S. SIBANYONI	**Clause 3.1 - 3.4**
Authorized/Checked by SANAS Technical Signatory:	M. NAUDÉ	**Date of Issue: 16 JULY 2024**

Director: Marianka Naudé

1. PROCEDURE

The Integrating Sound Level Meter was calibrated according to procedure 1002/P/013 and to the IEC 61672-3:2006 specifications as well as the manufacturer's specifications.

The ½" Microphone was calibrated according to procedure 1002/P/002 and 1002/P/011 as well as the manufacturer's specifications.

The ⅓-Octave/Octave Filter was calibrated according to procedure 1002/P/008 and to the IEC 61260 specification as well as the manufacturer's specifications.

2. MEASURING EQUIPMENT

Keysight	33522B	Function Generator	MY 52814359
Keysight	34461A	Digital Multimeter	MY 53223917
JFW	50BR-022	50 Ohm Step Attenuator	7343961614
Major Tech	MT 669	Data Logger	150828456
Gems	PD6000-6RO	Pressure Gauge Digital	1606-0204475
Svantek	SV 35	Acoustic Calibrator	58106
Major Tech	MT 669	Data Logger	150828469
Keysight	34461A	Digital Multimeter	MY 53223905
G.R.A.S	42 AP	Piston Phone	256092
G.R.A.S	26 AG	½" Pre-Amplifier	189056
B&K	4226	Multi-Functional Calibrator	3081643
Greysinger	80 CL	Data Logger	02304030/1/2
B&K	2829	4-Ch Microphone Power Supply	2329283
G.R.A.S	40 AQ	½" Microphone	160815

Calibrations performed by this laboratory are in terms of standards, the accuracies of which are traceable to national measuring standards as maintained by NMISA.

Calibrated by Calibration Technician:	*N.J. BLIGNAUT*	*Clause 3.1 & 3.2*
Calibrated/Supervised by Calibration Technician:	*W.S. SIBANYONI*	*Clause 3.1 - 3.4*
Authorized/Checked by SANAS Technical Signatory:	*M. NAUDÉ*	*Date of Issue: 16 JULY 2024*

Director: Marianka Naudé | 082 727 3312

3. RESULTS - ACCORDING TO THE IEC 61672-3: 2006:

3.1 The following parameters of the Integrating Sound Level Meter were calibrated:

Parameter	Specification	Uncertainty of Measurement in dB
Calibration Check Frequency at 114,0 dB at 1 000 Hz at Nominal Range: High	IEC 61672-3: Clause 9	± 0,3
Self-Generated Noise: A-Weighted with Microphone 21,7 dB A-Weighted Electrical 6,6 dB C-Weighted Electrical 9,2 dB Z-Weighted Electrical 12,8 dB B-Weighted Electrical 6,8 dB	IEC 61672-3: Clause 10	-------
Level Linearity at 8 000 Hz Nominal Range: High Reference Level at 114,0 dB: (45,7 dB to 134,0 dB)	IEC 61672-3: Clause: 14	± 0,3
Level Range Control at 1 000 Hz Reference Level at 114,0 dB Nominal Range: High Low Range	IEC 61672-3: Clause: 15	± 0,3
Frequency and Time Weightings at 1 000 Hz at 114,0 dB	IEC 61672-3: Clause 13	± 0,3
Tone Burst Response (Max. Fast, Max. Slow, LA_{eq} and SEL)	IEC 61672-3: Clause 16	± 0,3

Calibrated by Calibration Technician:	*N.J. BLIGNAUT*	*Clause 3.1 & 3.2*
Calibrated/Supervised by Calibration Technician:	*W.S. SIBANYONI*	*Clause 3.1 - 3.4*
Authorized/Checked by SANAS Technical Signatory:	*M. NAUDÉ*	*Date of Issue: 16 JULY 2024*

Director: Marianka Naudé | 082 727 3312

Parameter	Specification	Uncertainty of Measurement in dB
A-Weighting Network (31,5 to 20 000) Hz	IEC 61672-3: Clause 12	± 0,3
C-Weighting Network (31,5 to 20 000) Hz	IEC 61672-3: Clause 12	± 0,3
Z- Weighting Network (31,5 to 20 000) Hz	IEC 61672-3: Clause 12	± 0,3
B- Weighting Network (31,5 to 20 000) Hz	IEC 61672-3: Clause 12	± 0,3
Peak, C Low Peak Range	IEC 61672-3: Clause 17	± 0,3

Conclusion: The Integrating Sound Level Meter complied with the above-specified clauses of the IEC 61672-3:2006 specifications recommended tests and requirements according to ARP 0109:2014, **Class 1.**

3.2 The following parameters of the built-in ⅓-Octave/Octave Filter were calibrated:

Octave Frequency Response (31,5 to 16 000) Hz	IEC 61260: Sections 4.7 & 5.6
⅓-Octave Frequency response (25 to 20 000) Hz	IEC 61260: Sections 4.7 & 5.6

The uncertainty of measurement was estimated as follows: ± 0,3 dB

Conclusion: The built-in Octave Filter complied with the above-specified clauses of the IEC 61260 specifications, recommended tests and requirements according to ARP 0109:2014, **Class 1.**

Calibrated by Calibration Technician:	*N.J. BLIGNAUT*	*Clause 3.1 & 3.2*
Calibrated/Supervised by Calibration Technician:	*W.S. MBANYONI*	*Clause 3.1 - 3.4*
Authorized/Checked by SANAS Technical Signatory:	*M. NAUDÉ*	*Date of Issue: 16 JULY 2024*

3.3 The following parameters of the ½" Microphone were calibrated and the results were corrected to the ambient condition of 1 013,25 mBar:

Output Sensitivity at 250 Hz at 94,0 dB
Frequency Response (31,5 to 16 000) Hz

The uncertainty of measurements was estimated as follows: ± 0,3 dB

Conclusion: The parameters measured for the ½" Microphone, complied with the manufacturer's specification.

3.4 The ½" Microphone was calibrated Electroacoustic according to Clause 12 of IEC 61672-3: 2006 complete with Integrating Sound Level Meter and Svantek SV 17 ½" Pre-amplifier Serial No: 33273, free-field corrections were taken into consideration and the results were corrected to the ambient condition of 1 013,25 mBar:

FREQUENCY (Hz)	CALCULATED EXPECTED VALUE (dB)	MEASURED VALUE (dB)	DEVIATION (dB)	UoM (dB)
1 000 (Ref)	114,2	114,2	0,0	± 0,3
31,5	111,1	111,1	0,0	± 0,3
63	113,4	113,4	0,0	± 0,3
125	114,0	113,9	- 0,1	± 0,3
250	114,2	114,2	0,0	± 0,3
500	114,2	114,2	0,0	± 0,3
1 000	114,2	114,2	0,0	± 0,3
2 000	113,7	113,6	- 0,1	± 0,3
4 000	112,3	112,2	- 0,1	± 0,3
8 000	108,1	108,1	0,0	± 0,3
12 500	102,3	102,5	+ 0,2	± 0,3
16 000	97,0	98,1	+ 1,1	± 0,3

Calibrated by Calibration Technician:	*N.J. BLIGNAUT*	*Clause 3.1 & 3.2*
Calibrated/Supervised by Calibration Technician:	*W.S. SIBANYONI*	*Clause 3.1 - 3.4*
Authorized/Checked by SANAS Technical Signatory:	*M. NAUDÉ*	*Date of Issue: 16 JULY 2024*

4. REMARKS

4.1 The reported expanded uncertainties of measurements are based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately 95,45%, the uncertainties of measurements have been estimated in accordance with the principles defined in the GUM (Guide to Uncertainty of Measurement) ISO, Geneva, 1993

4.2 The environmental conditions during calibration for items in Section 3 were:
Temperature: (23 ± 3) °C
Relative Humidity: (50 ± 15) %RH

The Environmental Conditions specified in the relevant IEC and ISO standards took precedence.

4.3 Calibration labels bearing cal date, due date (if requested), certificate number and serial number have been affixed to the instrument.

4.4 The above statement of conformance is based on the measurement values obtained, extended by the estimated uncertainty of measurement, being within the appropriate specification limits.

4.5 The above specified Sound & Vibration Analyser and ½" Microphone must be used as a unit. The ½" Microphone's frequency range determines the useful frequency range of the instrument vice versa.

4.6 The result on this Certificate relates only to the items and parameters calibrated.

4.7 Abbreviation:
UoM = Uncertainty of Measurement

----------SECTION 4.7 THE END OF CERTIFICATE----------

Calibrated by Calibration Technician:	*N.J. BLIGNAUT*	*Clause 3.1 & 3.2*
Calibrated/Supervised by Calibration Technician:	*W.S. SHANYONI*	*Clause 3.1 - 3.4*
Authorized/Checked by SANAS Technical Signatory:	*M. NAUDÉ*	*Date of Issue: 16 JULY 2024*

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Calibration Laboratory
CAL-048-13-00
CAL-048-01-00

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Tel: 012 689-2008 (076 920 3070) • Fax: 086 211 4690
E-mail: admin@mnacoustics.co.za / marianka@mnacoustics.co.za
Website: www.mnacoustics.co.za

CERTIFICATE OF CALIBRATION

CERTIFICATE NUMBER	2024-AS-3134
ORGANISATION	ACOUSTECH CONSULTING
ORGANISATION ADRESS	14A JUDITH STREET, OBSERVATORY, JOHANNESBURG, 2198
CALIBRATION OF	SOUND LEVEL CALIBRATOR complete with ½" ADAPTER
MANUFACTURER	01 dB
MODEL NUMBER	CAL 01 and BAC 012
SERIAL NUMBER	990541
DATE OF CALIBRATION	28 NOVEMBER 2024
RECOMMENDED DUE DATE	NOVEMBER 2025
PAGE NUMBER	PAGE 1 OF 3

This certificate is issued in accordance with the conditions of approval granted by the South African National Accreditation System (SANAS). This Certificate may not be reproduced without the written approval of SANAS and M and N Acoustic Services.

The measurement results recorded in this certificate were correct at the time of calibration. The subsequent accuracy will depend on factors such as care, handling, frequency of use and the number of different users. It is recommended that re-calibration should be performed at an interval, which will ensure that the instrument remains within the desired limits and/or manufacturer's specifications.

The South African National Accreditation System (SANAS) is member of the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA). This arrangement allows for mutual recognition of technical test and calibration data by member accreditation bodies worldwide. For more information on the arrangement please consult www.ilac.org

Calibrated by:	Authorized/Checked by:	Date of Issue:
W.S. SIBANYONI (CALIBRATION TECHNICIAN)	M. NAUDÉ (SANAS TECHNICAL SIGNATORY)	02 DECEMBER 2024

Director: Marianka Naudé (082 727 3312)

1. PROCEDURE

The UUT was calibrated according to the procedures 1002/P/001 and also to the IEC 60942:1997 specifications for Sound Level Calibrators as well as the manufacturer's specifications.

2. MEASURING EQUIPMENT

Keysight	34461A	Digital Multimeter	MY 53224004
Greysinger	80 CL	Environmental Logger	02304030/1/2
G.R.A.S	42 AP	Piston Phone	256092
G.R.A.S	26 AG	½" Pre-Amplifier	189056
G.R.A.S	40 AQ	½" Microphone	160815
Leader	LDM-170	Distortion Meter	0100240
Svantek	SV 35	Acoustic Calibrator	58106
LG	FC-7015	Universal Counter	00022701
Agilent	34461A	Digital Multimeter	MY 53205694
G.R.A.S	42 AG	Multi-Frequency Calibrator	279025
B&K	2829	4-Ch Microphone Power Supply	2329283

Calibrations performed by this laboratory are in terms of standards, the accuracies of which are traceable to national measuring standards as maintained by NMISA.

3. RESULTS

3.1 The following parameters of the Sound Calibrator were calibrated:

Output Level	IEC 60942: Section 5.2.3
Output Frequency	IEC 60942: Section 5.3.3
Selective Distortion	IEC 60942: Section A.4.9

The Sound Calibrator output level on 74,0 dB was found to be 74,0 dB at 1 000,06 Hz.

No Adjustment was made.

The Sound Calibrator output level on 94,0 dB was found to be 94,0 dB at 1 000,06 Hz.

No Adjustment was made

The Sound Calibrator output level on 114.0 dB was adjusted from 113,8 dB to 114,0 dB at 1 000,06 Hz

These results were corrected to the ambient condition of 1 013,25 Pa.

Conclusion: The Sound Calibrator complied with the above-specified clauses of the IEC 60942:1997 specifications, recommended tests and requirements according to ARP 0109:2014, **Class 1.**

Calibrated by:	*Authorized/Checked by:*
W.S. SIBANYONI	*M. NAUDÉ*
(CALIBRATION TECHNICIAN)	*(SANAS TECHNICAL SIGNATORY)*

Director: Marianka Naudé | 082 727 3312

4. REMARKS

4.1 The reported expanded uncertainties of measurements are based on a standard uncertainty multiplied by a coverage factor of $k = 2$, providing a level of confidence of approximately 95,45%, the uncertainties of measurements have been estimated in accordance with the principles defined in the GUM (Guide to Uncertainty of Measurement) ISO, Geneva, 1993

4.2 The environmental conditions during calibration for items in Section 3 were:
Temperature: (23 ± 3) °C
Relative Humidity: (50 ± 15) %RH

The Environmental Conditions specified in the relevant IEC and ISO standards took precedence.

4.3 Calibration labels bearing calibration date, due date (if requested), certificate number and serial number have been affixed to the instrument.

4.4 The above statement of conformance is based on the measurement values obtained, extended by the estimated uncertainty of measurement, being within the appropriate specification limits.

4.5 The uncertainty of measurements was estimated as follows:

Sound Pressure Level:	± 0,13 dB
Frequency:	± 0,1 Hz
Distortion:	± 0,2 %

4.6 The result on this Certificate relates only to the items and parameters calibrated.

----------SECTION 4.6 THE END OF CERTIFICATE ----------

Calibrated by:	*Authorized/Checked by:*
W.S. SIBANYONI	*M. NAUDÉ*
(CALIBRATION TECHNICIAN)	*(SANAS TECHNICAL SIGNATORY)*

Director: Marianka Naudé | 082 727 3312

APPENDIX E

Appendix E: Curriculum Vitae of Specialists

CV
Oliver Knoppersen
Acoustic Consultant

Profile

Oliver worked for Pro Acoustic Consulting Engineers from 2009 to 2015 in an internship that shaped his knowledge of acoustics. In 2015 he joined Acoustech Consulting. He specialises in many areas of acoustics, but his main interests lie in building acoustics, Industrial acoustics, Studio Acoustics and Environmental Acoustics. He has been involved in a number of projects in South Africa as well as on the African Continent. He has been involved in Green Star Rated buildings, offices, studios, a number of industrial projects and environmental projects in South Africa and abroad. Some of his most prestigious projects include Menlyn Park Shopping Centre, , YFM Radio Studios (South Africa), Kusile Power Station (South Africa), Ingula Power Station (South Africa), KCM Copper Mine (Zambia) and the initial phase of Hillside Aluminium Plant.

Experience and skills

Oliver's skills and experience include a working knowledge of all SABS standards (SANS, South African National Standards) South African Regulations, ISO Acoustic Standards and international best practice relating to architectural and environmental acoustics.

As a consultant, the ability to assess existing layouts and designs, and provide carefully designed solutions in cross disciplinary environments is critical. Oliver brings the following skills to the team – Environmental acoustic modelling and simulation -SoundPLAN), manipulation and creation of dxf/dwg drawings, internal acoustical design, sound insulation design, noise mitigation design, noise measurement & analysis, project management, producing design documentation and excellent communication.

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Selected Projects

SANRAL - THE PROPOSED N2/N3 CORRIDOR CAPACITY UPGRADES BETWEEN EB CLOETE INTERCHANGE AND CEDARA – Noise impact assessment and noise mitigation design (Low noise surfaces, noise barriers ect.) to be completed early 2021.

Globeleq - Kribi Power Development Company. Noise assessment, noise and low frequency mitigation design of a 216MW Gas to Power Station (13 closed cycle combustion engines). To be completed in early 2021.

Kusile Power Station

Design of the desulphurisation Plant to meet max. 85dBA at 1 m from the plant façade. Completed 2012

KMC Copper Mine, Zambia

Noise reduction to meet the noise specifications for an adjacent hospital. Completed in 2018

Ingula Pump Storage Scheme, South Africa

Internal Noise Control from pumps and generators. Completed 2017

Richards Bay Hillside Aluminium Smelter

Industrial Noise Survey in order to provide Noise Control Recommendations. Completed in 2018.

South32 Wolvekrans Colliery Mega-facility

Noise Impact Assessment . Completed in 2019

Bidvest Quarry 2 Extension Durban Noise Impact Assessment

Noise Impact Assessment at a terminal at the Durban Harbour. Completed in 2016

National Multi Product Pipeline (NMPP) – Noise Impact Assessment and Noise Mitigation Design

Pipeline from Durban to Jameson Park with Pump Stations. Noise Impact Assessment and Noise Control Recommendations. Completed in 2014

Position
Director and Senior Acoustic Consultant

ID Number
8608245163086

Nationality
South African

Languages
English

Residential address
24 Orwell Street
Kensington
Johannesburg
2094

Contact detail
oliver@acoustech.co.za
082 807 4895
011 648 4998

Formal qualifications
AMIOA Institute of Acoustics (IOA UK) 2018

Key skills
Architectural Acoustics
Industrial Acoustics
Noise Control
Environmental Acoustics
Broadcasting Studios Acoustics

Experience
14 years

References

Thinga Nethanani
NTC Group
Project Manager
083 260 8877

Yovka Raytcheva-Schaap
Aurecon
Environmentally Sustainable Design (ESD) Consulting & Project Management
082 779 2551

Marlin Nadasen
Naidu Consulting
Manager
083 780 4809

Professional Experience

2009-2015: Trainee Consultant: Worked for Pro Acoustic with two professional engineers (Jean Knoppersen and Ivan Lin) and my colleague Steven Liddell (Now owner of Venta Acoustics UK) in the field of acoustics.

I underwent training in the use of Soundplan to produce large scale terrain models; acquire and interpret source noise levels for use in the model, run calculations using the appropriate methodologies/standards; interpret the results of the noise model calculations; assess the results against appropriate criteria and write reports in preparation for issue to clients, subject to checks by senior staff.

Understood GreenStar Assessment (a rating system similar to BREEAM), Prepared technical letters and reports under guidance from senior staff;

I attended client meetings and design team workshops with senior staff to gain experience and understanding. I would usually action the items discussed.

I understood Environmental Noise Surveys, source noise measurements and sound insulation testing. Initially, this was under the supervision of experienced staff. Later I undertook this work on my own.

Assistant project manager in the design and construction of radio studios, working closely with a specialist contractor including frequent site visits. Gained exposure to practical operational requirements of the studios, construction methodologies and consideration of onsite factors and limitations,

I was responsible for the maintenance and calibration of equipment (sound level meters).

2015 to Present: Worked with a professional engineer (Jean Knoppersen) in the field of acoustics.
I was responsible for the maintenance and calibration of equipment (sound level meters).

I understood Environmental Noise Surveys, source noise measurements and sound insulation testing. I undertook this work on my own.

Prepared technical letters and reports under guidance from senior staff;

I attended client meetings and design team workshops. I would usually action the items discussed.

Proficient at Noise prediction modelling to produce large scale terrain models; acquire and interpret source noise levels for use in the model, run calculations using the appropriate methodologies/standards; interperate the results of the noise model calculations; assess the results against appropriate criteria and write reports in preparation for issue to clients, subject to checks by senior staff.

2019: Promoted to Directorship in Acoustech Consulting

Project List

Nedcore Sandton
9-hour Noise Measurements - Green Star Design

Mpower Radio Studio Witbank
Studio Design + Project Management

NMPP Pipeline and Pump Stations
24-hour Noise Measurements

O.R Tambo Hotel
Sound Insulation Measurements

Tanza Night Club
Noise Measurements

VOPAK (Chemical Storage Facility)
Industrial Noise Measurements + Noise Modelling (Soundplan)

YFM Radio Studio Craighall Park
Studio Design + Project Management

Stark TV Studios
Sound Insulation Measurements

Department of international Relations & Cooperation Conference Room
Room Acoustics + Sound Insulation Measurements

Discovery Data Centre
Noise Measurements

Holiday Inn Express Hotel Roodepoort
Sound Insulation Measurements

Jacaranda FM Radio Studio Nelspruit
Studio Design + Project Management

Park Inn Hotel Sandton
Sound Insulation Measurements

KPMG Campus
Noise Measurements

Menlyn Maine
Noise Measurements

Nedcor Phase 2 Greenstar
Green Star Internal Noise Measurements

NMPP Pipeline and Pump Stations
Enclosure Design + Noise Modelling

Radioheads Radio Studio
Studio Design+Project Management

Voice of WITS (University Radio Studio)
Design+Project Management

Zouk Night Club
Noise Measurements

ABSA Towers West Green Star
Measurements

Able Partitions
Sound Insulation Measurements+Report

CheckersHyper Mayville
HVAC Measurements

Danone Factory
Factory Noise Measurements

Gautrain Sandton Extract Fans
Fan Noise Measurements

Hilton Hotel Sandton
Noise+ Sound Insulation
Measurements+Report

Jan Smuts Research Project
Road Traffic Noise
Research+Presentation

Kusile Power Station
Industrial Noise Modelling+Report

Middelburg Eastern Bypass
Road Traffic Noise Modelling+Report

Nedbank Newtown Noise
Measurements+Report

Ilanga Mall HVAC Noise
Measurements

NMPP
Site Inspection+Noise Measurements

Planet Fitness Bedfordview
Structural borne Investigation+Noise
Measurements+Report

Planet Fitness Village Walk
Noise Measurements

SCAW Metals
Environmental Noise
Measurements+Report

South Point Braamfontein
Office HVAC Noise Measurements

Vodafone Innovation Centre
Noise Measurements and Façade
Design

WITS Generators
Generator Noise Measurements

8 Melville Road
Noise survey + Report

90 Grayston Drive
Green Star 9 hour Noise survey +
Report

102 Rivonia Road
Green Star 9 hour Noise survey +
Report

Erf 108 Corlett Drive
1 hour Measurement

DSTV City Green Star
9 hour Noise survey + Report

Formula One Hotel
Sound Insulation Measurements +
Report

Grayston Sun Hotel
Noise survey + Report

Grosvenor Studio (EWH)
Studio Design and Project
Management

Grundfos Green Star
9 hour Noise survey + Report

Hyundai Head Office
Green Star 9 hour Noise survey +
Report

Jet Blast and Drilling Middelburg
Sound Insulation Measurements

Kusile Power Station Noise Study
Review
Industrial Noise Modelling+Report

Lakeside Office Park
1 hour Measurement+Report

Market Theatre
STI+Reverb+room Impulse Response
Measurements

Newtown Junction Green Star
9 hour Noise survey + Report

Newtown Majestic Green Star 9
hour Noise survey + Report

NWU Potchesfstroom Amphitheatre
Room Impulse Response
Measurements

Pentad Office Pretoria
Office Measurements+Report

Swaziland Broadcast Studios (SBIS)
Project Management

Unilever depot
Noise
Modelling+Measurements+Report

USAID Pretoria Green Star
9 hour Noise survey + Report

Vodacom Data Park
Noise Measurements+Façade
Design+Report

Vopak Revision (Chemical Storage
Facility)
Industrial Noise Modelling+Report

Abbotts College
Room Impulse Response
Measurements (Study with Ecophon)

The Baron Restaurant, Bryanston
Room Acoustics

Kathleen Close Apartment Building
Attenuator Design for Heat
Exchangers

Michelangelo Legacy Hotel Nightclub
Measurements+Report

MTN Gallo Manor Call Centre
Open Plan Office Measurements

Primedia 94.7 Radio Studio
Independent Consulting on Studio
Building to ensure compliance with
clients specifications

ABSA Tower South+270RR
HVAC Measurements+ Noise
Modelling

MIS Engineering
Noise Measurements+Report

5 Packard Street
Road Noise Study – Noise Modelling
and Noise Mitigation Design

ABSA Contact Centre Service Yard
12-hour Noise Measurements
Mechanical Noise Mitigation Design

Anglo-American 55 Marshall Street
Site Inspections of implementation
of boardroom acoustic design

Bretton Wood Apartment Building
Heat Exchangers
Noise Mitigation Design

Davar Partners International
Studio Design and Project
Management

Oscar Pistorius Trial
Noise Modelling and Research

Joe Public Voice Over and Recording
Studio
Studio Design

Margate Indoor Shooting Range
Noise Mitigation and Internal
Acoustic Design

Planet Fitness Gym Bedfordview
Sound Insulation Measurements and Noise Mitigation Design

Rheinmettal Denel Munitions
Noise Mitigation and Internal Acoustic Design

SAMHS Military Hospital Generators
Noise Measurements and Noise Mitigation Design

Universal Music Studio
Music Studio Design and Project Management

Vodacom MTB Data Building
Occupational Noise Measurements and Report

Advantedge Generator
Generator Noise Measurements and Report

Big Brother House
Sound Insulation Recommendations and Noise Survey

Bounce
16-hour Noise Survey and Report

DSTV
Mechanical Noise Investigation

Johnny's Restaurant Generator
Noise Measurements and Report

Kansanshi Smelter Zambia
Industrial Noise Measurements and Report

Life Wilgers Hospital
Mechanical Noise Measurements and Noise Mitigation Report

Menlyn Park Shopping Centre
Green Star Acoustic Analysis and Report

Quantum Foods
Mechanical Noise Mitigation Design

Rebel Foods
Mechanical Noise Mitigation Design

Revelation Church of God Music Studio
Music Studio Design and Project Management

SASRIA Generator
Generator Noise Mitigation Design

Southlands Food Depot
12 Hour Noise Measurements, Noise Nuisance Assessment and noise mitigation design

St Andrews School for Girls
New Hall Internal Acoustic Design

St Johns College
Room Acoustic Design

USAID Southern Africa
Green Star Internal Noise Audit

Waterkloof Glen Pretoria
9-Hour Noise Measurements

Sun City Casino Entertainment Centre Refurbishment
Sound Insulation and Room Acoustic Design

Times Square Menlyn Maine Casino, Arena and Hotel
Façade Design, Sound Insulation and Room Acoustics Design, Hotel Room Acoustic Design, Conference Centre Design, Arena Acoustic Design

Bidvest Chemical Storage Terminal
Noise Measurements, Noise Modelling and Environmental Noise Impact Assessment

Bloemfontein Advocate Office Building Sound Insulation Measurements and recommendations

Broadwalk Office Park
Noise Measurements

Econet
Acoustic Investigation into existing TV Studios and provided recommendations to achieve better acoustic performing studios.

Krank'ed Up Music Festival
Noise Monitoring during a Music Festival

Menlyn Park Shopping Centre Phase 1
Green Star As Built Audit Retail Tool

Optimum Mine Ventilation Shaft
Environmental Impact Assessment

Statistics of South Africa Office Building
Sound Insulation Measurements to ensure compliance with clients specifications

Studio Blu Conference Venue
Noise Impact assessment and noise mitigation design

Unilever Dust Extractors
Noise Measurements and noise mitigation design to reduce noise from dust extractors to the rest of the plant area.

Assemblies of God Church Nelspruit
Noise Impact Assessment

BMW M Festival
Noise Monitoring during the Music Festival

El Devino Complex Noise Complaint
Noise Nuisance Assessment

Houghton Hotel Conference Centre
Internal Acoustic Design

I4C Office
Measurement Reverberation Time Measurement before and after acoustic treatment

Ingula Pump Storage Eskom
Noise Mitigation Design

Jehovah Witness Hostel Rwanda
Acoustic Recommendations to reduce noise from the city (Night clubs, restaurants and a stadium) to the existing hostel

Midstream College Music Festival
Noise Monitoring during a Music Festival

NOOA Petroleum Chemical Storage
Noise Measurements, Noise Modelling and Environmental Noise Impact Assessment

199 Bryanston Drive Office Park Generator
Noise Measurements and Noise Mitigation Design

Accenture Office Building
Sound Insultation measurements to ensure compliance with clients specifications

Andiccio24 Restaurant
Noise Nuisance Assessment

Booysens Magistrate Court
Sound Insultation measurements to ensure compliance with the acoustic design

Discovery Head Office Boardroom
Acoustic recommendations

DSTV Delicious Festival, Kyalami
Noise Management Plan and Noise Monitoring during a Music Festival

Formfunc Office
Greenstar IEQ 5 Audit

FSM
Sound Insulation Tests of existing prefabricated mining accommodation

Generator Noise Wapadrand
Noise Measurements of a Generator

Hillside Aluminium Smelter Richards Bay
Noise Survey to assess the noise levels that the employees experience with a view to provide noise mitigation measures. Next phase would be to provide noise mitigation design for each area.

Jolly Roger Tavern Pretoria
Noise Nuisance Assessment and noise mitigation design

KCM Copper Mine Ball Mills
Noise Impact Assessment, Noise Mitigation Design. The project is awaiting the go ahead for the implementation of the noise mitigation (approx. $6 million project)

Menlyn Park Shopping Centre Phase 2
Green Star Acoustic Design Retail Tool

Nampak House Boardroom
Acoustic recommendations

Natural Dehydrated Foods Nelspruit
Noise Impact Assessment

Silver Stream Office Park Generator
Noise Measurements and Noise Mitigation Design

Talco Grain and Milling
Noise Measurements, Mechanical Noise Mitigation Design

Times Square: Sun Arena
Compliance Measurements: Reverberation Time, Sound Insulation Tests, HVAC noise Measurements

Vodacom Boardroom
Acoustic recommendations

Fort Ikapa Cape Town Shooting Range
Noise Impact Assessment

Altitude Beach Restaurant
Noise Impact Assessment

Sudor Coal Weltevreden Colliery
Noise Impact Assessment

140 West Street Sandton
5th Floor demising wall design

Standard Bank Head Office Rosebank
Gas Generator Noise Mitigation Design

Alpla Office Design
Noise mitigation to ensure office noise levels specifications are met.

Castle Gate Lifestyle Centre
Generator noise measurements

Illovo Central
Chiller Noise Mitigation Design

UIF Sunnyside Office Development
Architectural Acoustic Design of the building

Africrest Residential
Sound Insulation Testing

Air Liquide Large Industries
Industrial Office Noise Reduction Design

Altitude Beach Restaurant
Noise Survey and Noise Mitigation

Barloworld Generator Civic Theatre
Noise Mitigation design

Bayport Financial Services
Generator Noise Survey

Bokpoort PV Plant Generators
Noise Impact Assessment

Castle Gate Lifestyle Centre
Generator Noise Survey

Data Centre Lagos
32MW Generator Noise Mitigation Design

New Way Generators
Generator Noise Survey for Teraco Data Centres

Smart P.E.T Factory
Noise Assessment and noise mitigation design

Virgin Active Morningside
Noise Assessment and noise mitigation design

ABSA Branches
Noise investigation and acoustic measurements

Air Liquide Large Industries
T17 Building – Noise Mitigation

Foreign, Commonwealth and Development Office, Nairobi
Noise Assessment

Hotel Development, Douala Cameroon
Noise Survey

acoustech
ACOUSTIC ENGINEERING CONSULTANTS

Summary CV
Duduzile Skhosana
Consultant

Profile

Duduzile is currently working for Acoustech Consulting as a Consultant with vast experience providing administrative skills in office settings. Accustomed to addressing the changing needs of an office and supporting colleagues and superiors with excellent assistance skills. Works closely with a professional engineer and an Acoustics Consultant aiding in various projects that involve environmental noise surveys, noise monitoring, sound insulation testing and source noise measurements. She brings forth high quality organizational skills and a self-motivated drive to achieve excellence. Proficient in various software applications and filing systems, A commitment to handle confidential tasks safely and professionally.

Duties

Ad Hoc Administrative duties

Assists with quotations for new work opportunities.

Assists with preparations of reports in line with the terms of reference of some projects.

Assists with collection of data and analysis for various project through noise surveys, source noise measurements, sound insulation testing and run calculations using appropriate standards to interpret results of the noise model calculations with Svan PC++

Selected Projects

Bokpoort PV Plant

Assisted with noise measurements for the Noise Impact Assessment. (2020)

Sudor Coal

Assisted with ambient noise measurements (2020)

Monchique Apartments

Noise investigation between two apartments – Assisted with noise measurements (2020)

Castle Gate Lifestyle Centre

Generator Noise Assessment – Assisted with noise measurements and report (2020)

Sky Hotel Sandton

Sound Insulation Tests- Assisted with tests and calculations (2020)

New Way Power Generator

Generator Noise Assessment for Teraco– assisted with noise measurements and reports (2021)

Broadway Sweets

Noise Survey – Assisted with noise measurements tests (2021)

Swiss Reinsurance

Assisted with sound insulation tests (2021)

ABinBev

Assisted with sound insulation tests (2021)

Croft & Co

Reverberation Time Measurements – Performed measurements before and after installation of Ecophon Solo Panels (2021)

Virgin Active Morningside

Noise Investigation between gym and resident (2021)

WKC

Assisted with ambient noise measurements (2021)

Sibanye-Stillwater

Biennial Noise Monitoring for - Driefontein, Kloof, Rand Uranium, Ezulwini, Burnstone & Beatrix mine (2021)

Paper & Pulp Industries

Assisted with noise measurements and report (2021)

Rainbow Skyreach

Assisted with light aircraft noise measurements and report writing (2021)

Smart P.E.T Factory

Assisted with noise survey (2021)

Africrest

Assisted with sound insulation testing of refurbished apartments (2021)

Bayport Sandton Generator Noise Assessment

Generator Noise Assessment – Conducted noise measurements and assisted in report writing (2021)

Altitude Beach Fourways

Noise Monitoring (2021 & 2022)

GIBS

Sound insulation testing of a studio (2022)

St John's College (Hall)

Performed Sound Insulation Tests (2022)

50 Coleraine Drive Estate

Generator Noise Assessment – Assisted with noise measurements and report (2022)

Feltex Auto Trim Silverton

Factory Noise Measurements (2022)

Clarina Ext 43 Township

Conducted a noise impact assessment (2022)

Ukhuni Business Furniture

Assisted with an acoustic assessment on meeting capsule pods - Sound Insulation (2022)

Sandton Mosque

Assisted with noise measurements (2022)

Zwavelstream Clinic

Performed noise measurements (2022)

ABSA

Assisted with an acoustic noise survey at various branches (2022)

Ekandustria

Performed a noise survey and assessment

Tasbet Park Extension 3 Township

Conducted a noise impact assessment

75 Sandpiper Street Generator Noise Assessment – Assisted with noise measurements and report writing

Medupi Power Station

Assisted with ambient noise measurements (2022)

Acoustech Consulting (Pty) Ltd REG 2015/098932/07
Directors: J Knoppersen Pr Eng BSc Eng (Wits) GDE (Wits); O Knoppersen AMIOA (IOA)
Associates: W Meyer BSc Eng (Mech) (UKZN)

GREEN BUILDING COUNCIL SOUTH AFRICA MEMBER 2021

DSTV Delicious

Noise monitoring during the music festival (2022)

BMW M Festival

Noise monitoring during the music festival (2022)

Crocodile Reserve BESS Facility

Conducted a noise impact assessment (2022)

Unica Iron & Steel (Unit 2)

Conducted a noise impact assessment (2022)

Waterfall Country Estate Generator

Generator Noise Survey (2022)

Lotus Gardens ERF 399 Township

Conducted a noise impact assessment (2022)

Grandmark International Pretoria

Conducted a noise survey and assessment (2022)

4 Fricker Road (Illovo) Generator

Generator Noise Survey & Assessment (2022)

Kameelhoek Mine

Conducted a noise impact assessment (2023)

UJ 3D Printed House

Sound Insulation measurements (2023)

Boundary Place Generator

Generator Noise Survey & Assessment (2023)

79 Kallenbach Drive Generator

Generator Noise Survey & Assessment (2023)

15 Fricker Road (Assore) Generator

Generator Noise Survey & Assessment (2023)

5 Sturdee Avenue (Rosebank) Generator

Generator Noise Survey & Assessment (2023)

Rosebank Corner Generators

Generator Noise Survey & Assessment (2023)

Grayston Ridge Office Park Generators

Generator Noise Survey & Assessment (2023)

DSTV Delicious

Noise monitoring during the music festival (2023)

Tenbosch Mine

Conducted a noise impact assessment (2023)

Canal Walk Shopping Centre

Ambient Noise Measurements (2023)

Park Hyatt Winston

Sound Insulation Measurements (2023/2024)

Hatfield Plaza

Noise Survey & Assessment of Bar/ Restaurants (2024)

158 Jan Smuts Ave

Generator Noise Survey & Assessment (2024)

PNP Norwood

Post Generator Noise Mitigation Measurements (2024)

1 Sixty Jan Smuts Ave

Generator Noise Survey & Assessment (2024)

Parliament (CPT)

Ambient Noise Measurements (2024)

South Coast Phase 3 Pipeline NIA

Conducted a noise impact assessment (2024)

Canal Walk Shopping Centre

Generator Noise Survey and Assessment (2024)

Colgate- Palmolive Boksburg

Noise Control Noise Survey (2024)

DSTV Delicious

Noise monitoring during the music festival (2024)

Witberg

Noise Monitoring (2024)

BMW M Festival

Noise monitoring during the music festival (2024)

Baby Steps

Noise Investigation (2024)

Kyalami 9- Hour Event

Noise monitoring during the event (2024)

XM Conference & Awards

Event Noise Monitoring (2024)

Waterfall Estate Padel Court

Noise Assessment (2024)

Standard Bank Kingsmead

Reverberation measurements (2025)

BHBW Site

Noise Assessment (2025)

Sibanye-Stillwater

Noise Monitoring for - Driefontein, Kloof, Rand Uranium, Ezulwini, Burnstone & Beatrix mine (2025)

Kwanda Resources

Noise Monitoring(2025)

Position
Assistant Consultant

ID Number
9206010109084

Nationality
South African

Languages
English

Residential address
162 Anderson Street
Marshalltown
Johannesburg
2001

Contact detail
dudu@acoustech.co.za
071 164 8193
011 648 4998

Formal qualifications
BA Geography & Environmental Science (Monash University)

Key skills
Environmental Acoustics

Experience
5 years 9 Months

References

Jean Knoppersen

082 456 0977

Oliver Knoppersen

082 807 4895

Grace Langa
Sibanye-Stillwater
Superintendent Environmental
Compliance Coordinator

011 278 9770
083 375 5770