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Anglo American Platinum Mogalakwena Complex

Combined Projects Environmental Authorisation

Cable Repair Yard and

Mogalakwena, Complex 3rd Concentrator Pre-Assembly Yard

Environmental Noise Impact

Mogalakwena Local Municipality

Waterberg District Municipality

Limpopo Province

Project No: 015/2022

Compiled by: B v/d Merwe

Date: 15 January 2022

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 which **SRK Consulting** was appointed as Environmental Assessment Practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act) for the **Mogalakwena Combined Project – Cable yard and Mogalakwena Complex 3rd Concentrator Pre-assembly yard**. I further declare that I am confident in the results of the studies undertaken and conclusions drawn because of it. I have disclosed, to the environmental assessment practitioner, in writing, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act. I have further provided the environmental assessment practitioner with written access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not. 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: 15 January 2022

Title / Position: Environmental noise and vibration specialist

Qualification(s): MSc Environmental Management

Experience (years/ months): 20 years

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

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 15 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, Globesight Environmental Consulting, Knight Piesold Environmental (Pty) Ltd, MattMcdonold Engineering (Pty) Ltd and SRK Consulting (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):

- Baseline environmental annual noise survey - Sishen Iron Ore Company (Pty)Ltd;
- 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 extensions 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. 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 refer 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.

Copyright

Copyright on all documents, drawings, and records, whether manually or electronically produced, which form part of the submission and any subsequent report or project document, shall vest in dBAcoustics CC. The Client, on acceptance of any submission by dBAcoustics and on condition that the client pays to dBAcoustics the full price for the work as agreed, shall be entitled to use the results of the project, the technology described and recommendations for its own benefit.

Should the Client wish to utilise any part of, or the entire report, for a project other than the subject project, permission must be obtained from dBAcoustics CC. This will ensure validation of the suitability and relevance of this report on an alternative project.

Executive summary

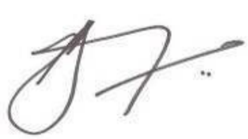
dBAcoustics was appointed by SRK Consulting (Pty) Ltd to undertake a Noise Impact Assessment to inform the Combined Basic Assessment for two projects within the Mogalakwena Complex Mining right area.
The project consists of the following infrastructure:

- Cable yard; and
- Mogalakwena Complex 3rd Concentrator (M3C) Pre-assembly yard.

An environmental noise survey was conducted on 7 and 8 December 2021 respectively. The noise data have been used to determine the potential noise impacts into the abutting residential areas which are the Seritaria Secondary School, Ga-Masenya/Skimming, Danisane, Sandsloot, and Ga-Molekana. These habitable areas are all within a radius of 5 342m from the project areas. The two projects will take place in an area where there are other mining activities and feeder roads with a continuous flow of traffic during the day and intermittent traffic flow during the night.

The environmental noise impact during the construction/development phase will be insignificant and during the operational phase the impact will be insignificant should all the noise mitigatory measures be in place. The potential noise intrusion from the proposed mining activities can however be controlled by means of approved acoustic screening measures, state of the art equipment, proper noise management principles and compliance to the Noise Regulations, 1994 and the International Finance Corporation's Environmental Health and Safety Guidelines.

The proposed Mogalakwena Complex project will be in line with the environmental noise standards and guidelines provided that all the noise mitigatory measures are in place and that the Noise Impact Management Plan (NIMP) and Noise Monitoring Plan (NMP) for Mogalakwena Complex is adhered to.



Barend van der Merwe – MSc UJ
Environmental noise and vibration specialist

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No.	Requirement	Section in report
1a)	Details of -	
(i)	The specialist who prepared the report	
(ii)	The expertise of that specialist to compile a specialist report including a curriculum vitae	P 3
b)	A declaration that the specialist is independent	P 3
c)	An indication of the scope of, and the purpose for which, the report was prepared	P 2
C (A)	An indication of the quality and age of the base data used for the specialist report	P 12
C (B)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	P 23
d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	P 19
e)	A description of the methodology adopted in preparing the report or carrying out the specialised process	P 23
f)	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	P18
g)	An identification of any areas to be avoided, including buffers	P 19
h)	A map superimposing the activity including the associated structure and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	N/A
i)	A description of any assumption made and any uncertainties or gaps in knowledge	P 12
j)	A description the findings and potential implication\s of such findings on the impact of the proposed activity, including identified alternatives on the environment	P 22
k)	Any mitigation measures for inclusion in the EMPr	Appendix A Pages 3 & 4 Appendix B Pages 3 & 4
l)	Any conditions for inclusion in the environmental authorisation	P 29 Appendix A Page 11 Appendix B Page 11
m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	P 30
n)	A reasoned opinion -	P 27
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i (A)	Regarding the acceptability of the proposed activity or activities: and	P 30
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o)	A description of any consultation process that was undertaken during preparing the specialist report	N/A

1. Introduction

dBAcoustics was appointed by SRK Consulting to compile a Noise Impact Assessment to inform the Combined Basic Assessment for two projects within the Mogalakwena Complex mining right and surface lease area.

The project consists of the following:

- Cable Repair yard; and
- M3C Pre-assembly yard.

The proposed location of the project areas is illustrated in Figure 1.

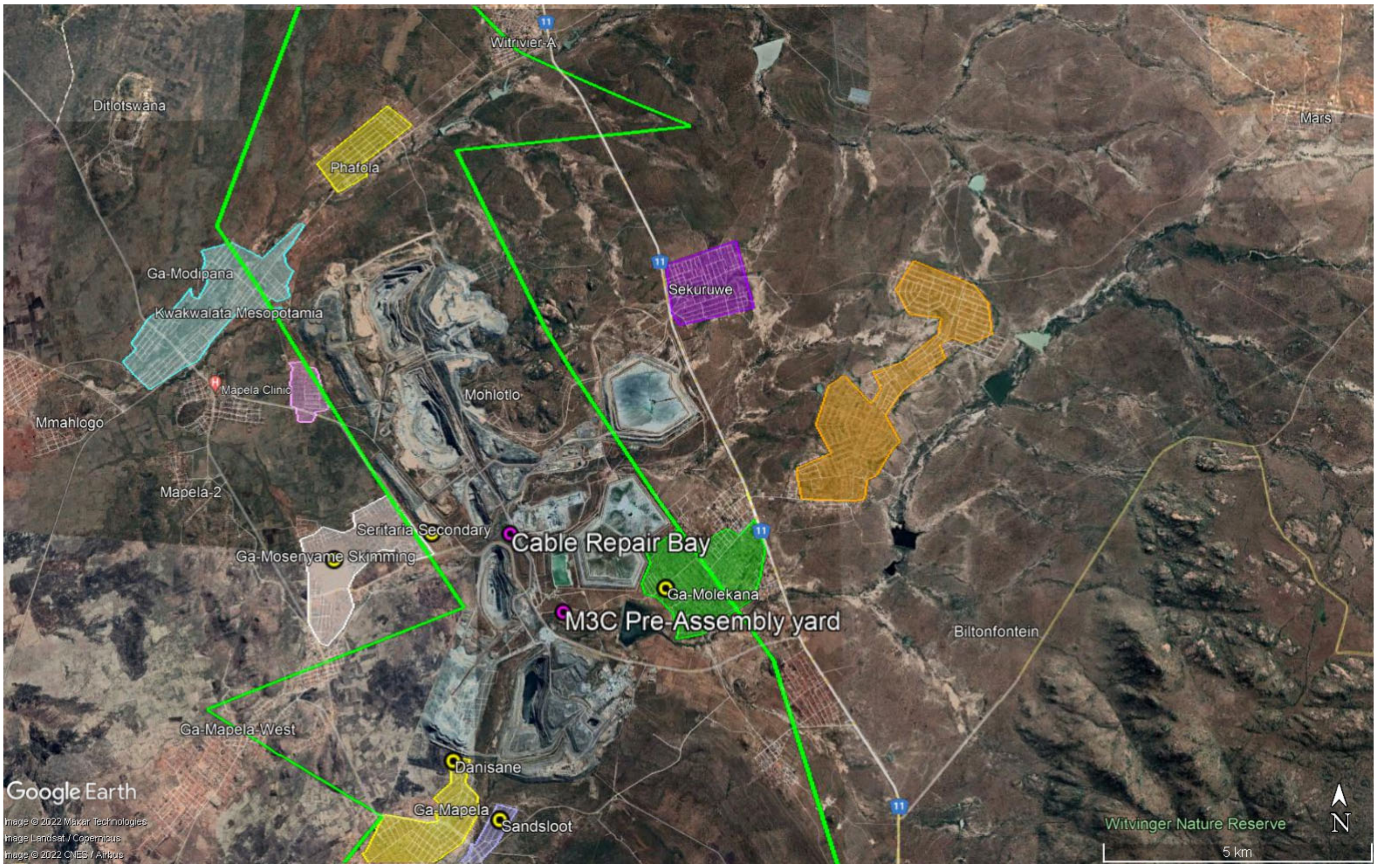

Figure 1: Location of the two project areas

2. Projects details and activities

The proposed project details and activities are provided below and have been assessed separately for the purposes of this report:

A. Cable Repair yard

- Construction of a new cable repair workshop which will replace the existing cable repair shop at the Central pit.

B. M3C Pre-assembly yard

- Establishment of a temporary area to pre-assemble components required for the Mogalakwena Complex 3rd Concentrator – temporary containerized buildings, messing facilities; ablutions, document, and data storage, under roof materials and materials storage;
- Laydown and Storage of equipment and materials; and
- Pre-assembly of structures.

The proposed projects will take place in an area where there are other mining activities and feeder roads which already have a continuous flow of traffic during the day and intermittent traffic flow during the night. The anticipated noise impact will be low during the construction, operational and decommissioning phases.

3. Background to environmental noise

3.1 Environmental 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.

The sound pressure level in free field conditions is inversely proportional to the square of the distance from the sound source – inverse square law. Expressed logarithmically as decibels, this means the sound level decreases 6 dB with the doubling of distance. This applies to a point source only. If the sound is uniform and linear then the decrease is only 3 dB per doubling of distance. The decibel scale is logarithmic, therefore decibel levels cannot be added in the normal arithmetic way, for example, two sound sources of 50.0dB each do not produce 100.0dB but 53.0dB, nor does 50.0dB and 30.0dB equal 80.0dB but remains 50.0dB. Air absorption is important over large distances at high frequencies, and it depends on the humidity but is typically about 40.0dB/km @ 4000 Hz. Traffic noise frequencies are mainly mid/low and will be unaffected below 200m.

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.

Sound propagation is affected by wind gradient rather than the wind itself. The profile of the ground causes such a gradient. The sound may be propagated during upwind conditions upwards to create a sound shadow. A downwind refracts the sound towards the ground producing a slight increase in sound level over calm isothermal conditions. The velocity of sound is inversely proportional to the temperature therefore a temperature gradient produces a velocity gradient and a refraction of the sound. Temperature decreases with height and the sound is refracted upwards.

For a source and receiver close to the ground quite large attenuation can be obtained at certain frequencies over absorbing surfaces, noticeably grassland. This attenuation is caused by a change in phase when the reflected wave strikes the absorbing ground and the destructive interference of that wave with the direct wave. The reduction in sound tends to be concentrated between 250 Hz and 600 Hz.

Noise screening can be effective when there is a barrier between the receiver and the source i.e., walls, earth mounds, cuttings, and buildings. The performance of barriers is frequency dependent. To avoid sound transmission through a barrier the superficial mass should be greater than 10 Kg/m2.

There is a complex relation between subjective loudness and the sound pressure level and again between annoyance due to noise and the sound pressure level. In general, the ear is less sensitive at low frequencies and the ear will only detect a difference in the sound pressure level when the ambient noise level is exceeded by 3.0-5.0dBA.

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 95.0 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;
- Annoyance.

Several 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 (except for long duration, high level noise) on humans is limited to disturbance and/or annoyance and the accompanying emotional reaction. This reaction is difficult to predict and is influenced by the emotional state of the complainant, his attitude towards the noisemaker, 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 extractor 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.

Noise affects humans differently and the new noise which will be coming from the mine establishment and the associated activities will depend upon the intensity of the sound, the length of time of exposure and how often over time the ear is exposed to it. Urban dwellers are besieged by noise, not only in the city streets but also in the busy workplaces and household noises.

The time-varying characteristics of environmental noise are described using statistical noise descriptors:

- Leq: The Leq is the constant sound level that would contain the same acoustic energy as the varying sound level, during the same period.
- L_{Max}: The instantaneous maximum noise level for a specified period.
- L_{Min}: The instantaneous minimum noise level for a specified period.

The following relationships occur for increases in A-weighted noise levels:

- The trained healthy human ear can discern changes in sound levels of 1.0dBA under controlled conditions in an acoustic laboratory;
- It is widely accepted that the average healthy ear can barely perceive noise level changes of 3.0dBA;
- A change in sound level of 5.0dBA is a readily perceptible increase in noise level;
- A 10.0dBA change in the sound level is perceived as twice as loud as the original source.

The World Bank in the Environmental Health and Safety Regulations has laid down the following noise level guidelines:

- Residential area – 55.0dBA for the daytime and 45.0dBA for the night-time period;
- Industrial area – 70.0dBA for the day- and night-time periods.

The difference between the actual noise and the ambient noise level, the <u>time of the day and the duration of the activity</u>, will determine how people will respond to sound and what the noise impact will be. To evaluate such, there must be uniform guidelines to evaluate each scenario. SANS 10103 of 2008 has laid down sound pressure levels for specific districts and has provided the following continuous noise levels per district as given in Table 1.

Table 1: Recommended noise levels for different districts.

Type of district	Equivalent continuous rating level ($L_{Req.T}$) for ambient noise - dBA					
	Outdoors			Indoors, with open windows		
	Day-night L_{Rdn}	Daytime L_{Reqd}	Night-time L_{Reqn}	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 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

For industrial districts, the $L_{R.dn}$ concept does not necessarily hold. For industries legitimately operating in an industrial district during the entire 24h day/night cycle, $L_{Req.d}$ = $L_{Req.n}$ = 70dBA can be considered as typical and normal.

The response to noise can be classified as follows:

- An increase of 1.0dBA to 3.0dBA above ambient noise level will cause no response from the affected community. For a person with normal hearing an increase of 0dBA to 3.0dBA will not be noticeable
- An increase between 1.0dBA – 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.

Because there is no clear-cut transition from one community response to another as well as several variables, categories of responses can overlap. This should be taken into consideration during the evaluation of a potential noise problem. There is therefore a mixture of activities and higher noise levels as per the above recommended continuous rating levels within i.e., residential, industrial and feeder roads in proximity of each other. The ambient noise level will therefore differ throughout the study area, depending on the region and the measuring position in relation to areas with existing mining activities. People exposed to an increase in the prevailing ambient noise level will react differently to the noise levels and the response is given in Table 2.

Table 2: Estimated community/group response when the ambient noise level is exceeded

Excess 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

4. Methodology

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 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 noise survey was conducted in terms of the provisions of the Noise Control Regulations, 1999 and the South African National Standards, SANS 10103 of 2008. The following integrated noise level meters were used in the noise survey:

<u>Larson Davis 831</u>

- Larson Davis Integrated Sound Level Meter Type 1 – Serial no. S/N 0001072;
- Larson Davis Pre-amplifier – Serial no.PRM831 0206;
- Larson Davis ½" free field microphone – Serial no. 377B02-316581;
- Larson Davis Calibrator 200 – Serial no.9855;
- Certificate Number: 2019-AS-0892A;
- Date of Calibration: 17 February 2021.

<u>Larson Davis LXT Sound Expert</u>

- Larson Davis Integrated Sound Level Meter Type 1 – Serial no. S/N 0006037;
- Larson Davis Pre-amplifier – Serial no. PRM LXT1 and 377B 02;
- Larson Davis Calibrator 200 – Serial no.9855;

- Certificate Number: 2019-AS-0892A;
- Date of Calibration: 28 July 2020.

Batteries were fully charged, and a windshield was always in use. The calibration certificates are attached as Appendix A.

The noise survey was carried out in terms of the Noise Control Regulations Section 16 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”.

5. Description of the receiving environment

Existing mining activities (north and south concentrator), opencast activities , traffic (inside the mining area), traffic along the N11 and feeder road between the N11 and the western communities, seasonal agricultural activities, domestic activities all contributes to the prevailing ambient noise levels depending on the distance the residential area is to the existing mining activities.

The prevailing ambient noise levels in the vicinity of Seritaria Secondary School, Ga-Mosenyana/Skimming, Danisane, Sandsloot and Ga-Molekana were as follows:

- Seritaria Secondary School – Daytime 39.0dBA and night-time 44.6dBA;
- Ga-Mosenyana/Skimming – Daytime 39.8dBA and night-time 39.0dBA;
- Danisane – Daytime 40.1dBA and night-time 45.1dBA;
- Sandsloot - Daytime 38.6dBA and night-time 43.5dBA;
- Ga-Molekana – Daytime 43.0dBA and night-time 44.5dBA;
- Mining area in the vicinity of Bakenberg Road – Daytime 49.5dBA and night-time 48.6dBA.

The communities in the vicinity of the proposed mining area and project areas A and B, are illustrated in Figure 2.

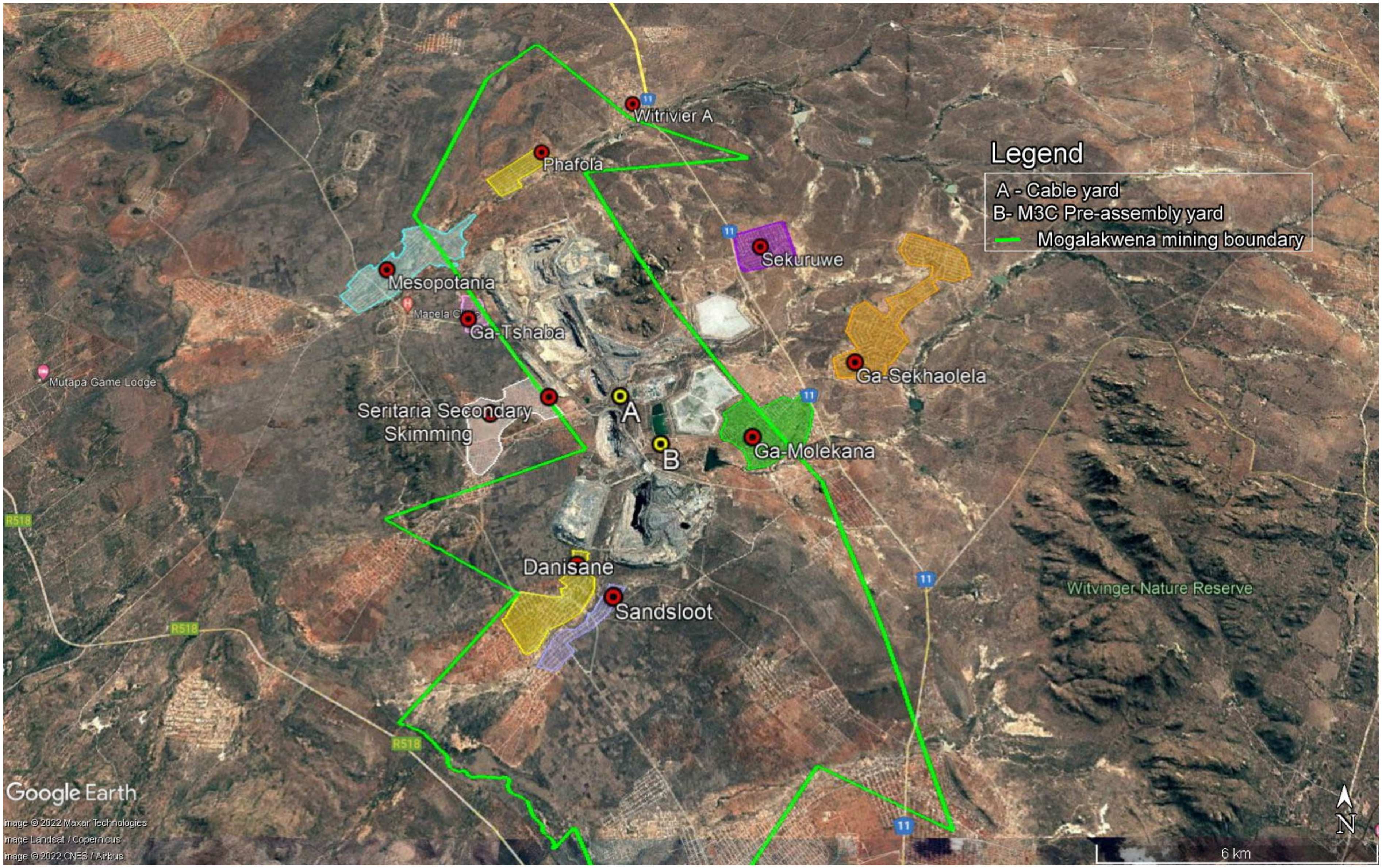

Figure 2: Existing communities in the vicinity of the Mogalakwena Complex

The distances in meters between the project areas and the abutting communities are illustrated in Table 3.

Table 3: Distances between the project areas and the communities

Communities	Distance between the different project areas and the abutting communities in meters		
	A	B	C
Seritaria Secondary School	1 381	2 419	2 803
Ga-Masenya/Skimming	1 932	3 040	2 826
Danisane	4 321	3 485	2 147
Sandsloot	5 234	3 963	2 790
Ga-Molekana	3 031	1 519	1 725

6. Assumptions and Limitations

The following assumptions were used in the calculations of the potential noise intrusion levels at the residential areas from the cable yard and M3C pre-assembly yard areas respectively:

- Operations will take place on a 24-hour basis;
- The abutting communities (depending on the location of the communities to the proposed project area) are already exposed to some mining activity noises as the Mogalakwena Complex is an operational mine;
- Activities associated with the projects will take place on a 24-hour basis;

There were no limitations at the time of compiling the report as all the relevant information per project area was provided by the Environmental Assessment Practitioner.

7. Results of the noise survey

The results of the noise survey conducted on 7 and 8 December 2021 were used to determine the potential noise impact at the different communities in the vicinity of the mining right boundaries. The measuring points are given in Figure 3.

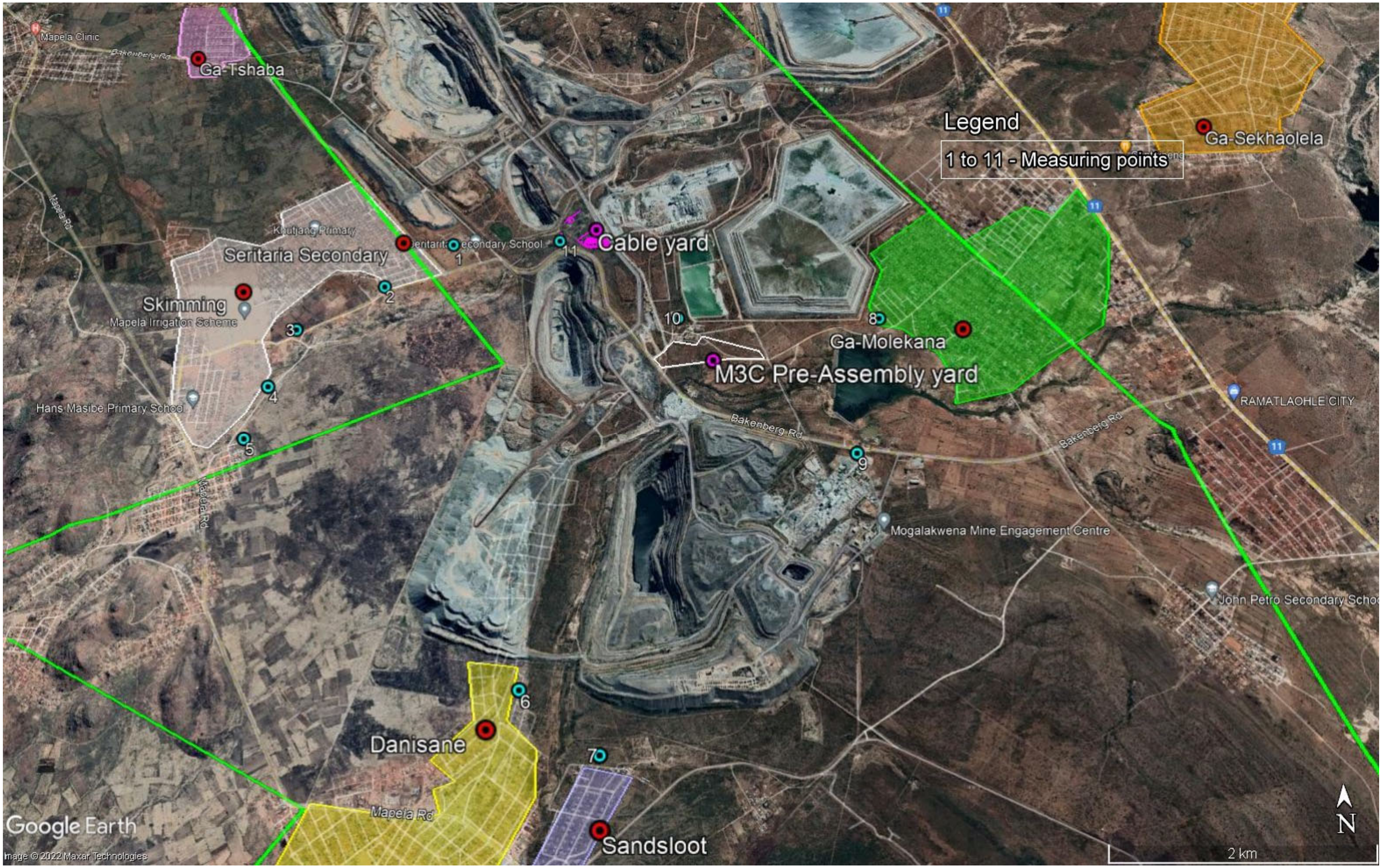

Figure 3: Measuring points within the study area.

The results of the noise survey were as follow:

Table 4: Noise levels for the day and night in the study area.

Measuring point	Daytime				Night 1				Night 2			
	LAeq-dBA	Lmax - dBA	Lmin - dBA	Remarks	LAeq- dBA	Lmax - dBA	Lmin - dBA	Remarks	LAeq-dBA	Lmax - dBA	Lmin - dBA	Remarks
1	**39.0**	54.0	29.8	Distant mining & traffic	**44.8**	56.4	37.7	Distant mining	**44.2**	55.6	37.2	Distant mining
2	**39.7**	55.0	31.1	Distant mining & domestic	**37.6**	49.6	31.9	Distant mining	**40.1**	52.7	34.0	Distant mining
3	**39.1**	49.6	32.3	Distant mining	**40.1**	48.2	30.0	Distant mining	**39.8**	48.2	30.7	Distant mining
4	**36.3**	56.5	26.7	Distant mining & traffic	**40.9**	52.3	34.0	Distant mining	**39.4**	51.8	33.6	Distant mining
5	**44.1**	52.2	37.9	Domestic and distant mining activities audible.	**38.4**	50.2	32.3	Domestic and distant mining activities audible	**35.9**	46.7	31.1	Distant domestic and insects.
6	**40.1**	56.7	24.8	Distant animals, birds, and domestic noise	**40.0**	46.4	36.5	Domestic, mining and insects.	**50.1**	67.4	38.7	Distant mining and insects.
7	**38.6**	55.7	24.9	Domestic and birds.	**42.0**	53.8	33.6	Domestic and insects	**44.9**	57.1	38.0	Distant mining and insects
8	**43.0**	54.5	33.5	Distant mining.	**44.8**	61.8	33.1	Distant mining and insects.	**44.1**	52.2	37.9	Distant mining and insects.
9	**54.3**	67.4	38.7	Traffic and distant mining activities	**50.1**	66.7	37.7	Traffic and mining activities	**54.2**	59.6	46.0	Traffic and distant mining.
10	**48.1**	59.2	40.4	Distant hauling and mining.	**50.1**	59.9	39.7	Distant hauling and mining.	**47.8**	60.1	40.5	Distant mining and traffic.
11	**46.1**	58.0	38.1	Distant mining activities.	**44.3**	56.5	36.9	Distant mining activities.	**44.9**	57.1	38.0	Distant mining activities.

7.1 Noise impact at the different noise receptors

The noise levels at the noise sensitive areas will be added in a logarithmic manner to determine the overall sound exposure at the receptor. The categorization of the intrusion levels during the construction and operational phases will be as follows See Appendices A, B C. The increase in the prevailing ambient noise level is calculated in the following manner:

$\Delta L\mathrm{Req,T} = L\mathrm{Req,T}\ (\mathrm{post}) - L\mathrm{Req,T}\ (\mathrm{pre})$

where,

- LReq,T (post) – noise level after completion of the project – projected or calculated noise levels;
- LReq,T (pre) – noise level before the proposed project – ambient noise level.

The criteria for assessing the magnitude of a noise impact are illustrated in Table 5.

Table 5: Noise intrusion level criteria

Increase Δ-dBA	Assessment of impact magnitude	Color code
0 <Δ≤ 1	Not audible	
1 <Δ≤ 3	Very Low	
3 <Δ≤ 5	Low	
5 <Δ≤ 10	Medium	
10 <Δ≤ 15	High	
15 <Δ	Very High	

The noise intrusion levels and noise impact assessment at each of the residential areas are illustrated in Appendix A – Cable yard and Appendix B – M3C pre-assembly yard .

8. Summary of the potential impacts

The proposed project will take place in an area where there are other mining activities and feeder roads with a continuous flow of traffic during the day and intermittent traffic flow during the night.

The potential noise impact will be **low** during the construction and operational phases after the implementation of mitigatory measures.

9. Recommendations

The following three primary variables should be considered when designing acoustic screening measures for the control of sound and/or noise:

- The source – Reduction of noise at the source;
- The transmission path – Reduction of noise between the source and the receiver;
- The receiver – Reduction of the noise at the receiver.

The last option is not applicable and the noise levels at the noise source will be controlled on a pro-active manner when and if such increase occur and there may be an increase in the prevailing noise levels.

10. Acoustic screening recommendations

The acoustic screening measures for the project are given in Table 6. These are based on the best practicable methods, acoustic screening techniques and the IFC's Health and Safety Guidelines.

Table 6: Recommended acoustic screening measures

Activity	Recommendations
Construction phase	• Equipment and/or machinery which will be used must comply with the manufacturer's specifications on acceptable noise levels and any noise sources above 85.0dBA to be acoustically screened off.
	• Construction activities to take place during day/nighttime provided that the prevailing ambient noise level along the mine boundaries will not be exceeded.
Operational phase	• Equipment and/or machinery which radiate noise levels between 85.0dBA and 90.0dBA to be acoustically screened off.
	• Noise monitoring to be carried out along the mining boundaries in the vicinity of the mining expansion footprint areas to identify noise sources on a pro-active basis.
	• Noise monitoring at the communities and the mine boundaries to be done on a quarterly basis for a year after which the frequency can change to an annual basis;
	• Actively manage the process and the noise management plan must be used to ensure compliance to the noise regulations and/or standards.

The following are the Environmental, Health and Safety Guidelines of the IFC of the World Bank, which should be implemented during the construction, operational and decommissioning phases of the project:

- Selecting equipment with lower sound power levels;
- Installing silencers for fans;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing acoustic enclosures for equipment causing radiating noise;
- Installing vibration isolation for mechanical equipment;
- Re-locate noise sources to areas which are less noise sensitive, to take advantage of distance and natural shielding;
- Taking advantage during the design stage of natural topography as a noise buffer;
- Develop a mechanism to record and respond to complaints.

The Noise Impact Management Plan (NIMP) in Table 7 for the proposed project

Table 7: Noise impact management plan

Action	Description	Frequency	Responsible person
Management objective	To ensure that the legislated noise levels will always be adhered to.	Annual noise surveys to verify the recommended prevailing noise levels according to SANS 10103 of 2008.	The engineer during the construction phase and the responsible person (Mogalakwena Environmental Department) during the operational phase of the project
Monitoring objective – Construction phase	Measure the environmental noise levels during the construction phase of the project to ensure compliance to the recommended noise levels.	Surveys to verify the recommended prevailing noise levels according to SANS 10103 of 2008.	Mogalakwena Environmental Department
Monitoring objective – Operational phase	Measure the environmental noise levels during the operational phase of the project to ensure compliance to the recommended noise levels.	Surveys to verify the recommended prevailing noise levels according to SANS 10103 of 2008.	Mogalakwena Environmental Department
Monitoring technology	The environmental noise monitoring must take place with a calibrated Class 1 noise monitoring equipment.	Surveys to verify the recommended prevailing noise levels according to SANS 10103 of 2008.	Mogalakwena Environmental Department
Specify how the collected information will be used	The noise data will have to be discussed after each monitoring period and pro-active measures to be implemented if the threshold of 70.0dBA were exceeded.	After each monitoring session.	Mogalakwena Environmental Department
Spatial boundaries	At the boundaries of the identified abutting communities as well as at the boundaries of the different mining areas.	Annually	Mogalakwena Environmental Department
Define how the data will be analysed and interpreted and how it should be presented in monitoring reports	Reports must be compiled for each monitoring cycle and the results must be compared to the previous set of results to determine if there was a shift in the prevailing ambient noise.	surveys to verify the recommended prevailing noise levels according to SANS 10103 of 2008.	Mogalakwena Environmental Department

Action	Description	Frequency	Responsible person
Accuracy and precision of the data	The noise surveys will have to be conducted in terms of the recommendations of the Noise Control Regulations and SANS 10103 of 2008.	Calibrated equipment must be used at all times.	Environmental noise and vibration specialist

11. Potential Mitigation Measures

Table 8: Mitigation Measures.

Aspect	Mitigation	Responsible person	Activity
Construction phase			
Grading and building of Cable yard, M3C Pre-assembly yard.	Construction equipment to comply with the standards for construction vehicles as explained in the IFC's Environmental Health & Safety Regulations.	Site engineer	Annual environmental audits during the construction phase.
Additional traffic to and from the project areas	Roads to be always kept in a good state of repair and all potholes to be repaired. Speed limits specific to the areas where the projects will be located to be adhered to at all times	Site engineer	Annual environmental audits during the construction phase.
Operational phase			
Noise generated by the two project areas	Noise levels may not exceed the threshold value (before a noise disturbance may be created) of 7.0dBA at the MRA.	Site engineer	Annual environmental audits during the construction phase.
Cumulative impact			
Cumulative impact of two project areas	Environmental noise audit to be carried out once the two projects is commissioned.	Site engineer	Environmental audits.

12. Recommended conditions for authorisation

The following conditions will be applicable from an environmental noise point of view:

- All acoustic screening measures must be in place before commissioning of the projects;
- Environmental noise monitoring to be carried out during the different phases of the projects as detailed in Table 10;
- All noise sources associated with the different mining areas to be identified and registered; and
- The noise (Noise Control Regulations, 1994) and/or guidelines to be always adhered to.

13. Conclusion

The environmental noise impact during the construction phase and the operational phases of the two projects will be low should all the noise mitigatory measures be in place.

The potential noise intrusion from the proposed activities can however be controlled by means of approved acoustic screening measures, state of the art equipment, proper noise management principles and compliance to the Noise Regulations, 1994 and the International Finance Corporation's Environmental Health and Safety Guidelines.

The proposed Mogalakwena Complex project – Cable yard and M3C Pre-assembly yard will be in line with the environmental noise standards and guidelines provided that all the noise mitigatory measures are in place and that the Noise Impact Management Plan (NIMP) and Noise Monitoring Plan (NMP) for Mogalakwena Complex is adhered to.

Barend van der Merwe – MSc UJ
Environmental noise and vibration specialist

Appendix A: Section A – Cable yard

The impact assessment for the establishment of the cable yard during the pre-construction phase, construction phase, operational phase, rehabilitation phase and the post-closure phase are dealt with in this section. The location of the Cable yard is illustrated in Figure A 1.

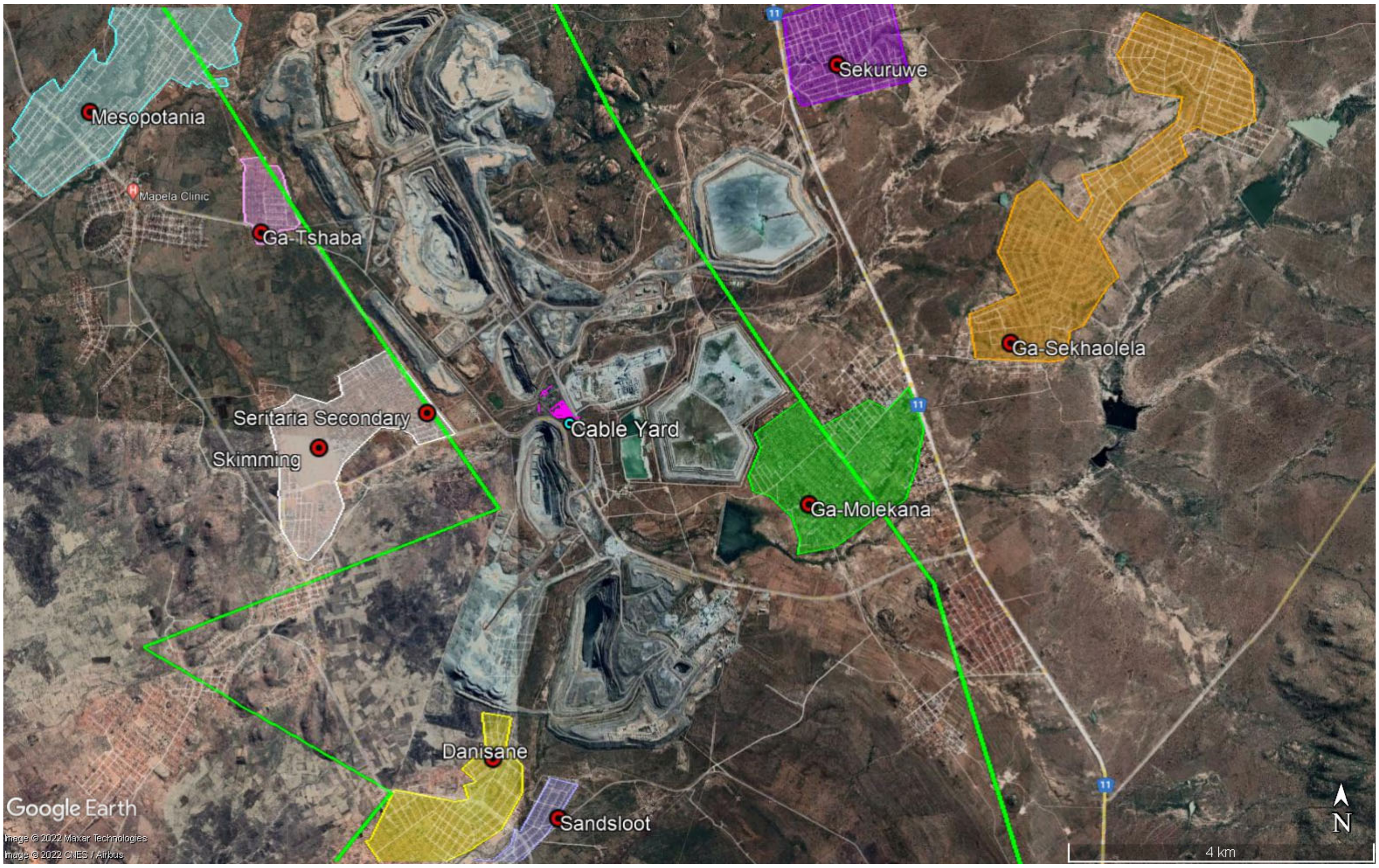

Figure A 1: Cable yard location

The following sound levels were used in determining the noise intrusion level during the construction phase at the different project construction areas:

- Clearing of vegetation and stripping of topsoil and vegetation at the different project area footprints – 85.0dBA;
- Construction and development activities during the construction of buildings – 86.0dBA.

The following sound levels were used in determining the noise intrusion level during the operational phase of the cable yard:

- Cable yard – 85.0dBA;

- Compressors – 87.0dBA;
- Cable Bay – 80.0dBA;
- Vehicles – 82.0dBA;
- Parking bay – 75.0dBA; and
- Administrative building – 65.0dBA.

1. Calculated noise levels for the construction and operational phases of the project – Cable yard

1.1 Construction Phase

The following noise levels as given in Table A 1 are construction machinery and equipment that may be used during the construction. The cumulative noise levels (when all the machinery is in use) were calculated for setback distances of 2m up to 1 920m.

Table A 1: Sound pressure levels of construction machinery

Equipment	**Reduction in the noise level some distance from the source - dBA**								
Cumulative distance from source in meters	2m from the machinery and/or equipment	15m	30m	60m	120m	240m	480m	960m	1920m
Dump truck	91	62.5	56.5	50.4	44.4	38.4	32.4	26.4	20.3
Backhoe	85	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Drilling Equipment	100	71.5	65.5	59.4	53.4	47.4	41.4	35.4	29.3
Flatbed truck	85	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Pickup truck	70	41.5	35.5	29.4	23.4	17.4	11.4	5.4	-0.7
Tractor trailer	85	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Crane	85	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Pumps	70	41.5	35.5	29.4	23.4	17.4	11.4	5.4	-0.7
Welding Machine	72	43.5	37.5	31.4	25.4	19.4	13.4	7.4	1.3
Generator	90	61.5	55.5	49.4	43.4	37.4	31.4	25.4	19.3
Compressor	85	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Jackhammer	90	61.5	55.5	49.4	43.4	37.4	31.4	25.4	19.3
Rock drills	100	71.5	65.5	59.4	53.4	47.4	41.4	35.4	29.3
Pneumatic tools	85	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Cumulative noise levels from the construction activities when all such work within a radius of 30m	**103.9**	75.4	69.3	63.3	57.3	51.3	45.3	39.2	33.2

The following equation was used to calculate the noise level at the noise receptors during the construction phase.

$$Lp = Lw - 20\log R - 5dB$$

Where, Lp is the sound level at a distance from the source in dBA;

Lw is the sound level at the source in dBA;

R is the distance from the source.

The noise levels at the noise receptors have been added in a logarithmic manner to determine the overall sound exposure at the receptor.

- Sound level change of 1.0dB can barely be detected by humans;
- Change of 2.0dB to 3.0dBA, barely noticeable;
- Change of 5.0dB, readily noticeable;
- Change of 10.0dB perceived as a doubling in loudness;
- Change of 20.0dB represents a dramatic change.

The noise intrusion level criteria for the construction phase of the project is given in (Table A 2 and Table A 3) and the noise intrusion levels have been categorized in terms of the noise level criteria in Table 5 of the main report. The noise intrusion levels during the construction phase of the project will be below the threshold value of 7.0dBA. The noise from the proposed project activities will not be audible at the abutting noise receptors due to the existing mining activities at Mogalakwena Complex.

Table A 2: Calculated noise intrusion levels during the construction phase – Clearing of footprint

Position	Clearing and stripping of topsoil	Earthworks	Digging of trenches and foundation	Construction of roads	**Cumulative Levels**	**Cumulative noise level - Daytime**	**Cumulative noise level – Night-time**	**Intrusion noise level - daytime**	**Intrusion noise level – night-time**
Seritaria Secondary School	22.7	22.7	20.7	22.7	26.3	28.3	39.1	0.1	0.0
Ga-Masenya/Skimming	19.8	19.8	17.8	19.8	23.4	25.4	39.8	0.0	0.0
Danisane	12.8	12.8	10.8	12.8	16.8	18.6	40.1	0.0	0.0
Sandsloot	11.1	11.1	9.1	11.1	15.4	17.1	38.6	0.0	0.0
Ga-Molekana	15.9	15.9	13.9	15.9	19.7	21.6	43.0	0.0	0.0

Table A 3: Calculated noise intrusion levels during the construction phase – Construction of buildings

Position	Deliveries of construction material	Delivery of material for construction of buildings	Assembly/erecting buildings	Cumulative Levels	Cumulative noise level - Daytime	Cumulative noise level – Night-time	Intrusion noise level - daytime	Intrusion noise level – night- time
Seritaria Secondary School	20.7	22.7	20.7	20.2	35.4	36.4	**0.1**	**0.1**
Ga-Masenya/Skimming	17.8	19.8	17.8	23.9	35.6	36.5	**0.3**	**0.2**
Danisane	10.8	12.8	10.8	22.8	35.5	36.5	**0.2**	**0.2**
Sandsloot	9.1	11.1	9.1	23.1	45.7	45.0	**0.0**	**0.0**
Ga-Molekana	13.9	15.9	13.9	25.6	45.7	45.0	**0.0**	**0.0**

1.2 Operational phase

The following activities will become part of the operational phase activities of the Cable yard activities:

- Cable yard – 85.0dBA;
- Compressors – 87.0dBA;
- Cable Bay – 80.0dBA;
- Vehicles – 82.0dBA;
- Extract fans – 87.0dBA;
- Parking bay – 75.0dBA; and
- Administrative building – 65.0dBA.

The noise intrusion levels at the abutting communities during the operational phase for the project are illustrated in Table A4. The calculated noise intrusion levels will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors.

Table A 4: Noise intrusion levels for the operational phase

Position	Cable yard	Compressors	Cable bay	Vehicles	Parking Bay	Administrative building	Extract fans	Cumulative Levels	Cumulative noise level - Daytime	Cumulative noise level – Night-time	Intrusion noise level - daytime	Intrusion noise level – night- time
Seritaria Secondary School	25.2	25.2	25.7	25.7	5.7	7.7	17.8	26.5	39.2	44.7	**0.2**	**0.1**
Ga- Masenya/ Skimming	22.3	22.3	22.8	22.8	2.8	4.8	15.8	23.8	39.9	39.1	**0.1**	**0.1**
Danisane	15.3	15.3	15.8	15.8	-4.2	-2.2	14.7	18.7	40.1	45.1	**0.0**	**0.0**
Sandsloot	13.6	13.6	14.1	14.1	-5.9	-3.9	13.5	17.4	38.6	43.5	**0.0**	**0.0**
Ga-Molekana	18.4	18.4	18.9	18.9	-1.1	0.9	21.9	23.8	43.1	44.5	**0.1**	**0.0**

2. Environmental noise impact assessment

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:

2.1 Impact Assessment Methodology

The potential noise impacts were evaluated in terms of the criteria given in the following EIA methodology. This will be applicable for the Cable yard project.

This methodology has been formatted to comply with Regulation 31(2)(1) of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA), which states the following :

(2) *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* –

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

- **Extend** (spatial scale) – with 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 (D) :	Probability (P) :
	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 yeas)	2 – Low probability
	1 – Immediate	1 – Improbable
		0 – None
Severity	**Extent / Scale (E):**	**Magnitude (M):**
	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 + extent = 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 either : high, moderate, or low on the following basis :

- More than 60 significance value indicates as **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

In order to assess the ***degree to which the potential impact can be reversed and be mitigated,*** each identified potential impact will need to be assessed twice.

– Firstly, the potential impact will be assessed and rated prior to implementing any mitigation and management measures; and
– Secondly, the potential impact will be assessed and rated after the proposed mitigation and management measures have been implemented.

The purpose of this dual rating of the impact before and after mitigation is to indicate that the significance rating of the initial impact is and should be higher in relation to the significance of the impact after mitigation measures have been implemented.

In order to assess the degree to which the potential impact can cause irreplaceable loss of resources (LoR), the following classes (%) will be used and will need to be selected based on your informed decision and discression :

5 100% - Permanent loss
4 75% -99% - Significant loss
3 50% - 74% - Moderate loss
2 25% - 49% - Minor loss
1 0% - 24% - limited loss

The Loss of Resources aspect will not affect the overall significance rating of the impact.

In terms of assessing the **cumulative impacts**, specialists are required to address this in a sentence/paragraph fashion as the spatial extent of the cumulative impacts will vary for project to project.

Cumulative impact, in relation to an activity, means the impact of an activity that in itself may not be significant, but may become significant when added to the existing or potential impacts eventuating from similar or diverse activities or undertakings in the area.

2.2 Impact assessment for the pre-construction construction, construction phase, operational phase, rehabilitation phase and the post closure phase are illustrated in Table A .

Table A 5: Impact assessment for the Cable yard project

Activity	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
Pre-Construction Phase																		
Clearing of vegetation	*Noise increase during noise and vibration surveys*	-	2	2	2	4	2	**16**	**Low**	*No noisy activities to be undertaken and motor-vehicle to be in a good order.*	1	2	2	4	1	**8**	**Low**	50.0
Stripping of topsoil	*Noise increase along the routes to and from the site.*	-	2	2	2	4	2	**16**	**Low**	*Keep within the speed limit. Motor vehicles to be fully serviced and exhaust system to be intact.*	1	2	2	4	1	**8**	**Low**	60.0
Construction Phase																		
Preparation of the footprint, digging of trenches, earthworks, and construction of the base of the Cable yard	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	3	2	2	6	3	**30**	**Moderate**	*All noise sources on construction vehicles in excess of 85.0dBA at 1.0m from the noise source to be acoustically screened off. Noise monitoring to be done to ensure that the noise sources are identified on a pro-active manner.*	**2**	**2**	**2**	**4**	**3**	**16**	**Low**	46.7
Construction of the buildings and stores	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	3	2	2	6	3	**30**	**Moderate**	*Noise monitoring to be done to ensure that the noise sources are identified on a pro-active manner*	**2**	**2**	**2**	**4**	**3**	**16**	**Low**	46.7
Construction vehicles along the access roads	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	3	2	2	6	3	**30**	**Moderate**	*Noise monitoring to be done to ensure that the noise sources are identified on a pro-active manner*	**2**	**2**	**2**	**4**	**3**	**16**	**Low**	46.7
Operational Phase																		
Noise generated by the Cable yard	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	3	5	2	6	2	**39**	**Moderate**	*All noise sources in excess of 85.0dBA to be acoustically screened off*	2	5	2	4	3	**22**	**Low**	43.6
Traffic to and from the Cable yard	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	3	5	2	6	2	**39**	**Moderate**	*All noise sources in excess of 85.0dBA to be acoustically screened off*	2	5	2	4	3	**22**	**Low**	43.6
Noise from the administrative buildings	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	2	5	2	6	2	**26**	**Low**	*All noise sources in excess of 85.0dBA to be acoustically screened off*	2	5	2	4	3	**22**	**Low**	15.4
Closure/Rehabilitation Phase																		
Rehabilitation of disturbed areas	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	2	2	2	4	2	**16**	**Low**	*No noisy activities to be undertaken and vehicles/machinery to be in a good order.*	1	2	2	4	1	**8**	**Low**	50.0

Planting of grass and shrubs	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	2	3	3	4	3	**20**	**Low**	*No noisy activities to be undertaken and vehicles/machinery to be in a good order.*	1	2	2	4	1	**8**	**Low**	60.0
Post-Closure Phase																		
Visiting of rehabilitated areas	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	**-**	2	2	2	4	2	**16**	**Low**	*No noisy activities to be undertaken and vehicles/machinery to be in a good order.*	1	2	2	4	1	**8**	**Low**	50.0

3. Potential Mitigation Measures

The mitigation measures for the Cable yard activities are given in Table A .

Table A 6: Mitigation Measures.

Aspect	Mitigation	Responsible person	Activity
Construction phase			
Clearing, grading and construction of Cable yard	Construction equipment to comply with the standards for construction vehicles as explained in the IFC's Environmental Health & Safety Regulations.	Site engineer	Environmental audits during the construction phase – bi-annual.
Additional traffic to and from the Cable yard activities	Roads to be always kept in a good state of repair and all potholes to be repaired.	Site engineer	Environmental audits during the construction phase – bi-annual.
Operational phase			
Noise generated by the Cable yard activities	Noise levels may not exceed the threshold value (before a noise disturbance may be created) of 7.0dBA at the mining right area.	Site engineer	Environmental audits – quarterly.
Traffic to and from the Cable yard area	Access roads to cable yard area to be always kept in good order.	Site engineer	Environmental audits – quarterly
Cumulative impact			
Cumulative impact of Cable yard activities	Environmental noise audit to be carried out once the Cable yard is commissioned.	Site engineer	Environmental audits.

Appendix B: M3C Pre-assembly yard

The impact assessment for the establishment of the M3C Pre-assembly yard during the pre-construction phase construction phase, operational phase, rehabilitation phase and the post-closure phase will be dealt with in this section. The location of the M3C Pre-assembly yard is illustrated in Figure B 1.

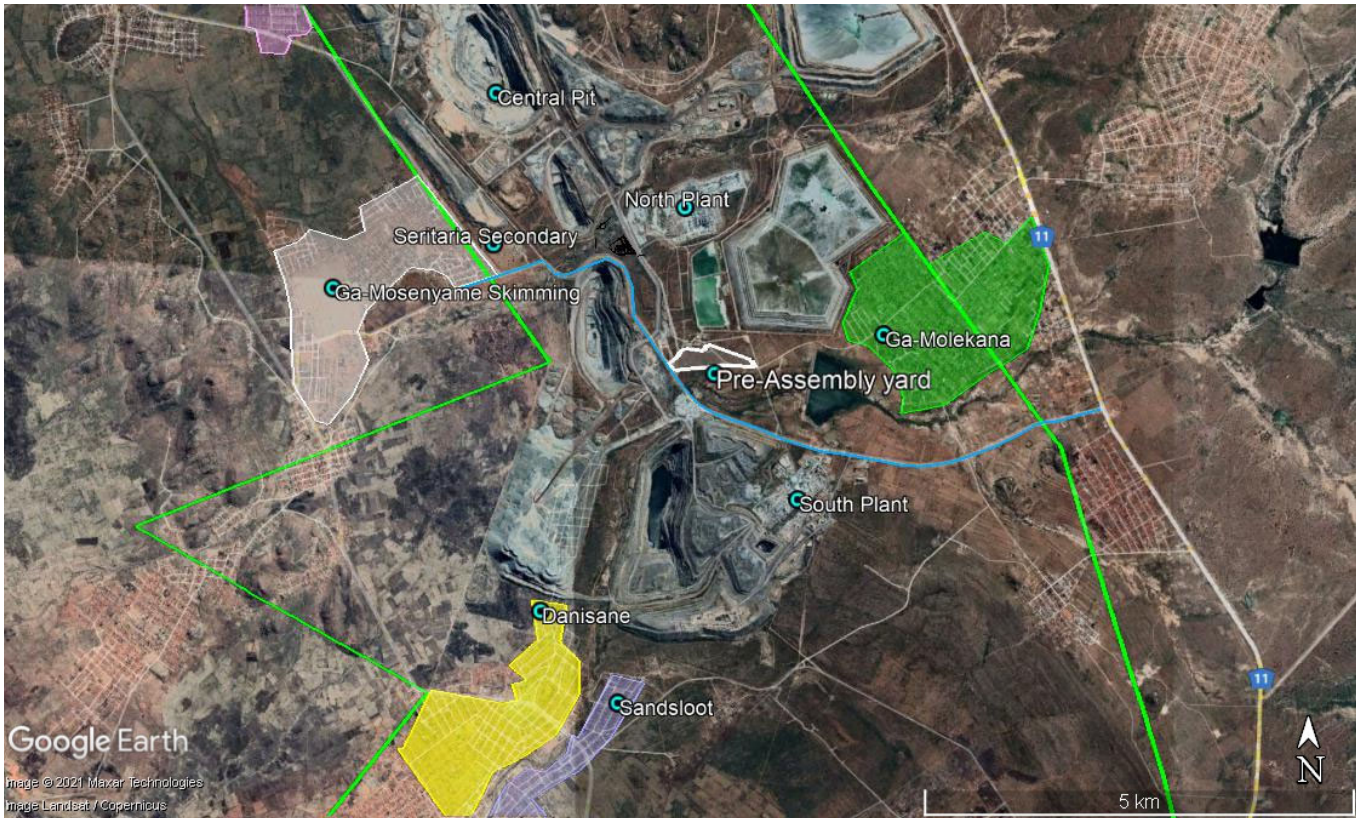

Figure B 1: Pre-assembly yard location

The following sound levels were used in determining the noise intrusion level during the <u>construction phase</u> at the different project construction areas:

- Clearing and stripping of topsoil and vegetation at the different project area footprints – 85.0dBA;
- Construction activities during the construction of buildings – 86.0dBA.

The following sound levels were used in determining the noise intrusion level during the <u>operational phase</u> of the cable yard:

- M3C Pre-assembly workshop – 85.0dBA;
- Compressors – 87.0dBA;
- Pre-assembly bays – 80.0dBA;
- Vehicles – 82.0dBA;
- Parking bay – 75.0dBA; and

- Administrative building – 65.0dBA.

1. Calculated noise levels for the construction and operational phases of the M3C Pre-assembly yard

1.1 Construction Phase

The following noise levels as given in Table B 1 are construction machinery and equipment that may be used during the construction. The cumulative noise levels (when all the machinery is in use) were calculated for setback distances of 2m up to 1 920m.

Table B 1: Sound pressure levels of construction machinery

Equipment	**Reduction in the noise level some distance from the source - dBA**								
Cumulative distance from source in meters	2m from the machinery and/or equipment	15m	30m	60m	120m	240m	480m	960m	1920m
Dump truck	91.0	62.5	56.5	50.4	44.4	38.4	32.4	26.4	20.3
Backhoe	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Drilling Equipment	100.0	71.5	65.5	59.4	53.4	47.4	41.4	35.4	29.3
Flatbed truck	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Pickup truck	70.0	41.5	35.5	29.4	23.4	17.4	11.4	5.4	-0.7
Tractor trailer	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Crane	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Pumps	70.0	41.5	35.5	29.4	23.4	17.4	11.4	5.4	-0.7
Welding Machine	72.0	43.5	37.5	31.4	25.4	19.4	13.4	7.4	1.3
Generator	90.0	61.5	55.5	49.4	43.4	37.4	31.4	25.4	19.3
Compressor	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Jackhammer	90.0	61.5	55.5	49.4	43.4	37.4	31.4	25.4	19.3
Rock drills	100.0	71.5	65.5	59.4	53.4	47.4	41.4	35.4	29.3
Pneumatic tools	85.0	56.5	50.5	44.4	38.4	32.4	26.4	20.4	14.3
Cumulative noise levels from the construction activities when all such work within a radius of 30m	**103.9**	**75.4**	**69.3**	**63.3**	**57.3**	**51.3**	**45.3**	**39.2**	**33.2**

The following equation was used to calculate the noise level at the noise receptors during the construction phase.

$$Lp = Lw - 20\log R - 5dB$$

Where, Lp is the sound level at a distance from the source in dBA;

Lw is the sound level at the source in dBA;

R is the distance from the source.

The noise levels at the noise receptors will be added in a logarithmic manner to determine the overall sound exposure at the receptor.

- Sound level change of 1.0dB can barely be detected by humans;
- Change of 2.0dB to 3.0dBA, barely noticeable;
- Change of 5.0dB, readily noticeable;
- Change of 10.0dB perceived as a doubling in loudness;
- Change of 20.0dB represents a dramatic change.

The noise intrusion level criteria for the construction phase of the project is given in (Table B 2 and

Table B 3) and the noise intrusion levels have been categorized in terms of the noise level criteria in Table 5 (main report). The noise intrusion levels during the construction phase of the project will be below the threshold value of 7.0dBA. The noise from the proposed construction activities will not be audible at the abutting noise receptors due to the existing mining activities at Mogalakwena complex.

Table B 2: Calculated noise intrusion levels during the construction phase – clearing of footprint

Position	Clearing and stripping of topsoil	Earthworks	Digging of trenches and foundation	Construction of roads	Cumulative Levels	Cumulative noise level - Daytime	Cumulative noise level – Night- time	Intrusion noise level - daytime	Intrusion noise level – night-time
Seritaria Secondary School	17.8	17.8	15.8	15.8	23.0	39.0	44.6	0.0	0.0
Ga-Masenya/Skimming	15.8	15.8	13.8	13.8	21.1	39.8	39.0	0.0	0.0
Danisane	14.7	14.7	12.7	12.7	20.0	40.1	45.1	0.0	0.0
Sandsloot	13.5	13.5	11.5	11.5	18.9	38.6	43.5	0.0	0.0

Ga-Molekana	21.9	21.9	19.9	19.9	27.0	43.0	44.5	**0.0**	**0.0**

Table B 3: Calculated noise intrusion levels during the construction phase – construction of buildings

Position	Deliveries of construction material	Delivery of material for construction of buildings	Assembly/erecting buildings	Cumulative Levels	Cumulative noise level - Daytime	Cumulative noise level – Night-time	Intrusion noise level - daytime	Intrusion noise level – night- time
Seritaria Secondary School	15.8	14.5	16.0	20.5	39.1	44.6	**0.1**	**0.0**
Ga-Masenya/Skimming	13.8	14.5	14.0	19.2	39.8	39.0	**0.0**	**0.0**
Danisane	12.7	16.9	12.9	19.6	40.1	45.1	**0.0**	**0.0**
Sandsloot	11.5	14.6	11.7	18.0	38.6	43.5	**0.0**	**0.0**
Ga-Molekana	19.9	14.8	20.1	23.7	43.1	44.5	**0.1**	**0.0**

1.2 Operational phase

The following activities will become part of the operational phase activities of the pre-assembly activities:

- M3C Pre-assembly yard – 85.0dBA;
- Compressors – 87.0dBA;
- Cranes – 80.0dBA;
- Vehicles – 82.0dBA;
- Mobile generator – 90.0dBA
- Extract fans – 87.0dBA; and
- Administrative building – 65.0dBA.

The noise intrusion levels at the abutting communities during the operational phase for the project are illustrated in Table B 4. The calculated noise intrusion levels will be insignificant and there will not be an increase in the prevailing ambient noise levels at the abutting noise receptors.

Table B 4: Noise intrusion levels for the operational phase

Position	Pre-assembly yard	Compressors	Cranes	Vehicles	Mobile generators	Extract fans	Administrative buildings	Cumulative Levels	Cumulative noise level - Daytime	Cumulative noise level – Night-time	Intrusion noise level - daytime	Intrusion noise level – night- time
Seritaria Secondary School	25.2	26.2	25.7	15.7	30.7	15.7	5.8	31.0	39.6	44.8	**0.6**	**0.2**
Ga-Masenya/Skimming	22.3	23.3	22.8	12.8	27.8	12.8	3.8	28.1	40.1	39.3	**0.3**	**0.3**
Danisane	15.3	16.3	15.8	5.8	20.8	5.8	2.7	21.3	40.2	45.1	**0.1**	**0.0**
Sandsloot	13.6	14.6	14.1	4.1	19.1	4.1	1.5	19.7	38.7	43.5	**0.1**	**0.0**
Ga-Molekana	18.4	19.4	18.9	8.9	23.9	8.9	9.9	24.4	43.1	44.5	**0.1**	**0.0**

2. Environmental noise impact assessment

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:

2.1 Impact Assessment Methodology

The potential noise impacts were evaluated in terms of the criteria given in the following EIA Methodology.

This methodology has been formatted to comply with Regulation 31(2)(1) of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA), which states the following :

(2) *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* –

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

- **Extend** (spatial scale) – with 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 (D) :	Probability (P) :
	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 yeas)	2 – Low probability
	1 – Immediate	1 – Improbable
		0 – None
Severity	**Extent / Scale (E):**	**Magnitude (M):**
	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 + extent = 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 either : high, moderate, or low on the following basis :

- More than 60 significance value indicates as **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

In order to assess the ***degree to which the potential impact can be reversed and be mitigated,*** each identified potential impact will need to be assessed twice.

– Firstly, the potential impact will be assessed and rated prior to implementing any mitigation and management measures; and

– Secondly, the potential impact will be assessed and rated after the proposed mitigation and management measures have been implemented.

The purpose of this dual rating of the impact before and after mitigation is to indicate that the significance rating of the initial impact is and should be higher in relation to the significance of the impact after mitigation measures have been implemented.

In order to assess the *degree to which the potential impact can cause irreplaceable loss of resources (LoR)*, the following classes (%) will be used and will need to be selected based on your informed decision and discression :

5 100% - Permanent loss
4 75% -99% - Significant loss
3 50% - 74% - Moderate loss
2 25% - 49% - Minor loss
1 0% - 24% - limited loss

The Loss of Resources aspect will not affect the overall significance rating of the impact.

In terms of assessing the **cumulative impacts**, specialists are required to address this in a sentence/paragraph fashion as the spatial extent of the cumulative impacts will vary for project to project.

Cumulative impact, in relation to an activity, means the impact of an activity that in itself may not be significant, but may become significant when added to the existing or potential impacts eventuating from similar or diverse activities or undertakings in the area.

2.2 Impact assessment for the pre-construction, construction, operational, rehabilitation and post-closure phase

The noise impact assessment for the different phases is illustrated in Table B5.

Table B 5: Impact assessment for the M3C Pre-Assembly yard

Activity	Nature of the impact		Significance of potential impact BEFORE mitigation							Mitigation Measures	Significance of potential impact AFTER mitigation							Degree of mitigation (%)
			P	D	E	M	LoR	Significance			P	D	E	M	LoR	Significance		
Pre-Construction Phase																		
Clearing of vegetation	*Noise increase during noise and vibration surveys*	-	2	2	2	4	2	**16**	**Low**	*No noisy activities to be undertaken and motor-vehicle to be in a good order.*	1	2	2	4	1	**8**	**Low**	50.0
Stripping of topsoil	*Noise increase along the routes to and from the site.*	-	2	3	2	4	2	**16**	**Low**	*Keep within the speed limit. Motor vehicles to be fully serviced and exhaust system to be intact.*	1	2	2	4	1	**8**	**Low**	60.0
Construction Phase																		
Preparation of the footprint, digging of trenches, earthworks, and construction of the base of the M3C Pre-Assembly yard	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	3	2	2	6	3	**30**	**Moderate**	*All noise sources on construction vehicles in excess of 85.0dBA at 1.0m from the noise source to be acoustically screened off. Noise monitoring to be done to ensure that the noise sources are identified on a pro-active manner.*	**2**	**2**	**2**	**4**	**3**	**16**	**Low**	**46.7**
Construction of the buildings and stores	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	3	2	2	6	3	**30**	**Moderate**	*Noise monitoring to be done to ensure that the noise sources are identified on a pro-active manner*	**2**	**2**	**2**	**4**	**3**	**16**	**Low**	**46.7**
Construction vehicles along the access roads	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	3	2	2	6	3	**30**	**Moderate**	*Noise monitoring to be done to ensure that the noise sources are identified on a pro-active manner*	**2**	**2**	**2**	**4**	**3**	**16**	**Low**	**46.7**
Operational Phase																		
Noise generated by the M3C Pre-Assembly yard, compressors, cranes, mobile generator, and extract fans.	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	3	5	2	6	2	**39**	**Moderate**	*All noise sources in excess of 85.0dBA to be acoustically screened off*	2	5	2	4	3	**22**	**Low**	43.6
Traffic to and from the M3C Pre-Assembly yard	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	3	5	2	6	2	**39**	**Moderate**	*All noise sources in excess of 85.0dBA to be acoustically screened off*	2	5	2	4	3	**22**	**Low**	43.6
Noise from the administrative buildings	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	-	2	5	2	6	2	**26**	**Low**	*All noise sources in excess of 85.0dBA to be acoustically screened off*	2	5	2	4	3	**22**	**Low**	15.4
Closure/Rehabilitation Phase																		

Rehabilitation of disturbed areas	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	**-**	2	2	2	4	2	**16**	**Low**	*No noisy activities to be undertaken and vehicles/machinery to be in a good order.*	1	2	2	4	1	**8**	**Low**	50.0
Planting of grass and shrubs	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*		2	3	3	4	3	**20**	**Low**	*No noisy activities to be undertaken and vehicles/machinery to be in a good order.*	1	2	2	4	1	**8**	**Low**	60.0
Post-Closure Phase																		
Visiting of rehabilitated areas	*Noise increase in excess of the 70.0dBA threshold value along the MRA footprint*	**-**	2	2	2	4	2	**16**	**Low**	*No noisy activities to be undertaken and vehicles/machinery to be in a good order.*	1	2	2	4	1	**8**	**Low**	50.0

2.4 Potential Mitigation Measures

The potential mitigation measures are illustrated in Table B .

Table B 6: Mitigation Measures

Aspect	Mitigation	Responsible person	Activity
Construction phase			
Clearing, grading and building of Pre-assembly footprint	Construction equipment to comply with the standards for construction vehicles as explained in the IFC's Environmental Health & Safety Regulations.	Environmental Department	Environmental audits during the construction phase -Annually.
Additional traffic to and from the Pre-assembly yard	Roads to be always kept in a good state of repair and all potholes to be repaired.	Environmental Department	Environmental audits during the construction phase -Annually.
Operational phase			
Noise generated by the Pre-assembly yard	Noise levels may not exceed the threshold value (before a noise disturbance may be created) of 7.0dBA at the MRA.	Environmental Department	Annual environmental audits.
Assembly of different buildings etc. and daily operations	Noise levels may not exceed the threshold value (before a noise disturbance may be created) of 7.0dBA at the MRA.	Environmental Department	Annual environmental audits.
Cumulative impact			
Cumulative impact of Pre-assembly yard	Environmental noise audit to be carried out once the Pre-assembly project is commissioned.	Environmental Department	Environmental audits.

14. List of Definitions and Abbreviations

13.1 Definitions

Ambient noise

The totally encompassing sound in each 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 500 m or less from the point of observation

Residual noise

The ambient noise that remains at a given position in each 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 because 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 by 7.0dBA or if no zone level has been designated, the typical rating levels for ambient noise in districts, indicated in table 2 of SANS 10103.

Noise nuisance

Means any sound which disturbs or impairs the convenience or peace of any person

13.2 Abbreviations

dBA – A-weighted sound pressure level;

IFC – International Finance Corporation;

m/s – meters per second;

NSA – Noise sensitive areas;

L_{Basic} – Basic noise level in dBA;

SANS – South African National Standards;

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