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Environmental Noise Impact Assessment

Proposed Township
Gerhardsville Extension 2
on a Part of Portion 16 and a Part of Portion 66 of the Farm Knopjeslaagte 385-JR
City of Tshwane

Project No: 176/2019
Compiled by: B v/d Merwe
Date: 21 August 2019

Contents

DECLARATION OF INDEPENDENCE

I, **Barend J B van der Merwe,** as duly authorised representative of **dBAcoustics**, hereby confirm my independence and declare that I have no interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of the proposed residential development. I further declare that I am confident in the results of the studies undertaken and conclusions drawn as a result of it. I have further provided SFP Townplanning with written access to all information at my disposal regarding the noise impact assessment. I am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 and any other specific and relevant legislation (national and provincial), policies, guidelines and best practice.

Signature: 

Full Name: Barend Jacobus Barnardt van der Merwe

Date: 21 August 2019

Title / Position: Environmental noise and vibration specialist

Qualification(s):\ MSc Environmental Management

Experience (years/ months):16 years

Registration(s): SAAI, AIAI, SAAG and NACA

Details of specialist and expertise

I, Barend JB van der Merwe of 43 6th Street, Linden Johannesburg have been an environmental noise and ground vibration specialist for the last 14 years. I have been instrumental in the pre-feasibility studies of proposed projects which may have an impact on the environment and noise sensitive areas. I am also involved with the noise and ground vibration impact assessments and the environmental management plans compilation of large projects such as wind farms, mining, roads, trains (primarily the Gautrain) and various point noise sources. As a post-graduate student in Environmental Management at the University of Johannesburg, I obtained an MSc degree with the research project concentrating on the impact of noise and ground vibration on a village close to a new underground mine. I have played a major role in the identification, evaluation and control of physical factors such as noise and ground vibration in the following projects – wind farms, various platinum and coal mines and the quarterly noise evaluation of the Gautrain, the decommissioning of the N11 near Mokopane, construction of the P166 near Mbombela, design of the Musina by-pass, noise mitigatory measures at the N17 road near Trichardt, establishment of the weigh bridge along the N3 near Pietermaritzburg, George Western by-pass. The following large environmental companies are amongst my clients: Gibb, Royal Haskoning DHV, Coffey Environmental, Golder Associates Africa (Pty) Ltd, GCS Environmental (Pty) Ltd, Knight Piesold Environmental (Pty) Ltd, MattMcdonold Engineering (Pty) Ltd and SRK Engineering (Pty) Ltd.

Qualifications

1. MSc – Environmental management – University of Johannesburg;
2. BSc Honours in Geography and Environmental Management – University of Johannesburg;
3. National Higher Diploma in Environmental Health - Witwatersrand Technikon;
4. National Diploma in Public Health - Cape Town Technikon;
5. National Certificate in Noise Pollution - Technikon SA;
6. National Certificate in Air Pollution - Technikon SA;
7. National Certificate in Water Pollution - Technikon SA;
8. Management Development Diploma - Damelin Management School; and
9. Advanced Business Management Diploma - Rand Afrikaans University.

Membership

- South African Institute of Acoustics (SAAI);
- International Association of Impact Assessment (IAIA);
- National Association of Clean Air (NACA);
- South African Association of Geographers (SAAG).

Experience

- Noise impact assessment of different mine establishments;
- Noise Control Officer i.t.o. Noise Control Regulations;
- Compilation of noise management plans;
- Annual and quarterly baseline noise surveys;
- Moderator Wits Technikon – Environmental Pollution III.
- Various road projects for SANRAL.

- Compilation of the Integrated Pollution strategy for Ekurhuleni Town Council.
- Represent clients at Town Planning Tribunals.
- Represent clients at Housing Board tribunals.
- Determine residual noise levels in certain areas as required by clients.
- Noise attenuation at places of entertainment.
- Design and implementation of sound attenuators.
- Noise projections and contouring.
- Advisory capacity regarding noise related cases to local authorities: - Sandton, Roodepoort, Randburg, Krugersdorp, Alberton, Centurion, Vereeniging. Due to my previous experience in Local Government I provide a service to these Local government departments on the implementation of the Noise Control Regulations and SANS 10103 of 2008 – The measurement and rating of environmental noise with respect to land use, health annoyance and to speech communication.
- Identification, Evaluation and Control of noise sources in industry.

I was involved in the following noise impact assessments during the Environmental Impact Assessment process (Noise and/or Vibration):

- Airlink BID for landing in Kruger National Park;
- Coal gasification plant in Theunissen;
- Langhoogte and Wolseley wind farms;
- Widening of N3 at Howick, KZN;
- Tulu Kapi Mine, Ethiopia;
- Boabab Iron Ore Mine, Mozambique;
- N11 Decommissioning Mokopane;
- Baseline noise survey for NuCoal Mines, Woestalleen, Vuna and Mooiplaats Collieries;
- Baseline noise monitoring Mooinooi mine;
- Leeuwpan coal mine;
- N17 Road at Trichardt for KV3 Engineers;
- N17 Road in Soweto;
- Proposed new by-pass road at Musina;
- George Western By-pass road between George Airport and Outeniqua Pass;
- Gautrain baseline monitoring;
- Upgrade of Delmas Road in Moreletta Park, Pretoria;
- Proposed weigh bridge, N3, Pietermaritzburg:
- Tonkolili Manganese mine, Sierra Leone;
- Proposed wind turbines in the Western Cape – Caledon;
- Extension of works at the PPC factory in Piketberg;
- Exxaro Arnot Colliery – Mooifontein;
- Hydro power plant – 2 Sites in Durban;
- Coal export terminal in Beira, Mozambique;
- Site selection for new Power Station – Kangra Mine, Piet Retief;
- Gas exploration at Ellisras;
- Noise survey and assessment of future mine shafts at various mines;
- Mining exploration at Potgietersrus – Lonmin Akani;
- New coal mines in Witbank – Dorstfontein Expansion Project;
- New coal mines in Middelburg and Ermelo;
- New Vanadium Manganese mine in Potgietersrus;
- Xolobeni mining project in Transkei;

- Glynn mines in Sabie;
- Rezoning of properties for housing at Burgersfort, Shosanguve, Hammanskraal;
- Various noise impact assessment for clients in and around Centurion;
- Relocation of night races from Newmarket racecourse to Turfontein racecourse;
- Rezoning applications for private clients.

Indemnity and Conditions Relating to this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information supplied by SFP Townplanning. The accuracy of the results and conclusions are entirely reliant on the accuracy and completeness of the supplied data. dBAcoustics does not accept responsibility for any errors or omissions in the supplied data and information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions and the findings apply to the site conditions as they existed at the time of the field survey. These opinions do not necessarily apply to conditions that may arise after the date of the field survey and subsequent noise impact assessment report. The report is based on scientific and recommended survey and assessment techniques. This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

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1. Introduction

dBAcoustics was appointed by SFP Townplanning to determine the prevailing noise levels in the vicinity of the proposed township – Gerhardsville X2 which is situated in the vicinity of the existing K46 road which is a feeder road between the north and the south. There are existing agricultural holdings to the north and the south.

The noise survey was done to identify noise sources in and around the proposed township, which may have an impact on the proposed development and to recommend mitigatory measures for compliance to the Noise Control Regulations and the South African National Standards SANS 10103 of 2008 - The measurement and rating of environmental noise with respect to annoyance and to speech communication.

The location of the proposed development (turquoise polygon) is illustrated in Figure 1.

Figure 1: Location of proposed development

Location of the proposed K46 is illustrated in Figure 2.

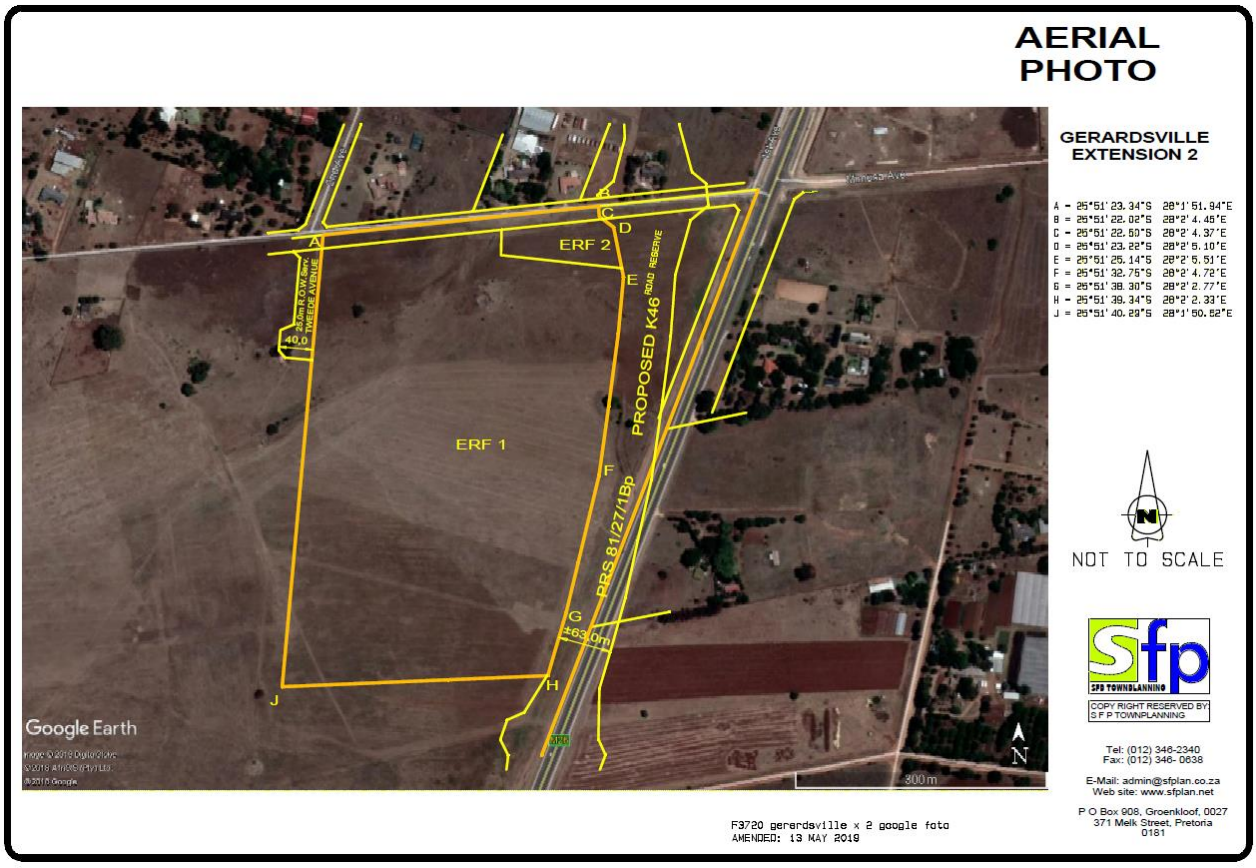

Figure 2: Proposed K46 road

2. Purpose of the Study

The noise survey is part of the requirements of the Noise Control Regulations where it is required to do a noise impact assessment in terms of Section 10 of the Noise Control Regulations, 1999.

The purpose of the noise survey was:

- To determine the prevailing ambient noise levels in the vicinity of the proposed development.
- Quantify the impact of noise of the proposed development during the construction and/or operational phases on the prevailing ambient levels and the outdoor environment.
- Determine the noise impact of the additional traffic on the existing residential units in the vicinity of the proposed development.

The proposed development will consist out of an Educational type development with school facilities and sports ground.

The lay-out of the proposed development is illustrated in Figure 3.

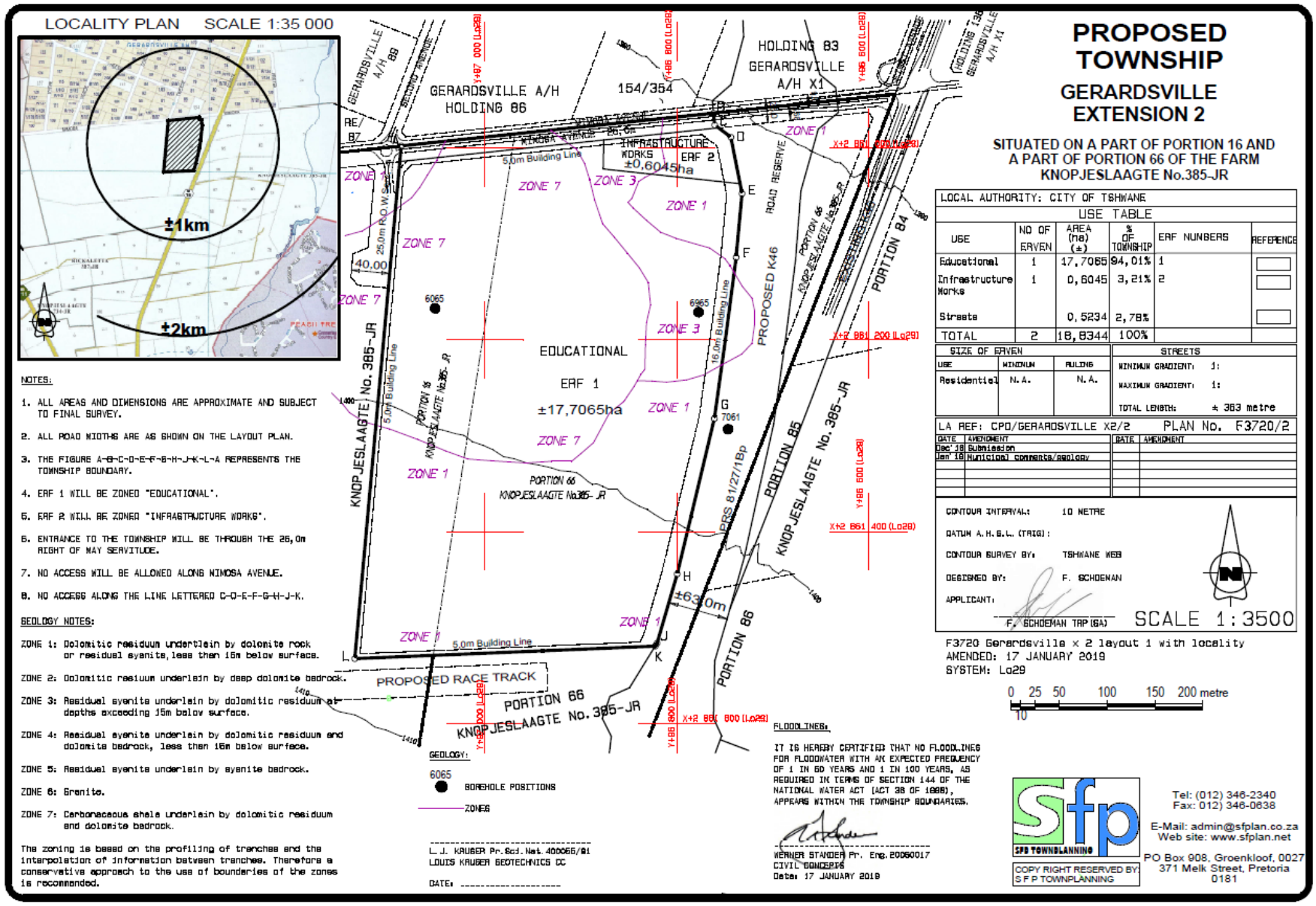

Figure 3: Proposed township development lay-out

3. Background to noise

Sound is a wave motion, which occurs when a sound source sets the nearest particles of air in motion. The movement gradually spreads to air particles further away from the source. Sound propagates in air with a speed of approximately 340 m/s.

Noise from a point source attenuates at a rate of 6 dB per doubling of distance from a point source and from a line source at a rate of 3 dB per doubling of distance – Inverse Square Law. In free field conditions a point source (diesel generator) which is measured at 87,0 dBA and at 10m from the source 84,5 dBA will be at 20m 78,5 dBA and at 40m the SPL will be 72,5 dBA etc. At a line source, which is road with cars, the reduction will only be 3 dB per doubling of distance.

The decibel scale is logarithmic therefore decibel levels cannot be added together in the normal arithmetic way, for example, two sound sources of 50 dB each do not produce 100 dB but 53 dB, nor does 50 dB and 30 dB equal 80 dB, but remains 50 dB.

When measuring the intensity of a sound, an instrument, which duplicates the ear variable sensitivity to sound of different frequency, is usually used. This is achieved by building a filter into the instrument with a similar frequency response to that of the ear. This is called an A-weighting filter because it conforms to the internationally standardized A weighting curves. Measurements of sound level made with this filter are called A-weighted sound level measurements, and the unit is dB.

There are certain effects produced by sound which, if it is not controlled by approved acoustic mitigatory measures, seem to be construed as undesirable by most people and they are:

- Long exposure to high levels of sound, which may damage the hearing or create a temporary threshold shift – in industry or at areas where music is played louder than 95 dBA. This will seldom happen in far-field conditions.

- Interference with speech where important information by the receiver cannot be analyzed due to loud noises.

- Excessive loudness – loud music or impulse sound created by explosions

- Annoyance – Barking dogs

A number of factors for example clarity of speech, age of listener and the presence of noise induced threshold displacement will influence the comprehensibility of speech communication.

The effect of noise on humans is limited to disturbance and/or annoyance and the accompanying emotional reaction. This reaction is very difficult to predict and is influenced by the emotional state of the complainant, his attitude towards the noise source, the time of day or night and the day of the week.

Types of noise exposure:

- Continuous exposure to noise – The level is constant and does not vary with time e.g. traffic on freeway and an extension fan.

- Intermittent exposure to noise – The noise level is not constant and occurs at times e.g. car alarms and sirens.

- Exposure to impact noise – A sharp burst of sound at intermittent intervals e.g. explosions and low frequency sound.

The human condition is affected by the intensity of the sound; the length of time of exposure and how often over time the human is exposed to it. Urban dwellers are besieged by noise, not only in the city streets but also in the busy workplaces and by household noises.

The World Health Organisation has published a series of recommended maximum sound pressure levels applicable to various situations and is illustrated in Table 1.

Table 1: Recommended noise levels for specific areas

Descriptor	Limit	Situation or effect
LAeq, 24	70 dBA	Negligible risk of hearing impairment
LAeq, 8	75 dBA	Negligible
LAeq	30 dBA	Excellent speech intelligibility
LAeq	55 dBA	Fairly good speech intelligibility
LAeq	30 dBA	No sleep disturbance in a bedroom
LAmax	45 dBA	No sleep disturbance – peak inside bedroom
LAeq	55 dBA	Residential areas, outdoors, daytime
LAeq	45 dBA	Residential areas, outdoors, night time

In terms of Table 5 of SANS 10103 of 2008 which is illustrated in Table 2 are the community response should the ambient noise level be exceeded.

Table 2: Categories of community/group response

Excess $)L_{Req,T}$[1)] dB	**Estimated community/group response**	
	Category	**Description**
0	None	No observed reaction
0-10	Little	Sporadic complaints
5-15	Medium	Widespread complaints
10-20	Strong	Threats of community/group action
>15	Very strong	Vigorous community/group action

1) Calculate $)L_{Req,T}$ from the appropriate of the following:

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

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

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

The difference between the actual noise and the ambient noise level will determine how people will respond to sound.

The following is of relevance to the ambient noise measurements:

The L_{Aeq} was measured over a sampling period in excess of 10-minute at each of the measuring points and was done during the day time.

4. Method of evaluation

The noise survey was conducted in terms of the provisions of the Noise Control Regulations, 1994 and the SANS 10103 of 2008 (The measurement and rating of environmental noise with respect to annoyance and to speech communication) using a digital Larson Davis 831 – Class 1 meter with Logging, Environmental 1/1, 1/3 Octave Band and percentiles Sound Level Meter (Class 1). On taking measurements the device-meter scale was set to the "A" weighed measurement scale which enables the device to respond in the same manner as the human ear. The device was held approximately 1.5 m above the surface and at least 3.0m away from hard reflecting surfaces. A suitable wind shield was used on the microphone for all measurements in order to minimise wind interference. The Instrument was checked and calibrated prior to use and maintained in accordance with equipment and coincided below 1.0dBA.The following instruments were used in the noise survey:

- Larsen Davis Integrated Sound Level meter Type 1 – Serial no. S/N 0001072;
- Larsen Davis Pre-amplifier – Serial no.PRM831 0206;
- Larsen Davis ½" free field microphone – Serial no. 377 B02 SN 102184;
- Larsen Davis Calibrator 200 – Serial no.9855;
- Certificate Number: 2018-AS-0912;
- Date of Calibration: 15 August 2018; and,
- Date of next calibration August 2019.

The instrument was calibrated before and after the measurements was done and coincided within 1.0dBA. Batteries were fully charged and the windshield was in place at all times.
The noise survey was carried out in terms of the Noise Control Regulations being:

"16 (1) Any person taking readings shall ensure that -

(a) sound measuring instruments comply with the requirements for type I instrument in accordance with SABS-IEC 60651, SABS-IEC 60804 and SABS-I EC 60942 as the case may be;

(b) the acoustic sensitivity of sound level meters is checked before and after every series of measurements by using a sound calibrator, and shall reject the results if the before and after calibration values differ by more than 1 dBA;

(c) the microphones of sound measuring instruments are at all times provided with a windshield;

(d) the sound measuring instruments are operated strictly in accordance with the manufacturer's instructions; and,

(e) sound measuring instruments are verified annually by a calibration laboratory for compliance with the specifications for accuracy of national codes of practice for acoustics, to comply with the Measuring Units and National Measuring Standards Act 1973 (Act No. 76 of 1973).

(2) The measuring of dBA values in respect of controlled areas, ambient sound levels or noise levels in terms of these regulations shall be done as follows:

(a) outdoor measurements on a piece of land: By placing the microphone of an integrating impulse sound level meter at least 1,2 metres, but not more than 1,4 metres, above the ground and at least 3,5 metres away from walls, buildings or other sound reflecting surfaces".

The calibration certificates are attached as Appendix A. The measured ambient noise level during the daytime period will be the baseline ambient noise criteria for the study area and will be evaluated in terms of SANS 10103 of 2008.

5. Comments

The noise survey was carried out at the boundaries of the proposed development. This is a typical residential development in the vicinity of other residential areas, freeway (R80) and feeder roads.

6. Methodology of the study

6.1 Site visit
6.2 Ambient noise measurements
6.3 Noise emissions during day time in the vicinity of the proposed development
6.4 Noise impacts
6.5 Assessment of the noise impact

6.1 Site visit

A site visit was carried out on 20 June 2019 in order to:

- Identify the major contributors to the prevailing ambient noise levels in and around the proposed development.
- Identify the major feeder roads in the vicinity of the proposed development.
- Any other sources of noise.

6.2 Ambient noise measurements

The measuring points 1 to 5 in the vicinity of the boundaries of the proposed development are illustrated in Figure 4.

Figure 4: Measuring points

The prevailing ambient noise levels were taken at the following geographical spatial points as illustrated in Table 3.

Table 3: Geographical information of the different measuring points

Measuring point	Latitude	Longitude	Remarks
1	25° 51.436'S	028° 1.862'E	Northern side some distance from Mimosa Avenue
2	25° 51.631'S	028° 1.846'E	Eastern boundary of the property.
3	25° 51. 692'S	028° 1.880'E	Southern boundary of the property.
4	25° 51. 686'S	028° 2.022'E	South-eastern corner next to the K46 road.
5	25° 51.484'S	028° 1.973'E	Middle of the property
6	25° 51.386'S	028° 2.074'E	Northern side some distance from Mimosa Avenue

6.3 Noise emissions at the measuring points

The ambient noise level is made up out of traffic noise and domestic type noise.

The following were the pre-vailing noise sources in the vicinity of the proposed institutional development:

Daytime:

- Traffic noise – distant and abutting roads;
- Domestic type noises;
- Intermittent aircraft noise;
- Birds.

6.4 Noise impacts

The difference between the actual noise and the ambient noise level will determine how people will respond to sound and what the noise impact on an individual will be. In order to evaluate such there must be uniform guidelines to evaluate each scenario. The World Health Organization has laid down sound pressure levels for specific districts and SANS 10103 of 2008 has provided the following recommended equivalent continuous noise levels per district:

Table 4: Typical rating levels for ambient noise in districts

Type of district	***Equivalent continuous* rating level $L_{Reg.T}$ [1)] for ambient noise** dBA					
	Outdoors			**Indoors, with open windows**		
	Day-night L_{Rdn} [2)]	**Day-time** L_{Rd} [1)]	**Night-time** L_{Rn} [1)]	***Day-night*** L_{Rdn} [2)]	**Day-time** L_{Rn} [1)]	**Night-time** L_{Rn} [1)]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with some workshops, with business premises and with main roads	60	60	50	50	50	40
e) Central business district	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

In districts where the $L_{R.dn}$ exceeds 55.0 dBA, residential buildings e.g. dormitories, hotel accommodation and residences, these areas should preferably be treated acoustically to obtain indoor $L_{Reg.T}$ values in line with Table 1 of SANS 10103 of 2008.

The reference time intervals can be specified to cover typical human activities and variations in the operation of noise sources and are for daytime between 6h00 to 22h00 and for nighttime between 22h00 and 6h00.

The response to noise can be classified as follows:

- An increase of 0.0dBA or less will cause no response from the affected community. For a person with normal hearing an increase of less than 3.0dBA will not be noticeable
- An increase between 0.0dBA – 10.0dBA will elicit little to sporadic response. When the difference is more than 5.0dBA above the ambient noise level a person with normal hearing will start to hear the difference.
- An increase between 5.0dBA and 15.0dBA will elicit medium response from the affected community.
- An increase between 10.0dBA and 20.0dBA will elicit strong community reaction.

The overlapping categories are because there is no clear-cut transition from one community response to another and there are variables, which should be taken into account when evaluating a potential noise problem.

6.6 Assessment of noise impacts

Two aspects are important when considering potential noise impacts on a specific area, and it is:

- The increase in the noise level, and;
- The overall noise level produced.

In terms of noise increases, persons exposed to an increase of 2.0dBA or less would not notice the difference. Some people exposed to increases of 3.0 to 4.0dBA will notice the increase in noise level, although the increase would not be considered serious. Noise increases of 5.0dBA and above are very noticeable, and, if these are frequent incidents, or continuous in nature, could represent a significant disturbance.

7. Results of the noise survey

7.1 Description of the environment

- Gerhardsville Ext 2

7.2 Measured ambient noise levels

- Gerhardsville Ext 2

7.1 Description of the environment

- Gerhardsville Ext 2

The proposed development is situated on the corner of Mimosa Avenue and the K46 road. There are agricultural holdings to the north and the south (at a distance) of the proposed

development. There is a constant flow of traffic during the day and less during the night time periods.

The following meteorological conditions were recorded on 20 June 2019:

20 June 2019 - Daytime

- Wind speed – less than 1.3m/s
- Temperature – 20.6^{o}C – No strong temperature gradient occurred near the ground.
- Cloud cover – Clouds.
- Wind direction – There was north-westerly wind blowing.
- Humidity – None.

7.2 Measured ambient noise levels

The results of the noise survey are illustrated in Table 5 where the Leq is the average noise level for the specific measuring point over a period of time, the Lmax is the maximum noise level and the Lmin is the minimum noise level registered during the noise survey for the specific area in dBA.

The prevailing ambient noise levels are typical noise levels which prevail in a district with feeder roads and existing residential properties.

Table 5: Results of noise survey

Position	Daytime - dBA			Remarks
	Ambient daytime	L_{Max}	L_{Min}	
1	***39.7***	63.4	27.2	Distant traffic noise.
2	***35.0***	47.7	26.7	Distant traffic noise.
3	***39.5***	57.0	23.9	Distant traffic noise.
4	***62.9***	80.7	36.9	Traffic noise along the K46 road.
5	***38.2***	57.2	25.7	Distant traffic noise.
6	***40.3***	59.1	28.9	Distant traffic noise.

The prevailing ambient noise levels were from 35.0dBA to 40.3dBA with a traffic noise level of 62.9 along the boundary abutting the K46 road.

The calculations to determine the noise level from the additional traffic, when the project is completed, will be based on a total of 350 vehicles during the morning peak period and 350 vehicles during the afternoon peak period (when the school closes). The number of heavy-duty vehicles which will visit the site will be 1% of the total of the traffic volume per period. The traffic noise predictions according to SANS 10210 of 2004, the national standard for the calculating and predicting of road traffic noise was used to calculate the noise level to be generated by the traffic along the proposed road. The calculation of the noise levels along the abutting roads were based on a speed of 60km/h.

Basic Model

$L_{Basic} = 38.3 + 10 \text{ Log } (Q_r)$ dBA,

where; L_{Basic} = basic noise level in dBA and Q_r is the mean traffic flow per hour.

Primary corrections to the basic model:

- Traffic flow Q – vehicles/hour;
- Corrections for speed of traffic and percentage of heavy vehicles, $L_{P,v}$;
- Correction for gradient, L_{gr};
- Correction for road surface, L_{t}.

Propagation:

- Correction for ground conditions and distance of the receiver, $L_{d,hr}$;
- Height relative to source *h*,m;
- Average height of propagation h_{av}, m.

The traffic noise during the construction phase will be **53.2dBA** along the feeder road. The traffic noise during the operational phase from the additional vehicles during the morning and afternoon peaks will be **57.1dBA** at 25m along Mimosa Avenue. The noise level at 100m from the road will be **49.3dBA**.

8. Discussion

Two aspects are important when considering potential noise impacts of a project and it is:

- The increase in the noise level, and;
- The overall noise level produced during the construction and the operational phase of the project.

The following activities will generate noise during the construction phase of the development:

- Ground works/Excavation;
- Transportation of waste soil/rock from the site;
- Foundations;
- Building activities;
- Transportation of building material to and from the construction site;
- Assembling of equipment/machinery.

The noise sources at the two different project areas which may create an increase in the noise levels in the near field on a temporary and/or permanent basis during the operational phase of the project:

- Increase in the traffic noise along the feeder roads;
- Traffic noise impact from the abutting feeder roads on the proposed residential area.

The impact assessment during the construction phase is illustrated as follows.

Table 6-1: Ground works/Excavation

Activity	**Ground works/Excavation**					
Project phase	*Construction phase*					
Impact Summary	*Noise increase at the boundary of the residential footprint and at the abutting residential areas*					
Potential Impact Rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	3	2	1	4	21	Low
Mitigation measures	*Construction activities to be done during day only provided that the prevailing ambient noise level at the residential footprint boundaries will not be exceeded.*					
After Management Impact rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	2	2	1	4	14	Low

Table 6-2: Transportation of waste soil/rock from the site

Activity	**Transportation of waste soil/rock from the site**					
Project phase	*Construction phase*					
Impact Summary	*Noise increase at the boundary of the residential footprint and at the abutting residential areas.*					
Potential Impact Rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	3	2	1	4	21	Low
Mitigation measures	*Construction activities to be done during day only provided that the prevailing ambient noise level at the residential footprint boundaries will not be exceeded.*					
After Management Impact rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	2	2	1	4	14	Low

Table 6-3: Foundations

Activity	**Foundations**					
Project phase	*Construction phase*					
Impact Summary	*Earthwork activities to be done during day only provided that the prevailing ambient noise level at the residential footprint boundaries will not be exceeded.*					
Potential Impact Rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	3	2	1	4	21	Low
Mitigation measures	*Construction activities to be done during day only provided that the prevailing ambient noise level at the residential footprint boundaries will not be exceeded.*					
After Management Impact rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	2	2	1	4	14	Low

Table 6-4: Building activities

Activity	**Building activities**					
Project phase	*Construction phase*					
Impact Summary	*Noise increase at the boundary of the residential footprint and at the abutting residential areas.*					
Potential Impact Rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	3	2	1	4	21	Low
Mitigation measures	*Construction activities to be done during day only provided that the prevailing ambient noise level at the residential footprint boundaries will not be exceeded.*					
After Management Impact rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	2	2	1	4	14	Low

Table 6-5: Transportation of building material to and from the construction site

Activity	**Transportation of building material to and from the construction site**					
Project phase	*Construction phase*					
Impact Summary	*Noise increase at the boundary of the residential footprint and at the abutting residential areas.*					
Potential Impact Rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	3	2	1	4	21	Low
Mitigation measures	*Construction activities to be done during day only provided that the prevailing ambient noise level at the residential footprint boundaries will not be exceeded.*					
After Management Impact rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	2	2	1	4	14	Low

Table 6-6: Assembling of equipment/machinery

Activity	**Assembling of equipment/machinery**					
Project phase	*Construction phase*					
Impact Summary	*Noise increase at the boundary of the residential footprint and at the abutting residential areas.*					
Potential Impact Rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	3	2	1	4	21	Low
Mitigation measures	*Construction activities to be done during day only provided that the prevailing ambient noise level at the residential footprint boundaries will not be exceeded.*					
After Management Impact rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	2	2	1	4	14	Low

The impact assessment during the operational phase is illustrated as follows.

- Increase in the traffic noise levels along the feeder roads;
- Traffic noise impact from the abutting feeder roads onto the school;
- Emergency generator.

Table 6.7: Increase in the traffic noise levels along the feeder roads

Activity	**Increase in the traffic noise levels along the feeder roads**					
Project phase	*Operational phase*					
Impact Summary	*Noise increase at the boundary of the school footprint and at the abutting Agricultural Holdings.*					
Potential Impact Rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	3	4	2	6	36	Moderate
Mitigation measures	*There will be a noise intrusion along Mimosa Avenue at 25m from the road but at 100m from the road the noise level will be 49.3dBA which will be during the morning and in the afternoon periods only. During the remainder of the day the noise increase will be limited as there may be traffic on an intermittent basis only. Speed limit of 60km/h to be maintained at all times.*					
After Management Impact rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	2	4	2	4	20	Low

Table 6.8: Traffic noise impact from the abutting feeder roads

Activity	**Traffic noise impact from the abutting feeder roads**					
Project phase	*Operational phase*					
Impact Summary	*Noise increase at the boundary of the school footprint and/or at the class rooms.*					
Potential Impact Rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	3	4	2	6	36	Moderate
Mitigation measures	The noise level along the boundary abutting the K46 road was 62.9dBA a brick wall of at least 2m will have to be constructed along the boundary abutting the K46 road. The following structural aspects must be implemented at the residential properties: • A site lay-out to be provided of the lay-out of the school in order to determine the distance between the K46 and the class rooms; • Solid core wooden doors to be fitted along the sides facing the freeway; • Beam-fill to be done where the roof and the walls join; • Windows frames to be fitted which can seal off tight when closed; • Neoprene closed cell seals to be fitted on the mating surfaces of the windows/doors and the frames if the threshold values in Table 1 of SANS 10103 of 2008 is not possible; • The recommended noise levels as per Table 1 of SANS 10103 of 2008 for Educational buildings to be complied with • The internal acoustics of the class rooms, laboratories, hall, personnel room and any other habitable area to be done in conjunction with an acoustic engineer.					
After Management Impact rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	2	4	2	4	20	Low

Table 6.9: Emergency generator (if required)

Activity	**Emergency generator**					
Project phase	*Operational phase*					
Impact Summary	*Noise increase at the boundary of the residential footprint and at the abutting residential areas.*					
Potential Impact Rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	3	4	2	6	36	Moderate
Mitigation measures	*The emergency generator to be encapsulated and installed in such a manner that the noise from the generator and/or exhaust will not exceed the prevailing ambient noise levels as measured at any of the boundaries of the residential development.*					
After Management Impact rating	***Probability***	***Duration***	***Extent***	***Magnitude***	***Significance score***	***Significance***
	2	4	2	4	20	Low

9. Recommendations

The following noise mitigatory measures are recommended for the proposed residential development:

- A final location of the school and lay-out to be provided in order to assess the potential noise intrusion levels and the noise mitigatory measures at the school building;
- Construction activities may only take place during the day time;
- The emergency generator (if required) to be encapsulated and installed in such a manner that the noise from the generator and/or exhaust will not exceed the prevailing ambient noise levels as measured at any of the boundaries of the residential development.
- A 2.0m high wall to be along the boundary next to the K46 road.
- A 30m wide servitude to be provided on the eastern side of the development where there will be habitable areas;
- Solid core wooden doors to be fitted at the residential properties facing the K46;
- Beam-fill to be done where the roof and the walls join;
- Windows frames to be fitted which can seal off tight when closed;
- Neoprene closed cell seals to be fitted on the mating surfaces of the windows/doors and the frames (the habitable rooms) if the threshold values in Table 1 of SANS 10103 of 2008 is not possible.

Recommended noise levels for educational buildings according to Table 1 of SANS 10103 of 2008:

Type of occupation	**Design equivalent continuous rating level ($L_{Req,T}$)$_a$ for ambient noise dBA**	**Maximum equivalent continuous rating level ($L_{Req,T}$)$_a$ for ambient noise dBA**
Classrooms	35.0	40.0
Secondary “open space” teaching areas	45.0	50.0
Conference rooms up to 250 seats	30.0	35.0
Corridors and lobbies	45.0	50.0
Laboratories – teaching	35.0	40.0
Laboratories – working	40.0	50.0

Lecture, teaching, and research offices	35.0	40.0
Assembly halls up to 250 seats	30.0	35.0
Music Practice rooms	35.0	45.0
Office areas	40.0	45.0
Administrative offices	35.0	45.0
Tutorial rooms	30.0	35.0

10. Conclusion and summary

The proposed development (educational) will be in line with SANS 10103 of 2008 - The measurement and rating of environmental noise with respect to annoyance and to speech communication and the Gauteng Noise Control Regulations, provided that a lay-out of the school building be provided and that the acoustic screening measures are in place.

Barend van der Merwe – MSc UJ
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Definitions/Noise:

Ambient noise
The totally encompassing sound in a given situation at a given time and usually composed of sound from many sources, both near and far

A-weighted sound pressure level (sound level) (L_{pA}), in decibels
The A-weighted sound pressure level is given by the equation:

$L_{pA} = 10 \log (p_A/p_o)^2$

Where

p_A is the root-mean-square sound pressure, using the frequency weighting network A in pascals; and

p_o is the reference sound pressure (p_o = 20 μPa).

NOTE The internationally accepted symbol for sound level is dBA.

Distant source
A sound source that is situated more than 500 m from the point of observation

Equivalent continuous A-weighted sound pressure level ($L_{Aeq, T}$), in decibels
The value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval *T*, has the same mean-square sound pressure as a sound under consideration whose level varies with time. It is given by the equation

$$L_{Aeq,T} = 10 \log \left[\frac{1}{t_2 - t_1} \int_{t_1}^{t_2} \frac{p_A^2(t)}{p_o^2} dt \right]$$

Where

$L_{Aeq,T}$ is the equivalent continuous A-weighted sound pressure level, in decibels, determined over a time interval *T* that starts at t_1 and ends at t_2;

p_o is the reference sound pressure (p_o = 20 μPa); and

$p_A(t)$ is the instantaneous A-weighted sound pressure of the sound signal, in pascals.

Impulsive sound
Sound characterised by brief excursions of sound pressure (acoustic impulses) that significantly exceed the residual noise

Initial noise
The component of the ambient noise present in an initial situation before any change to the existing situation occurs

Intelligible speech
Speech that can be understood without undue effort

Low frequency noise
Sound, which predominantly contains frequencies below 100 Hz

Nearby source
A sound source that is situated at a distance of 500 m or less from the point of observation

Residual noise
The ambient noise that remains at a given position in a given situation when one or more specific noises are suppressed

Specific noise
A component of the ambient noise which can be specifically identified by acoustical means and which may be associated with a specific source

NOTE Complaints about noise usually arise as a result of one or more specific noises.

Ambient sound level
Means the reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

Disturbing noise
Means a noise that causes the ambient noise level to rise above the designated zone level, or if no zone level has been designated, the typical rating levels for ambient noise in districts, indicated in table 2 of SANS 10103.

Abbreviations: SPL = Sound Pressure Levels, dB = Decibel, dBA = Decibel A weighted

Appendix A

The impact assessment methodology has been formalised to comply with Regulation 31(2) (l) of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA), which states the following:

An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision …, and must include –

(l) an assessment of each identified potentially significant impact, including –

(i) **cumulative** impacts;

(ii) the **nature** of the impact;

(iii) the **extent** and **duration** of the impact;

(iv) the **probability** of the impact occurring;

(v) the **degree** to which the **impact can be reversed**;

(vi) the **degree** to which the impact may **cause irreplaceable loss of resources**; and

(vii) the **degree** to which the **impact can be mitigated**.

Based on the above, the EIA Methodology will require that each potential impact identified is clearly described (providing the nature of the impact) and be assessed in terms of the following factors:

- **extend** (spatial scale) - will the impact affect the national, regional or local environment, or only that of the site?
- **duration** (temporal scale) - how long will the impact last?;
- **magnitude** (severity) - will the impact be of high, moderate or low severity?; and
- **probability** (likelihood of occurring) - how likely is it that the impact may occur?.

To enable a scientific approach for the determination of the environmental significance (importance) of each identified potential impact, a numerical value has been linked to each factor. The following ranking scales are applicable:

Occurrence	**Duration:**	**Probability:**
	5 – Permanent	5 – Definite/don't know
	4 - Long-term (ceases with the operational life)	4 – Highly probable
	3 - Medium-term (5-15 years)	3 – Medium probability
	2 - Short-term (0-5 years)	2 – Low probability
	1 – Immediate	1 – Improbable
		0 – None
Severity	**Extent/scale:**	**Magnitude:**
	5 – International	10 - Very high/uncertain
	4 – National	8 – High
	3 – Regional	6 – Moderate
	2 – Local	4 – Low
	1 – Site only	2 – Minor
	0 – None	

Once the above factors had been ranked for each identified potential impact, the environmental significance of each impact can be calculated using the following formula:

Significance = (duration + extend + magnitude) x probability

The maximum value that can be calculated for the environmental significance of any impact is 100. The environmental significance of any identified potential impact is then rated as either: high, moderate or low on the following basis:

- More than 60 significance value indicates a high (H) environmental significance impact;
- Between 30 and 60 significance value indicates a moderate (M) environmental significance impact; and
- Less than 30 significance value indicates a low (L) environmental significance impact.