DAS Steel (Pty) Ltd Noise Impact Assessment

Proposed Micro-Foundry – Cato Ridge

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QUALITY MANAGEMENT

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EXECUTIVE SUMMARY

The study investigated the potential noise impact that the proposed Micro Foundry would have on the surrounding environment in Catoridge, Kwa-Zulu Natal. The major land use around the proposed site is light and heavy industrial with large areas of open grassland. There are no receptors within immediate vicinity of the proposed site. Background noise levels are therefore benchmarked against typical environmental noise for a rural and industrial landuse according to the applicable SANS code of practice (SANS10103:2008).

The background noise level was measured on 15-16 March 2012 during both the daytime and night-time at each of the receptor points for 10-minute measurement periods. From this survey, a baseline noise level was assigned to 8 discrete receptor points distributed strategically across the extent of the study area.

Predictive data was then modelled for different scenarios (Construction Phase, Operational Phase and Worst-case Scenario) at each of the 8 receptor points. The construction phase model is based on the assumption that construction activities will only take place in the daytime, whilst the operational phase model assumes that activities continue through the night.

The following results show the median and logarithmic average noise level (with added background) of all the receptor points, greater than 1 m away from the source (point or line), for each of the modelled scenarios. The average background noise level during the daytime is 41.3 dB(A) compared to 40.9 dB(A) during the night-time.

	Additional noise at source dB(A)	Median noise level at receptors dB(A)	Average noise level at receptors dB(A)	Difference in noise level dB(A)
Construction	91.4	37.8	44.8	+3.5
Operational - Daytime	106.6	38.9	44.9	+3.6
Operational – Nighttime	57.0	43.5	43.5	+2.6
Worst case	130.0	49.3	53.8	+12.5

The increased environmental noise level in the region of the site is in the range of 2.6 to 3.6 dB(A) for the anticipated (likely) scenarios. This increase will be audible in the region of the study area but will likely be confined to a low humming noise generated from the micro foundry combined with vehicular traffic on the road. Theory suggests and results confirm that noise transmission will be topographically controlled and propagate more effectively eastwards.

GLOSSARY OF TERMS

Sound	Sound is small fluctuations in air pressure (measured in N/m^2, or Pascal) that are transmitted as vibrational energy via the medium (air) from the source to the receiver. The human ear is in essence a pressure transducer, which converts these small fluctuations in air pressure into electrical signals, which the brain then interprets as sound.
Noise	Noise is generally defined as unwanted sound.
Ambient sound level	According to the national Noise Regulations in terms of the Environment Conservation Act, ambient sound level means the reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes, after such a meter has been put into operation. Brüell & Kjaer (2001) define ambient noise as "the noise from all sources combined − factory noise, traffic noise, birdsong, running water, etc" while residual noise is referred to as the noise levels without the noise source of concern. For the purposes of this study ambient noise will be defined as the totally encompassing sound in a given situation at a given time, and is usually composed of sound from many sources, both near and far.
Noise nuisance	Noise nuisance means any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person.
Nuisance	A legal definition of a noise that offends or upsets the receiver because it is occurring at the wrong time in the wrong place or is of a character that annoys due to excessive tonal components or impulses.
A-weighting	The human ear is not equally sensitive to sound of all frequencies, i.e. it is less sensitive to low pitched (or 'bass') than high pitched (or 'treble') sound. In order to compensate when making sound measurements, the measured value is passed through a filter that simulates the human hearing characteristic. Internationally this is an accepted procedure when working with measurements that relate to human responses to sound/noise.
Sound or Noise level	A sound or noise level is a sound measurement that is expressed in terms of dB or dBA.
dB or dBA	The Decibel, the dB (or dBA) is not the unit of sound. The human ear is a phenomenally sensitive instrument that can detect fluctuations in air pressure over an extremely wide range of amplitudes. This makes the handling of sound quantities in absolute terms, i.e. Pascal (Pa), very cumbersome. For this reason a sound measurement is expressed as ten times the logarithm of the ratio of the sound measurement to a reference value, 20 micro (millionth) Pa. This process converts a scale of constant increases to a scale of constant ratios and considerably simplifies the handling of sound measurement quantities. The attached 'A' indicates that the sound measurement has been A-weighted.
L_{Leq}	(The equivalent sound pressure level). This is in essence a time-averaged sound measurement. Sound continuously fluctuates as a function of time. In order to effectively assess the effect of sound or noise on human beings it is very often necessary to obtain a measure of the average exposure to the sound or noise.
L_{Aeq}	(The equivalent A-weighted sound pressure level). This is internationally the most often used parameter to measure noise in relation to human responses.
L_{Amax}	The maximum sound pressure level of a noise event, normally measured on an A-weighted decibel scale.
Octave Bands	Indicates the magnitude of sound in the corresponding frequency band on a logarithmic scale; all the bands except the highest and lowest span an octave in frequency (32 Hz to 8,000 Hz).

1 INTRODUCTION

WSP Environment and Energy was appointed to undertake the environmental noise impact specialist study for a proposed micro foundry in Catoridge, Kwa-Zulu Natal. Environmental noise monitoring was conducted to establish the current baseline noise at specified receptor points. The monitoring was conducted on the 15-16 March 2012 and was done over the day and night timeframes as recommended by SANS 10328:2003 – *Methods for environmental noise impact assessments*, monitoring results will be compared to the relevant guideline rating levels as provided in SANS 10103:2008 *The measurement and rating of environmental noise with respect to annoyance and to speech communication*. A single band width at various intervals in the sound spectrum (Octaves Spectrum) was used as a fair indication of the character of the noise in the surrounding environment. The results from the survey were used in accordance with modelling software to calculate the future noise being generated by the activities at the proposed foundry.

1.1 AIMS AND OBJECTIVES

The environmental noise impact assessment has addressed the following:

- Provide a short summary of the noise regulations, guidelines and standards relevant to the operation.
- Describe the existing ambient noise conditions at each of the monitoring points.
- To determine the existing noise climate and the characteristic of the noise profile in the surrounding environment in Cato Ridge.
- Model the expected ambient noise levels at each receptor point during the operations.
- Rate the intensity, extent and duration of the impact on the surrounding environment.

The environmental noise impact assessment at each of the identified receptor points was conducted in accordance with SANS 10328:2008 and the assessment of the overall impact was conducted in accordance with SANS 10103:2008. In addition the assessment procedure considers legal stipulations contained in the Noise Control Regulations (NCR).

2 ENVIRONMENTAL NOISE

2.1 PRINCIPLES

Sound may be defined as any pressure variation (in air, water or other medium) that the human ear can detect. Noise is defined as “unwanted sound”. Noise can have a health impact and can negatively affect the quality of life of people.

The annoyance due to a given noise source is perceived very differently from person to person, and is also dependent upon many non-acoustic factors such as the prominence of the source, its importance to the listener’s economy and his or her personal opinion of the source.

Noise impact may be understood to mean one or a combination of negative physical, physiological or psychological responses experienced by individuals, whether consciously or unconsciously as caused by exposure to sound. The result of increased exposure to noise on individuals can have negative effects, both physiological (influence on communication and, productivity and even impaired hearing) and psychological effects (stress, frustration and disturbed sleep).

Hearing impairment is typically defined as an increase in the threshold of hearing. Hearing deficits may be accompanied by tinnitus (ringing in the ears). Noise-induced hearing impairment occurs predominantly in the higher frequency range of 3 000 – 6000 Hz, with the largest effect at 4 000 Hz. But with increasing $L_{Aeq,8h}$ and increasing exposure time, noise-induced hearing impairment occurs even at frequencies as low as 2 000 Hz. However, hearing impairment is not expected to occur at $L_{Aeq,8h}$ levels of 75 dB(A) or below, even for prolonged occupational noise exposure.

Annoyance. The capacity of a noise to induce annoyance depends upon its physical characteristics, including the sound pressure level, spectral characteristics and variations of these properties with time. During daytime, few people are highly annoyed at L_{Aeq} levels below 55 dB(A), and few are moderately annoyed at L_{Aeq} levels below 50 dB(A). Sound levels during the evening and night should be 5–10 dB lower than during the day.

Speech intelligibility is adversely affected by noise. Most of the acoustical energy of speech is in the frequency range of 100–6 000 Hz, with the most important cue-bearing energy being between 300–3 000 Hz. Speech interference is basically a masking process, in which simultaneous interfering noise renders speech incapable of being understood. Environmental noise may also mask other acoustical signals that are important for daily life, such as doorbells, telephone signals, alarm clocks, fire alarms and other warning signals, and music.

Sleep disturbance is a major effect of environmental noise. It may cause primary effects during sleep, and secondary effects that can be assessed the day after night-time noise exposure. Uninterrupted sleep is a prerequisite for good physiological and mental functioning, and the primary effects of sleep disturbance are: difficulty in falling asleep; awakenings and alterations of sleep stages or depth. The difference between the sound levels of a noise event and background sound levels, rather than the absolute noise level, may determine the reaction probability.

A method in environmental noise monitoring is the split the noise up into manageable spectrums, this is called the Octaves Banding. The Octaves band comes from the musical terms where the octave is the interval between two frequencies (notes) where the higher frequency is twice the frequency of the lower note. The Octaves Band is defined in terms of the centre frequency, thus the 500Hz band will represent the frequency from 353.5Hz to 707Hz. If the frequency recorded in the lower frequency range (32Hz band) the sound will be a very low noise, like a big engine running. The same is true for the opposite, if the highest noise is recorded to be in the upper frequencies (8000Hz band) the noise will have a very high pitched, like a jet engine whine.

2.2 NOISE GENERATION, TRANSMISSION AND REDUCTION

Sound is a pressure wave that decreases over distance from the source. Noise attenuation is typically described as a set reduction in decibel level per doubling of distance from the source. Depending on the nature of the noise source, sound propagates at different rates. The two most common categories of noise are point sources and line sources.

A review of international scientific literature shows that distance from a noise source is a mitigating factor. The most important factors affecting noise propagation are:

- The type of source (point or line);
- Distance from source;
- Atmospheric absorption;
- Wind;
- Temperature and temperature gradient;
- Obstacles such as barriers and buildings;
- Ground absorption;
- Reflections;
- Humidity;
- Precipitation.

Research has shown that a doubling in distance from a noise source results in a proportional decline in noise level. Sound propagation in air can be compared to ripples on a pond. The ripples spread out uniformly in all directions, decreasing in amplitude as they move further from the source.

For sound in air, when the distance doubles, the amplitude drops by half – which is a drop of 6 dB. Thus, if you are at a position one meter from the source and move one meter further away from the source, the sound pressure level will drop by 6 dB. If you move to 4 meters, it will drop by 12 dB, 8 meters by 18 dB, and so on. However, this is only true when there is no reflecting or blocking objects in the sound path. Such ideal conditions are termed free-field conditions.

With an obstacle in the sound path, part of the sound will be reflected; part absorbed and the remainder will be transmitted through the object. How much sound is reflected, absorbed or transmitted depends on the properties of the object, its size and the wavelength of the sound.

Noise mitigation can also result from the topography or shielding from trees or structures. When locations are not in the line of sight of the noise source, there is generally a 10+ dB(A) attenuation for broadband noise, with a further 10 dB(A) attenuation on the inside of an average residence, when the windows are open. The influences of vegetation, topography, and atmospheric conditions as noise reduction factors can vary greatly and are often impossible to quantify.

When ground cover or normal unpacked earth (i.e., a soft site) exists between the source and receptor, the ground becomes absorptive to sound energy. Absorptive ground results in an additional noise reduction over distance of 1.5 dB per doubling of distance. Added to the standard reduction rate for soft site conditions, point source noise attenuates at a rate of 7.5 dB per doubling of distance.

A hard site exists where sound travels away from the source over a generally flat, hard surface such as water, concrete, or hard-packed soil. These are examples of reflective ground, where the ground does not provide any attenuation. The standard attenuation rate for hard site conditions is 6 dB per doubling of distance for point source.

A break in the line of sight between the noise source and the receptor can result in a 5 dB reduction. Dense vegetation can reduce noise levels by 5 dB for every 30m of vegetation, up to a maximum reduction of 10 dB.

2.3 LEGISLATION AND GUIDELINES

During the baseline noise assessment, all measurements were taken according to the Department of Environmental Affairs and Tourism No. R. 154. Noise Control Regulations in Terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989), together with SANS 10103:2008.

There is currently no standards for the different octaves bands for a particular region/district, but the noise levels for the monitored period will be compared to the SANS Standard.

2.3.1 The National Noise Control Regulations

The National Noise Regulations of 1992 provide a more definitive approach to the control of noise and has been applied by many local authorities. These regulations have now been devolved to provincial level control.

The Noise Control Regulations, which were issued under the enabling Environment Conservation Act, were developed by the Council for the Environment after extensive consultation with local authorities. These are far more comprehensive and multi-faceted instruments to control noise both pro-actively and reactively. By March 1992, the application of these regulations had been promulgated in the area of jurisdiction of some 27 local authorities.

2.3.2 South African National Standards (SANS 10103)

From the 1960s the **SABS Code of Practice 10103** for *The Measurement and Assessment of Environmental Noise with Respect to Annoyance and Speech Communication* provided guidance in defining noise impact criteria limits and standards and was also used by local authorities in the control of environmental noise. This standard has now been updated by the South African National Standard **SANS 10103**, the latest edition of which is SANS 10103:2008 - *The Measurement and Rating of Environmental Noise with Respect to Annoyance and to Speech Communication.*

The tables below are adapted from those contained within the IFC – EHS Guidelines (Table 1) and the abovementioned code of practice, and describe typical noise rating levels for various land-use types (Table 2) and expected community response that may be elicited should these levels be exceeded (Table 3).

Table 1: Typical rating levels for noise in districts (adapted from SANS 10103:2008)

Type Of District	Equivalent Continuous Rating Level for Noise ($L_{Req,T}$) (dBA)					
	Outdoors			Indoors (with windows open)		
	Day-Night ($L_{R,dn}$)	Daytime ($L_{req,d}$)	Night-time ($L_{req,n}$)	Day-Night ($L_{R,dn}$)	Daytime ($L_{req,d}$)	Night-time ($L_{req,n}$)
a) Rural	45	**45**	**35**	35	35	25
b) Suburban (with little road traffic)	50	50	40	40	40	30
c) Urban	55	55	45	45	45	35
d) Urban (with one or more of the following: workshops; business premises; and main roads)	60	60	50	50	50	40
e) Central Business Districts	65	65	55	55	55	45
f) Industrial Districts	70	70	60	60	60	50

Table 2: Categories of community/ group response (adapted from SANS 10103:2008)

Excess ($\Delta L_{Req,T}$)[a] dBA	Estimated Community/ Group Response	
	Category	**Description**
0 – 10	Little	Sporadic Complaints
5 – 15	Medium	Widespread Complaints
10 – 20	Strong	Threats of community or group action
>15	Very Strong	Vigorous community or group action

NOTE: Overlapping ranges for the excess values are given because a spread in the community reaction might be anticipated.

a.$\Delta L_{Req,T}$ should be calculated from the appropriate of the following:

1) **$L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS $L_{Req,T}$ of the residual noise (determined in the absence of the specific noise under investigation);**
2) **$L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level of the ambient noise given in Table 1 of the code;**
3) **$L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from Table 2 of the code; or**
4) **$L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in the area because of the proposed development under investigation.**

3 STUDY METHODOLOGY

Ambient sound level measurements were undertaken at various positions on the proposed site and at surrounding off-site locations. Noise measurements were taken on the 15-16 March 2012 during the daytime and night-time, with daytime commencing at 06:00 and ending at 22:00 and night-time commencing at 22:00 and ending at 06:00 as prescribed in *SANS 10103:2008 - The measurement and rating of environmental noise with respect to annoyance and to speech communication*.

The noise parameters recorded were:

- L_{Fmax} The maximum sound pressure level of a noise event measured on a F-weighted decibel scale.
- L_{Amax} The maximum sound pressure level of a noise event measured on an A-weighted decibel scale.
- L_{Aeq} The equivalent continuous sound level, normally measured on an A-weighted decibel scale.
- L_{Feq} The equivalent continuous sound level, measured on the F-weighted decibel scale.
- Octaves Spectrum (32Hz to 8000Hz) All the frequency spectrum was measured in on a Z-Weighted decibel scale.

The results of each monitoring point will be compared with each other for identifying specific frequency trends.

All sound level measurement procedures were undertaken according to the relevant South African Code of Practice SANS 10103:2008. This included; selection of monitoring locations, microphone positioning, and equipment specifications among others. Sound level measurements were taken with an SABS-calibrated Type 1 Integrating Sound Level Meter.

The Noise monitored spectrum was split into 10 bands (32Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz and 8kHz), these are the Octaves bands. The noise level meter measured the noise in each of the octaves bands in real-time. The results can indicate where the noise is the loudest and if the noise needs to be reduced, specific equipment/plans can then be used to target the specific octaves bands.

3.1 BASELINE ASSESSMENT

The monitoring points are indicated in Figure 1 below, the monitoring points are labelled from REC 01 to REC 08.

Figure 1: Map identifying the noise monitoring points at the proposed site and surrounding area

3.2 MONITORING PROCEDURE

The noise prediction model utilises applicable formulas that are stipulated in the SANS 10103:2008. The model calculated all of the noise source emissions for each of the sources and scenarios and added them together to generate one single point of emission. The single source point was located at the centre of the proposed development area. At each of the receptors, the noise level was calculated and combined with the baseline noise level of the region, to determine the impact the proposed activity would have on the environment.

It is acknowledged that variations in parameters such as plant processes and meteorology can influence ambient sound levels. The climatic conditions used for a the scenarios were calculated from the weather data collected by Assmang Manganese in Cato Ridge and South African Weather Service Pietermaritzburg Station for 2011. All receptor heights are at 1,5m above ground. The operating hours of the plant will be 24-hours a day.

The model calculated various receptor points spaced out over the study area. Noise generated by the different activities associated with construction was combined and used as a point source (Total noise that would be emitted from the site).

The noise generated by the increase in vehicle movement along Eddie Hagan Drive was calculated by determining the shortest distance from the road to each of the receptors. The two noise sources (proposed foundry and road) were added together to give the total noise level at each receptor, to illustrate the noise impact that each of the phases would have on the surrounding environment. The background noise level was also added to the final output to provide a more realistic result of the noise impact on the environment.

The factors that have an effect on the formula to calculate the noise level at each receptor point, are:

- Source noise level
- Distance attenuation
- Topography*
- Air absorption (0.1 per 25 m in distance from source)

The formula used is:

$$LA_{eq(Receptor)} = SNL - DA - G - AB$$

Where, SNL is the source noise level, DA is the distance attenuation, AB is the air absorption and G is the topographical value. The topographical value is added to the formula if the receptor and source is in a visible line from each other. The DA is calculated by:

$$20 \times \log_{10}(\text{distance}) + 11$$

To calculate the total noise level from both point and line source (with background) is calculated by the following formula:

$$\text{Tot. Noise level} = 10 \times (\log_{10}[(10^{(\text{point noise level}/10)}) + ((10^{(\text{line noise level}/10)}) + (10^{(\text{background noise level}/10)})]$$

3.3 NOISE EMISSION SOURCE

The project will ultimately introduce new noise sources into the region namely during, construction and operational phases. The main sources of noise identified are listed in the table below.

Table 3: Listing the different noise sources during the different phases of the project

Construction phase	Operational phase
Construction activity including a crane, excavator, concrete mixer, riveting machinery etc.	Various plant including an air separation unit, CTF furnace, substation, transformer etc.
Onsite vehicle movement	Loading and off-loading transport trucks with in site (forklifts) magnetic loaders, gantry cranes
Road traffic noise	Road traffic noise

3.3.1 Construction phase

The noise associated with construction activities will create intermittent noise and will only occur for a short duration (anticipated less than a year). The noise impact is not expected to have a significant impact on the surrounding environment.

The construction phase noise sources will also include earthmoving equipment (Bulldozers, excavators, transport trucks and loading and off-loading of material onsite). This will have an effect on the road traffic noise on the Eddie Hagan Drive as well.

3.3.2 Operational phase

The noise impact from the operational phase will occur throughout the life span of the foundry and the impact is expected to influence the local environment noise level indefinitely.

4 RESULTS

The proposed site is on a ridge with the surrounding area mostly flat. The gradient of the region thus does not affect the spread of the noise generated by the new development.

4.1 BASELINE RESULTS

The baseline results were measured on the 15-16 March 2012 during the SANS 10103:2008 day and night-time periods. The results for the LAeq are as follows:

Table 4: Table indicating the results in tabular form

	REC 01	REC 02	REC 03	REC 04	REC 05	REC 06	REC 07	REC 08
Daytime	47.7	54.3	51.6	57.5	57.9	66.6	42.5	48.7
Nighttime	42.6	42.6	42.6	42.6	46.5	35.1	36.9	41.7

The graph below indicate the decibel value for each Octave band (32Hz to 8k Hz) to provide a complete analysis for the noise in the region.

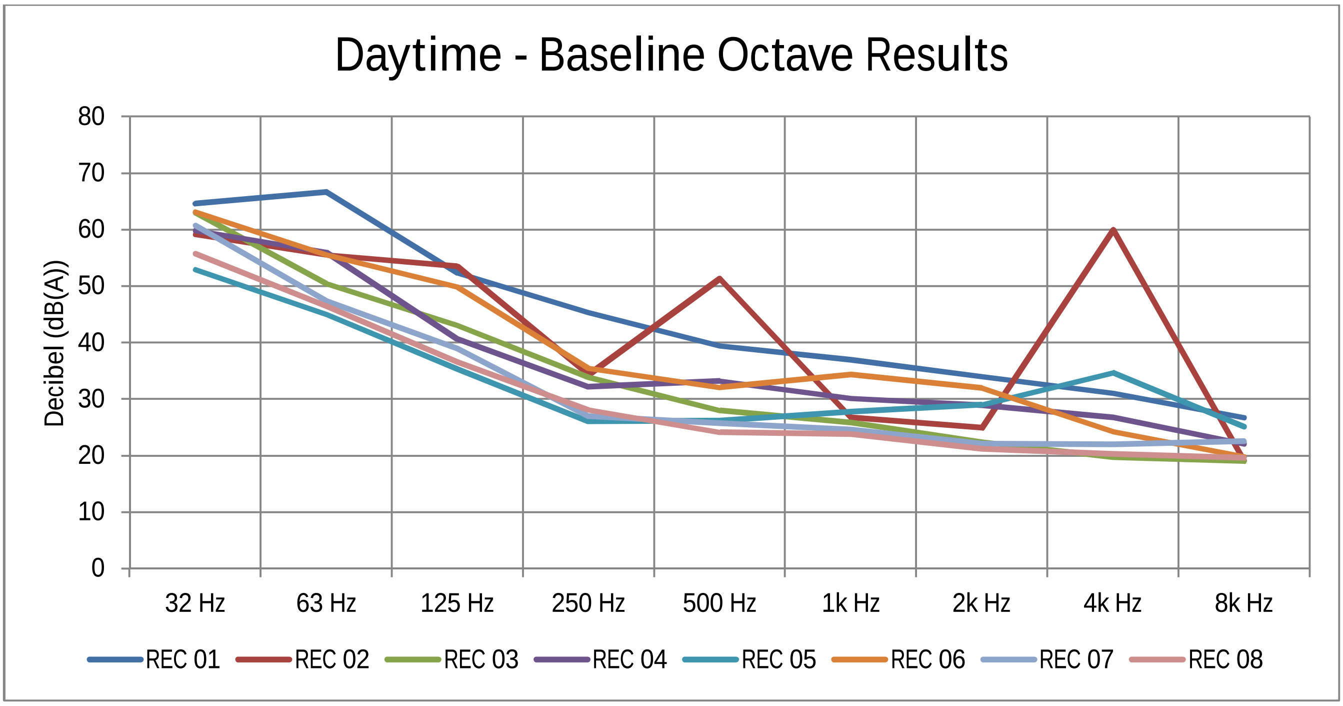

Figure 2: Graph illustrating the Octave band results during the daytime measurements

Table 5: Table with the daytime Octave results

	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
REC 01	64.6	66.7	52.4	45.3	39.4	36.9	34	31	26.7
REC 02	59.2	55.6	53.5	34.3	51.3	26.7	24.9	60	19.1
REC 03	63	50.5	43.1	33.9	28	25.8	22.4	19.7	19
REC 04	59.8	56	40.7	32.2	33.2	30.2	28.9	26.7	22.1
REC 05	52.9	45	35.4	26.1	26.2	27.8	29	34.7	25.2
REC 06	63.1	55.5	49.9	35.5	32.1	34.3	32	24.2	19.8
REC 07	60.8	47.4	39	27	25.7	24.6	22.1	22	22.6
REC 08	55.8	46.5	36.6	28.1	24.1	23.8	21.2	20.3	19.6

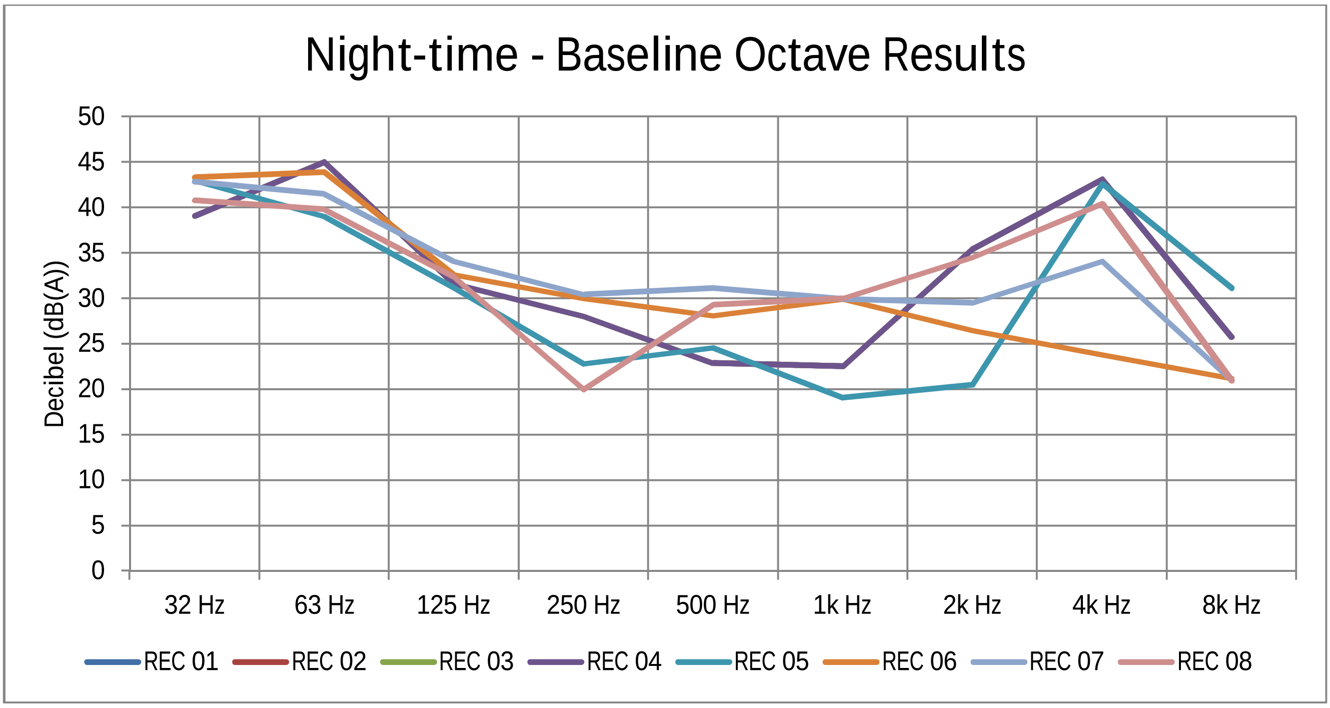

Figure 3: Graph illustrating the Octave band results during the night-time measurements

Table 6: Table with the daytime Octave results

	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
REC 01	39.1	45.0	31.6	28.0	22.9	22.5	35.4	43.1	25.8
REC 02	39.1	45.0	31.6	28.0	22.9	22.5	35.4	43.1	25.8
REC 03	39.1	45.0	31.6	28.0	22.9	22.5	35.4	43.1	25.8
REC 04	39.1	45.0	31.6	28.0	22.9	22.5	35.4	43.1	25.8
REC 05	43.0	39.0	31.2	22.8	24.6	19.1	20.5	42.6	31.1
REC 06	43.3	43.9	32.6	30.0	28.1	29.9	26.5	23.8	21.2
REC 07	42.8	41.5	34.1	30.4	31.1	29.9	29.5	34.1	21.0
REC 08	40.8	39.8	32.4	20.0	29.3	30.0	34.5	40.4	21.0

The following sections, for construction and operational phase, were calculated in accordance with the modelling software used for the study.

4.2 CONSTRUCTION PHASE

The noise sources used for the calculation of the noise level emitted from the proposed construction site are listed in the table below.

Table 7: Construction phase noise sources - Daytime

	Source Name	Units per hour	Noise per one	Total Calculate noise
1	Light vehicles	*6*	*70.9*	**78.7**
2	Heavy vehicles	*9*		**91.3**
	2.1 Bulldozers or equivalent	*3*	*83.9*	

	2.2 Transportation trucks	6	80.1	
3	Construction activity	---	*76*	**76**
			Total noise:	**91.7**

The anticipated total noise calculation is equal to all the vehicles idling in one location at 1800rpm for a whole hour thus the predicted traffic noise is environmental conservative.

It is assumed that the construction activity will only be during the daytime time frame (06:00 to 22:00) and with little to no night-time activities. The figure below illustrates the noise levels at the receptor points during construction, the baseline values are also shown in the figure.

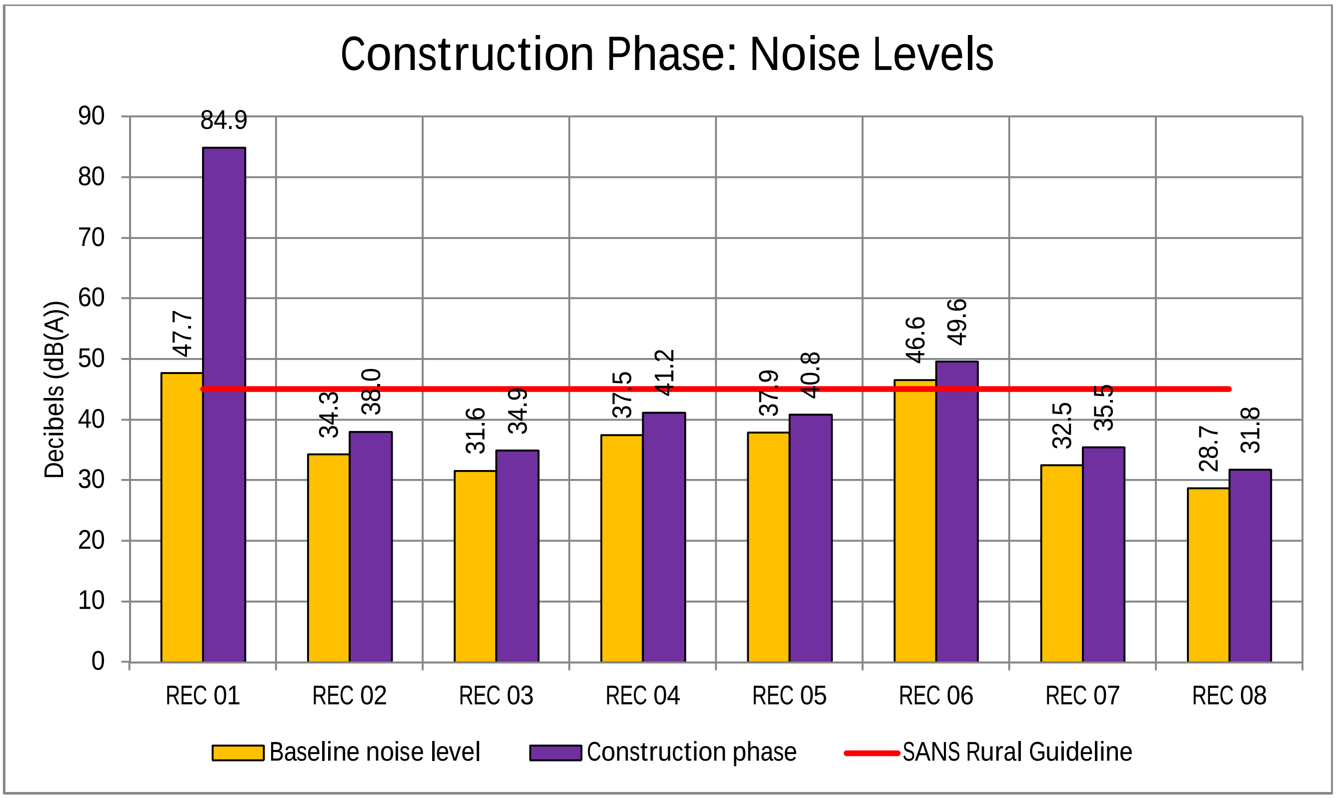

Figure 4: Graph illustrating the difference in noise level from baseline on a construction calculation

Table 8: Future noise levels during the construction phase

	Baseline noise	Noise addition at receptor	Total future noise	Difference in noise level
REC 01	47.7	84.89	84.89	+37.2
REC 02	34.3	26.19	38.03	+3.7
REC 03	31.6	14.68	34.95	+3.3
REC 04	37.5	26.35	41.20	+3.7
REC 05	37.9	21.46	40.85	+3.0
REC 06	46.6	2.47	49.61	+3.0
REC 07	32.5	2.94	35.47	+3.0
REC 08	28.7	0.61	31.76	+3.0

4.3 OPERATIONAL PHASE

All noise sources used for the calculation of the noise level emitted from the proposed site was predicted to be 103.6 dB(A).

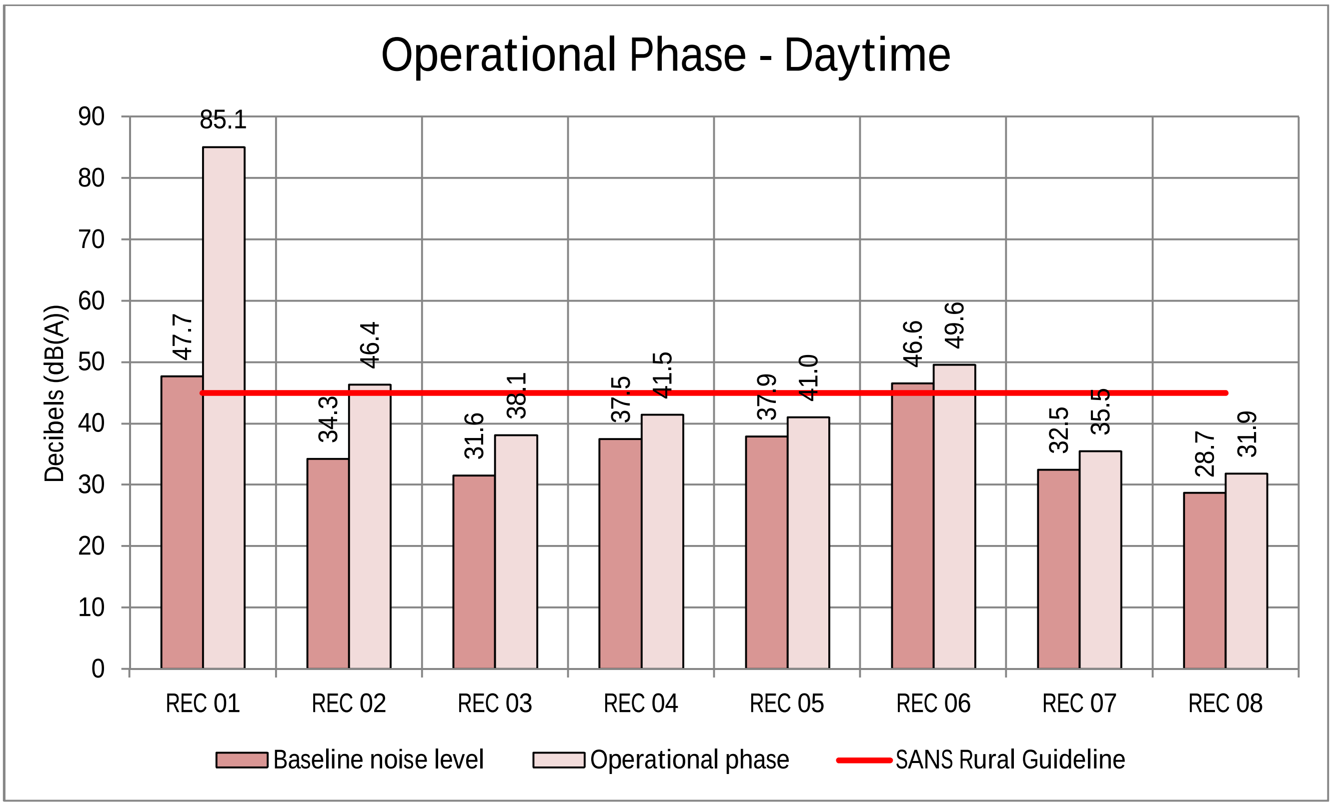

Figure 5: Graph illustrating the difference in noise level from baseline to future operations calculation - Daytime

Table 9: Future noise levels during the Operational phase - Daytime

	Baseline noise	Noise addition at receptor	Total future noise	Difference in noise level
REC 01	47.7	85.1	85.1	+37.4
REC 02	34.3	45.7	46.4	+12.1
REC 03	31.6	35.3	38.1	+6.5
REC 04	37.5	31.4	41.5	+4.0
REC 05	37.9	28.0	41.0	+3.1
REC 06	46.6	16.8	49.6	+3.0
REC 07	32.5	18.0	35.5	+3.0
REC 08	28.7	16.1	31.9	+3.2

4.3.1 Night-time

During the night-time timeframe (22:00 to 06:00) it's assumed that the operational activities will run on minimal operations, thus the main source of noise will be the plant operation. The noise emitted was predicted to be 57.1 dB(A).

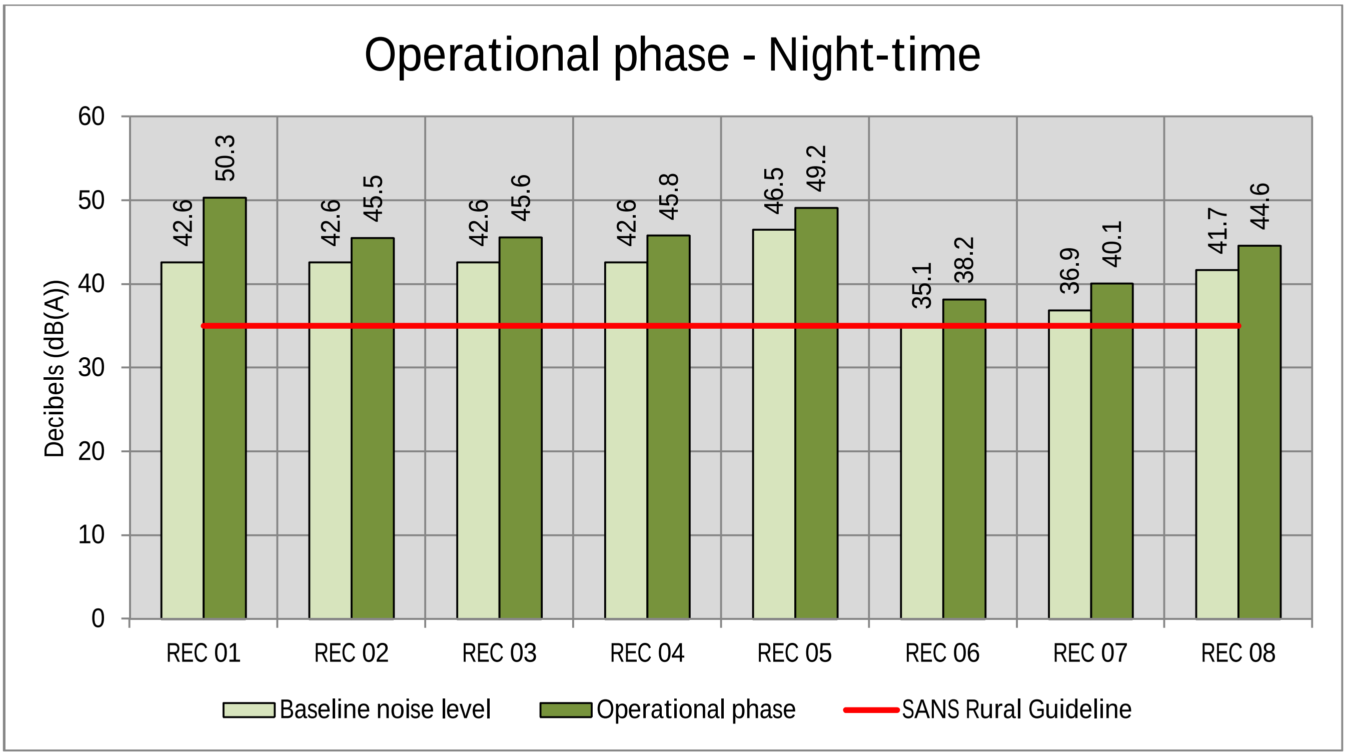

Figure 6: Graph illustrating the difference in noise level from baseline to future operations calculation – Night-time

Table 10: Future noise levels during the Operational phase – Night-time

	Baseline noise	Noise addition at receptor	Total future noise	Difference in noise level
REC 01	42.6	48.6	50.3	+7.7
REC 02	42.6	-6.0	45.5	+2.9
REC 03	42.6	-16.8	45.6	+3.0
REC 04	42.6	-9.8	45.8	+3.2
REC 05	46.5	-14.6	49.2	+2.7
REC 06	35.1	-32.2	38.2	+3.1
REC 07	36.9	-31.4	40.1	+3.2
REC 08	41.7	-33.6	44.6	+2.9

4.4 WORST CASE SCENARIO

The worst case scenario was calculated for a 130 dB(A) noise to be emitted from the site of works, the 130 dB(A) is the human threshold of pain, the likelihood for a noise to be emitted from the site of 130dB(A) is *very unlikely*.

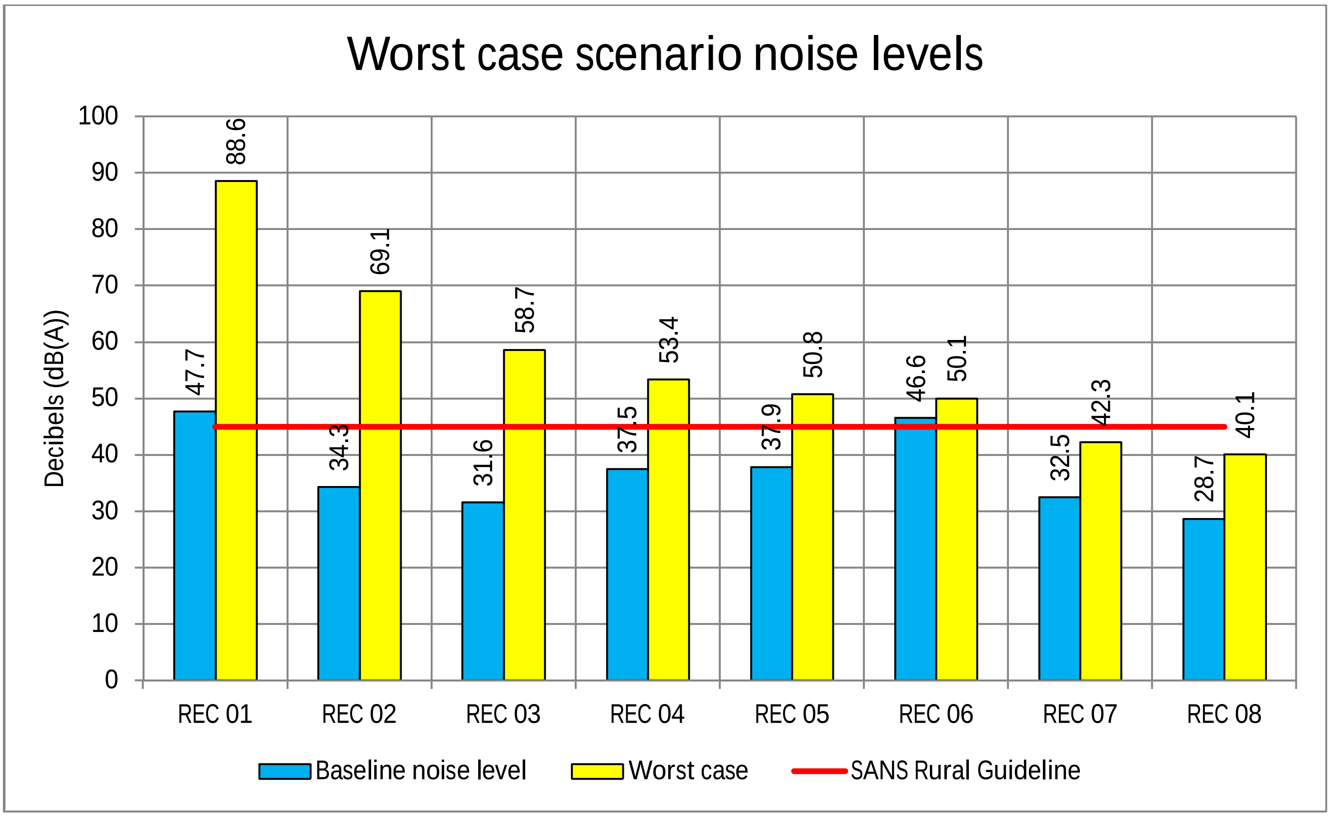

Figure 7: Graph illustrating the noise level at the different receptors as the worst case scenario

Table 11: Future noise levels during worst case scenario

	Baseline noise	Noise addition at receptor	Total future noise	Difference in noise level
REC 01	47.7	88.6	88.6	+41.0
REC 02	34.3	69.1	69.1	+34.8
REC 03	31.6	58.7	58.7	+27.1
REC 04	37.5	53.2	53.4	+16.0
REC 05	37.9	50.3	50.8	+12.9
REC 06	46.6	40.1	50.1	+3.5
REC 07	32.5	41.3	42.3	+9.8
REC 08	28.7	39.4	40.1	+11.4

5 DISCUSSION

5.1 CONSTRUCTION PHASE

The logarithmic average calculated for the construction phase scenario is 79.5 dB(A) but the median noise level for the receptor points is 41.6 dB(A) – below the SANS Rural guideline of 45 dB(A).

The construction phase scenario indicated that the highest increase in noise will be at REC 01, this is due to the proximity to the site.

The onsite noise level on average logarithmically, what the construction will generate, is 78.9 dB(A), and the offsite noise level is 21.6 dB(A). The onsite noise level exceed the SANS Industrial guideline of 70 dB(A) with 8.9 dB(A). The noise added from the construction activity to the community receptor points is at 21.6 dB(A). The total noise added to the community sites, from the construction phase and background noise level, is 44.3 dB(A), below the SANS Rural guideline (45 dB(A)). A brick wall has been constructed along the boundary of the site which will assist in mitigation of noise.

5.2 OPERATIONAL PHASE

The daytime noise level for the community receptor points is 44.4 dB(A) with an increase of ±4 dB(A), the night-time average for the four community receptors is 45.1 dB(A).

5.2.1 Daytime

The daytime activities during the operational phase produced the loudest noise, the noise added to the surrounding environment as a point source was 106.6 dB(A). The average logarithmic noise level over the site is 79.1 dB(A) and the average over the community receptors is 22.9 dB(A). The onsite average noise level is above the SANS Industrial guideline of 70 dB(A). The same receptor (REC 01) was the loudest onsite (85.1 dB(A)), this can be contributed to the increase in traffic and the operational noise activities. The operational phase noise will dissipate over the distance of the site and the effect from the noise generated by the operations will be at a minimal at the surrounding receptors.

5.2.2 Night-time

During the night-time time frame (22:00 to 06:00) the activity onsite was anticipated to be minimal. The noise generated by the site during the night-time (as a point source) is 53 dB(A). The logarithmic average noise level over the site during the night-time activities is 42.6 dB(A) and the average noise level over the community will be <0 dB(A) (-20.4 dB(A)) – calculations done over the eight receptor points monitored.

5.3 WORST CASE SCENARIO

The worst case noise level is based on the human pain threshold of 130 dB(A), the likelihood for noise to be generated at 130 dB(A) for a whole hour is minimal and the noise will likely only last for a second or to. The road traffic noise for the worst case was at 95 dB(A). The combined noise from the two sources indicated that the community will have a significant increase in noise level, increase of around ±10 dB(A).

The graphical representation for each of the scenarios run will be submitted as Appendix A.

6 CONCLUSION

The proposed micro foundry will have a noise impact on the surrounding environment, but with varying magnitude dependent upon the position of the receptor. According to the principles of sound propagation, the impact will be the greatest in the immediate vicinity of the site and diminishes rapidly over distance, with other factors such as terrain and large objects such as buildings that will also influence the impact on background levels.

The results indicated that the current background noise at the proposed site is low during the daytime and night-time. The logarithmic average calculated for the construction phase scenario is 79.5 dB(A) but the median noise level for the receptor points is only 41.6 dB(A) – below the SANS Rural Landuse guideline of 45 dB(A).

The operational phase of the plant will contribute to additional road traffic and therefore increase the noise generated from the road. The daytime noise impact on the surrounding community will be medium increasing the noise level by approximately 4 dB(A) at the community receptors. The night-time timeframe will experience minimal activity on-site with very little discernible impact on the surrounding community.

7 REFERENCES

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