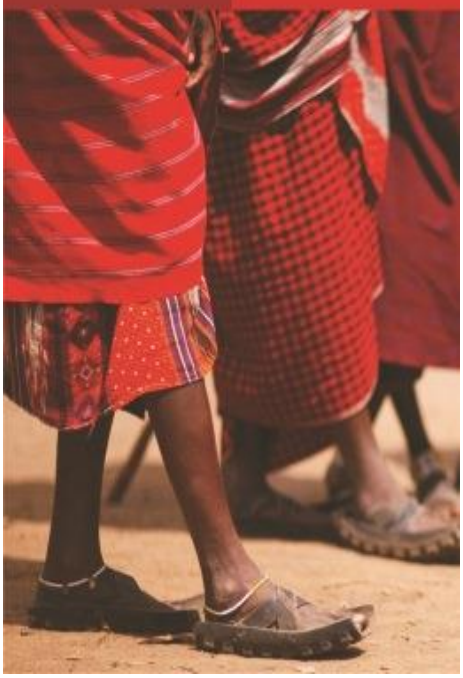

DIGBY WELLS
ENVIRONMENTAL

Environmental Impact Assessment for the Proposed Temo Coal Rail Loop, Road Diversion and Pipeline Project, near Lephalale, Limpopo Province

Noise Impact Assessment

Project Number:

NAM5335

Prepared for: Temo Coal Mining (Pty) Ltd

February 2019

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Noise Impact Assessment**
Project Name:	**Environmental Impact Assessment for the Proposed Temo Coal Rail Loop, Road Diversion and Pipeline Project, near Lephalale, Limpopo Province**
Project Code:	**NAM5335**

Name	Responsibility	Signature	Date
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I, Joel Boloko Maseki as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Temo Coal Mining (Pty) Ltd, other than fair remuneration for work performed, specifically in connection with the Rail Loop and Road Diversion Project in Limpopo Province.

Full Name:	Joel Maseki
Title/ Position:	Assistant Air Quality and Noise Specialist
Qualification(s):	MSc Geography & Environmental Management
Experience (Years):	2
Registration(s):	SACNASP

EXECUTIVE SUMMARY

Digby Wells Environmental (Digby Wells) was appointed by Temo Coal Mining (Pty) Ltd to undertake a noise assessment study as part of the requirements of the Environmental Authorisation process for the construction of the rail loop and road diversion.

This assessment was conducted to establish the noise baseline in the vicinity of the project area. This baseline assessment should be read in conjunction with the "Noise Impact Assessment for Namane Generation Independent Power producer and Transmission Line Project" conducted 2016 for the area. Long term measurements for day time and night time periods (24 Hours) were taken at two portions of farm Verloren Valey and at Lerekhureng Combined School at Steenbokpan close to road (D1675). The measurements were compared against the relevant noise control regulations as well as with the SANS 10103:2008 guidelines for compliance, such as:

- The Environment Conservation Act, 1989 (Act 73 of 1989);
- National Noise Control Regulations (R154 of 1992); and
- South African National Standards (SANS 10103:2008).

Based on the daytime results, the average (L_{Aeq}) ambient sound levels were measured above the SANS 10103:2008 guidelines for rural districts (45dBA) at locations N1 and N3, with of 57dBA and 47dBA respectively. The main sources of intermittent noise impacting on the measurements collected at these locations included sounds from vehicles N1 and at N3 vehicles passing by D175 road, birds songs and high pitch sound produced by the *gryllidae* (crickets). However, the background noise levels (L_{A90}) recorded was 34dBA and 26dBA and below the guidelines limit for daytime limit for rural district.

Night time results as recorded at the three sampling points indicated that two locations showed average noise values (L_{Aeq}) above the relevant SANS night-time rating limit guidelines for rural district. At N1, the L_{Aeq} was 40dBA which measured above the relevant SANS night-time rating limit guidelines (35dBA), with the main source of intermittent noise as a result of vehicles, travelling on the D175 road to the isolated homesteads in the area. At N3, the L_{Aeq} was 45dBA which is above the relevant SANS night-time rating limit guidelines (35dBA), with the main sources of intermittent noise arising vehicles passing by D175 road, birds songs and high pitch sound produced by the *gryllidae* (crickets). However, L_{A90} as recorded for both locations (N1 and N3) was below the relevant SANS nigh time rating limit guidelines (35dBA) with background noise levels at 34dBA and 26sBA respectively.

Based on the medium-term nature of the Project and considering the fact that it will be conducted in phases, it is not anticipated that construction phase activities will have significant impacts on background noise levels.

In conclusion, the background noise level measured during this investigation is within the SANS 10103:2008 guidelines for rural district for both day-time and night-time. With the construction anticipated to be medium-term in nature and conducted in phases, these were

factored into the ratings to discern the potential impacts associated with construction. Monitoring on a quarterly basis has been recommended once construction commences to assess project performance (i.e. monitoring, audits and non-compliance tracking) to inform management decision making to ensure compliance.

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LIST OF ACOUSTIC TERMS & ACRONYMS

Abbreviation	Description
Acronyms and Abbreviations	
L_{eq}	It is the Sound Pressure Level in dB, equivalent to the total Sound Energy over a given period of time.
A-weighting	the A-weighting filter covers the full audio range - 20 Hz to 20 kHz and the shape is similar to the response of the human ear at the lower levels
L_{Aeq}	A-weighted, equivalent sound level. A widely used noise parameter describing a sound level with the same Energy content as the varying acoustic signal measured
L_{A90}	It is the noise level exceeded for 90% of the measurement period. This noise level is extensively used as indicator for the background noise as it excludes impulsive and erratic noise sources.
Ambient Noise	Is the noise from all sources combined − mining noise, traffic noise, birdsong, running water, etc.
Residual Noise	It is ambient noise without specific noise. The residual noise is the noise remaining at a point under certain conditions when the noise from the specific source is suppressed.
Intermittent Noise	When machinery operates in cycles, or when single vehicles or aeroplanes pass by, the noise level increases and decreases rapidly. A single passing vehicle or aircraft is called an event.
Impulsive Noise	The noise from impacts or explosions, e.g., from blasting, is called impulsive noise. It is brief and abrupt, and its startling effect causes greater annoyance than would be expected from a simple measurement of sound pressure level.
Specific Noise	It is the noise from the source under investigation. The specific noise is a component of the ambient noise and can be identified and associated with the specific source.
Noise Level	Means the reading on an integrating impulse sound level meter taken at a measuring point in the presence of any alleged disturbing noise at the end of a total period of at least 10 minutes, after such meter had been put into operation, and, if the alleged disturbing noise has a discernible pitch, to which 5 dab has been added.
Disturbing Noise	Means 'n noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

1 Introduction

Temo Coal Mining (Pty) Ltd (hereinafter Temo Coal), proposes to construct ancillary infrastructure associated with their approved coal mining operation, the Temo Coal Mine ("Temo Mine"), near Lephalale in the Limpopo Province ("the Project"). The proposed ancillary infrastructure includes a road diversion, rail loop and water pipeline.

Digby Wells Environmental (Digby Wells) was commissioned by Temo Coal to perform an Noise Impact Assessment for inclusion in an Environmental Impact Assessment (EIA) for Environmental Authorisation for Listed Activities as detailed in the EIA Regulations, under the National Environmental Management Act No. 7 of 1998 (NEMA).

This noise assessment, establishes the baseline soundscape in the vicinity of the project area. This baseline assessment should be read in conjunction with the "Noise Impact Assessment for Namane Generattion Independent Power producer and Transmission Line Project" conducted 2016 for the area.

1.1 Project Background

Temo currently has an approved mining right (MR) which was authorised by the Department of Mineral Resources on 27 September 2013 (Reference Number: LP 30/5/1/2/2/199 MR). That Project was also authorised in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the Environmental Impact Assessment (EIA) Regulations thereunder, dated 18 June 2010 (which have since been repealed). The Environmental Authorisation was granted by the Limpopo Department of Economic Development, Environment and Tourism (LEDET) on 13 July 2015 (Reference Number: 12/1/9/2-W55).

Temo Mine is located approximately 60km from Lephalale in the Limpopo Province (Plan 2). This project considers applying for Environmental Authorisation, in terms of NEMA, and a Water Use Licence (WUL) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) to construct a rail loop, road diversion and pipeline.

The farm portions on which the Temo Mine is situated comprise Verloren Valey 246 LQ, Duikerpan 249 LQ, Japie 714 LQ, Hans 713 LQ and Kleinberg 252 LQ. Temo proposes to mine coal using open pit methods and the open pit will be situated entirely within the Farm Verloren Valey 246 LQ. Temo proposes to divert the dirt road (D175) around the approved mining right area for mining to continue as well as construct a rail loop for transportation of coal. The abovementioned proposed developments requires an EIA Report and Environmental Management Programme, in terms of the new EIA Regulations, published in GN R982 dated 04 December 2014 (as amended December 2017).

This Noise Impact Assessment, considered;

- **Diversion of road D175:** The approved open pit area has a road, the D175, which transects the south-western corner of the future pit area and continues to exit the Mining Right boundary near the north-western corner. To facilitate continued mining

and maximise the minable area at the Temo Mine, Temo proposes that the D175 be diverted around the mining area.

- **Proposed Rail Loop:** The purpose of the rail loop is to allow Temo to transport export-grade coal product to the Richards Bay Coal Terminal (RBCT) as well as for domestic use. The rail loop will include a loading loop which will be within the approved Mining Right boundary of the Temo Mine.
- **Proposed Bulk Water Pipeline:** Construction of a bulk water pipeline (for which three different pipeline routes are proposed) connecting the Temo mine to the Lephalale Waste Water Treatment Works (WWTW) to provide water to the mine.

1.2 Terms of Reference

This report relates specifically to the baseline noise soundscape scenario. The approach used in investigating the ambient noise levels is based on the following legislations:

- The National Environmental Management Act (Act 107 of 1998), NEMA;
- The Environment Conservation Act, 1989 (Act 73 of 1989);
- National Noise Control Regulations (R154 of 1992); and
- South African National Standards (SANS 10103:2008).

The Noise Impact Assessment study is comprised of a baseline assessment, excluding noise dispersion modelling, reason being that the “Rail Loop and Road Diversion” will take place in phases and will be short-term.

2 Details of the Specialist

Joel Maseki has an MSc (Geography & Environmental Management), working as a specialist with the Atmospheric Sciences & Noise Department at Digby Wells Environmental. He has authored several academic articles (i.e. journals and conference publications), with experience in conducting air quality and noise surveys across different industries. Joel has also gained experience working in Malawi, Mali, and South Africa.

3 Aim and Objectives

The aim of this study is to assess what the current noise levels are in the Project area and the surrounding receptors. To achieve this aim, baseline noise measurements were carried out at selected locations in the area.

4 Methodology

4.1 Literature Review

The National Noise Control Regulations (NNCR), published under Government Gazette 13717 and Government Notice (GN) R154 of 1992 in terms of Section 25 of the

Environmental Conservation Act, 1989 (Act 73 of 1989), as well as guidelines provided by SANS 10103:2008 were applied.

According to the NNCR "disturbing noise" means a noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

According to the SANS 10103:2008 "disturbing noise" means a noise level that causes the ambient noise level to rise above the designated zone level, or if no zone level has been designated, the typical rating levels for ambient noise in districts, indicated in Table 4-1, which is derived from SANS 10103:2008.

Table 4-1: Typical Rating Levels for Noise in Districts (SANS 10103, 2008)

Type of District	Equivalent continuous rating level ($L_{Reg.T}$) for noise (dBA)					
	Outdoors			Indoors, with open windows		
	Day-night	Day-time	Night-time	Day-night	Day-time	Night-time
	$L_{R,dn}$[a]	$L_{Req,d}$[b]	$L_{Req,n}$[b]	$L_{R,dn}$[a]	$L_{Req,d}$[b]	$L_{Req,n}$[b]
Residential Districts						
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
Non-Residential Districts						
d) Urban districts with some workshops, with business premises, and with 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
NOTE 1 If the measurement or calculation time interval is considerably shorter than the reference time intervals, significant deviations from the values given in the table might result.						

Type of District	Equivalent continuous rating level ($L_{Reg.T}$) for noise (dBA)					
	Outdoors			Indoors, with open windows		
	Day-night	Day-time	Night-time	Day-night	Day-time	Night-time
	$L_{R,dn}$[a]	$L_{Req,d}$[b]	$L_{Req,n}$[b]	$L_{R,dn}$[a]	$L_{Req,d}$[b]	$L_{Req,n}$[b]
NOTE 2 If the spectrum of the sound contains significant low frequency components, or when an unbalanced spectrum towards the low frequencies is suspected, special precautions should be taken and specialist advice should be obtained. In this case the indoor sound levels might significantly differ from the values given in columns 5 to 7						
NOTE 3 In districts where outdoor LR,dn exceeds 55 dBA, residential buildings (e.g. dormitories, hotel accommodation and residences) should preferably be treated acoustically to obtain indoor LReq,T values in line with those given in table 1.						
NOTE 4 For industrial districts, the LR,dn concept does not necessarily hold. For industries legitimately operating in an industrial district during the entire 24 h day/night cycle, LReq,d = LReq,n =70 dBA can be considered as typical and normal.						
NOTE 5 The values given in columns 2 and 5 in this table are equivalent continuous rating levels and include corrections for tonal character, impulsiveness of the noise and the time of day.						
NOTE 6 The noise from individual noise sources produced, or caused to be produced, by humans within natural quiet spaces such as national parks, wilderness areas and bird sanctuaries, should not exceed a maximum Weighted sound pressure level of 50 dBA at a distance of 15 m from each individual source.						
a) The values given in columns 2 and 5 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness of the noise and the time of day.						
b) The values given in columns 3, 4, 6 and 7 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness.						

The probable community/group response to levels in excess of the acceptable rating levels are presented in Table 4-2, where L_{Req},T is the equivalent continuous A-weighted sound pressure level, in decibels (dBA), determined over a specific time period. 'A-weighted' is a standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.

Table 4-2: Categories of Community/Group Response (SANS 10103, 2008)

Excess ($\Delta L_{Req,T}$)[a]dBA	Estimated community/group response	
	Category	Description

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 action
>15	Very strong	Vigorous action
NOTE Overlapping ranges for the excess values are given because a spread in the community reaction might be anticipated.		
a ΔLReq,T should be calculated from the appropriate of the following:		
1) ΔLReq,T = LReq,T of ambient noise under investigation MINUS LReq,T of the residual noise (determined in the absence of the specific noise under investigation);		
2) ΔLReq,T = LReq,T of ambient noise under investigation MINUS the maximum rating level for the ambient noise given in table 1;		
3) ΔLReq,T = LReq,T of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from table 2; or		
4) ΔLReq,T = Expected increase in LReq,T of ambient noise in an area because of a proposed development under investigation.		

4.2 Field work

Baseline noise measurements were taken at three locations in the area of the proposed project. The measurements were taken to determine the existing ambient noise levels in the area. The measurement locations were given the following ID's:

- N1, N2, and N3.

Cirrus, Optimus Green, precision integrating sound level meter was used for the measurements. The instrument was field calibrated with a drift of no more than 1dBA. Valid laboratory calibration certificates are available upon request. The measurements were taken on the selected measuring point properties, with the instrument being set at a height of between 1.2 and 1.4 meters above the ground and 3.5 meters away from any reflective surfaces. The measurement locations are presented in Figure 4-4, based on historical noise monitoring data (TN1-TN7) and the recent (N1-N3). The calibration certificates of the aforementioned equipment could be presented upon request.

The baseline conditions are defined using the L_{Aeq}. The L_{Aeq} level represents the 'average' noise level for the measurement period including impulsive and intermittent noise sources

such as traffic and animal noise. The L_{Aeq} as well as L_{A90} noise level for the measurement period is recorded and used to analyse the data. The L_{Aeq} noise level data describes the average noise level for the measurement period taking into account all noise sources that were audible at the specific measurement location. The L_{A90} noise level describes the noise level exceeded for 90% of the measurement period and is internationally accepted as indicator for the background noise. The L_{A90} noise level excludes impulsive, intermittent and erratic noise and thus is an accurate indicator of the impact of intermittent and erratic noise such as vehicle activity.

All measurements were taken in accordance with the SANS 10103:2008 guidelines. The measurements were taken for a 24-hr period at each location, taking into account the daytime as well as night time noise characteristics. According to the guidelines, daytime is between 06:00 and 22:00; and night time being between 22:00 and 06:00. In addition, photographs of the sampling locations are provided in Figure 4-1, Figure 4-2 and Figure 4-3, while the locations of the monitoring points in relation to the Project infrastructure are depicted in Figure 4-4. These sites were selected as there were the closest receptors and N1 being a School was given priority due to its sensitivity (location were learners can be impacted).

The L_{Aeq} as well as L_{A90} noise level for the measurement period is recorded and used to understand the noise impact at any given location. The L_{Aeq} data describes the average noise level for the measurement period taking into account all noise sources that were audible at the specific measurement location. The L_{A90} describes the noise level exceeded for 90% of the measurement period and is internationally accepted as indicator for the “background noise”. The L_{A90} noise level excludes impulsive, intermittent and erratic noise and thus is an accurate indicator of the impact of intermittent and erratic noise such as vehicle activity.

Table 4-3: Measurement locations

ID	Location	Coordinates		Category of receptor	Weather conditions
N1	Lerekhureng Combined School (Steenbokpan)	23°42'59.7"S	027°16'45.5"E	Rural	Clear Sky, wind speed <5m/s, Humidity: 47%
N2	Verloren Valey (Portion 246)	23°35'25.7"S	027°14'21.0"E	Rural	Clear Sky, wind speed <5m/s,
N3	Verloren Valey (Portion 246)	23°34'47.6"S	027°13'13.7"E	Rural	Clear Sky, wind speed <5m/s, Humidity: 31%

Figure 4-1: N1

Figure 4-2: N2

Figure 4-3: N3

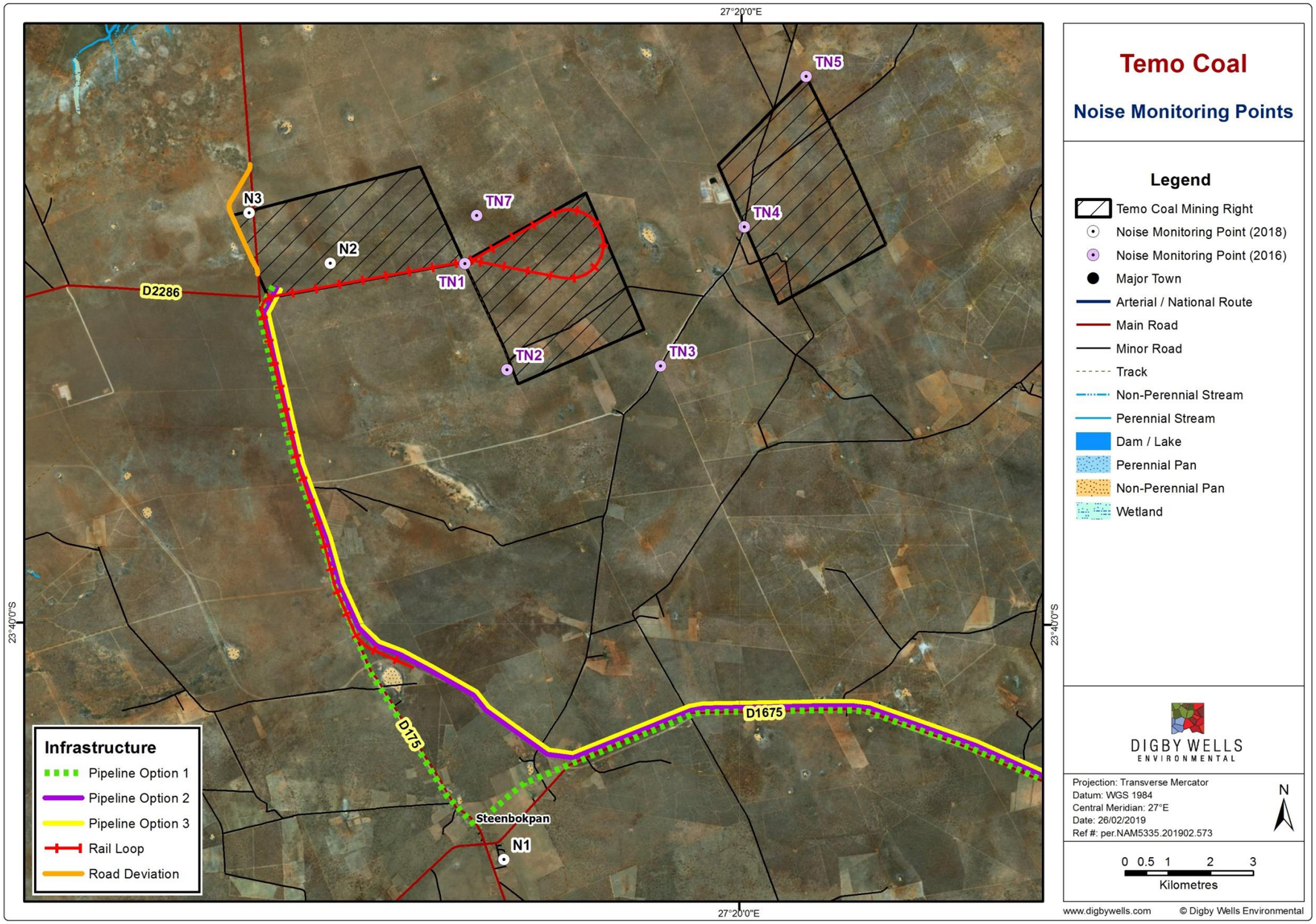

Figure 4-4: Noise Monitoring Locations

5 Assumptions and Exclusions

The following assumptions and exclusions are included as part of this assessment:

- No dispersion modelling was conducted for the construction of the rail loop and road diversion as the construction will be conducted in phases and short-term; and
- Impacts are not anticipated to exceed background soundscape. It was assumed that the construction of the rail loop and road diversion will have a negligible significance on the overall cumulative impact of the project.

6 Baseline Environment

6.1 Day-time Noise Baseline Results

Measurements were conducted at Lerekhureng Combined School at Steenbokpan (N1) and two farm two portions at Verloren Valey farm N2 and N3 respectively.

The noise meter recordings for the sampled points as well as the rating limits according to the SANS 10103:2008 guidelines are presented in Table 6-1. The noise level time series graphs are indicated in Figure 6-1 to Figure 6-3 for the three sampling points.

Based on the daytime results, the existing average sound levels are above the SANS 10103:2008 guidelines for rural districts (45dBA) for N1 and N3, with average noise levels ($L_A$eq) of 57dBA and 47dBA respectively. At location N1, the main sources of intermittent noise impacting on the measurements as expressed in peaks in the time history graph included private vehicles dropping learners off at School and teachers, coupled with noise from learners. Though the L_{Aeq} was above the relevant SANS daytime rating, the L_{A90} (background) level of 34 dBA was below the daytime limit for rural district.

At N3, L_{Aeq} of 47dBA was recorded and the main sources of intermittent noise impacting on the measurements included vehicles passing on the D175 road and birds songs. Though the L_{Aeq} was slightly above the relevant SANS daytime rating limit guidelines (45dBA), the L_{A90} (26dBA) was below the guidelines for daytime limit for rural district.

In the 2016 report, there were no exceedances of the “Acceptable Rating Levels” for day time of 45dBA. The maximum average noise levels ($L_A$eq) recorded in the area was 41dBA.

6.2 Night-time Baseline Noise Results

Night-time results as recorded at the three sampling points indicated that two locations recorded average noise levels above the relevant SANS night-time rating guideline for rural district (Table 6-1).

At N1, the L_{Aeq} was 40dBA measured above the relevant SANS night-time rating limit guidelines (35dBA), the main sources of intermittent noise included sound from vehicles travelling via the D175 road and vehicular traffic to and from a number of isolated settlements in the area.

At N3, the L_{Aeq} was 45 dBA measured above the relevant SANS night-time rating limit guidelines (35dBA), with the main sources of intermittent noise coming from vehicles travelling on the D175 road, birds songs and high pitch sound produced by the *gryllidae* (crickets).

The background (L_{A90}) sound level measured at this location of 26dBA was below the relevant SANS night-time rating limit guidelines (35dBA).

Table 6-2 show the background levels measured in the Project area and reported in the 2016 noise report for comparison.

However, there were several exceeances of the night-time “Acceptable Rating Levels” of 35dBA due to the high pitch sound produced by the *gryllidae* (crickets) at night. The maximum average noise levels ($L_A$eq) recorded in the area was 39dBA.

Table 6-1: Noise Measurements results

Sample ID	SANS 10103:2008 Guidelines							
	Type of district	**Period**	**Distance from Rail loop/road (m)**	**Acceptable rating level dBA**	**L_{Aeq} dBA**	**L_{A90}**	**Maximum/Minimum dBA**	**Date**
N1	Rural	Daytime	300m from D175 road	45	57	34	93/27	30/01/2019
		Night time		35	40			30/01/2019
N2	Rural	Daytime	543 m from the proposed rail loop	45	43	24	77/19	31/01/2019
		Night time		35	34			31/01/2019
N3	Rural	Daytime	90 from D175 road	45	47	26	69/20	01/02/2019
		Night time		35	45			01/02/2019
	Indicates current L_{Aeq} levels above either the daytime rating limit or the night time rating limit							

Table 6-2: Summary of Noise Measurements Results in the 2016 Report

Sample ID		**Acceptable rating level (dBA)**	TN1	TN2	TN3	TN4	TN5	TN6	TN7
Type of district		**Rural**							
Period	Day	**45**	39	33	34	32	35	37	41
	Night	**35**	**38**	39	38	32	34	39	37

Indicates $L_{Aeq,}$ levels above either the daytime rating limit or the night time rating limit.

For the average noise levels, the exceedance observed at night were due to the high pitch sound produced by the *gryllidae* (crickets)

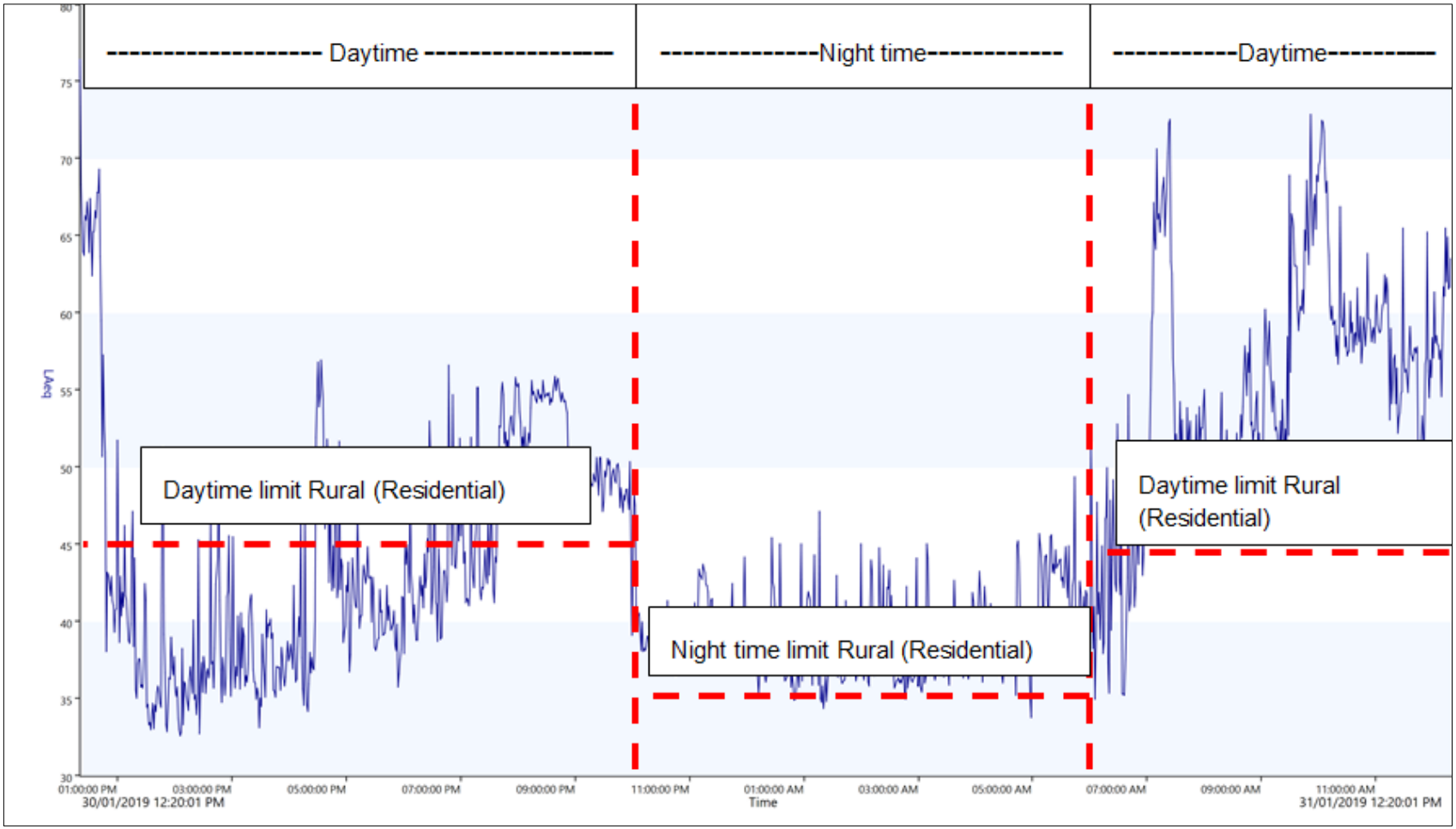

Figure 6-1: Noise time history graph for N1

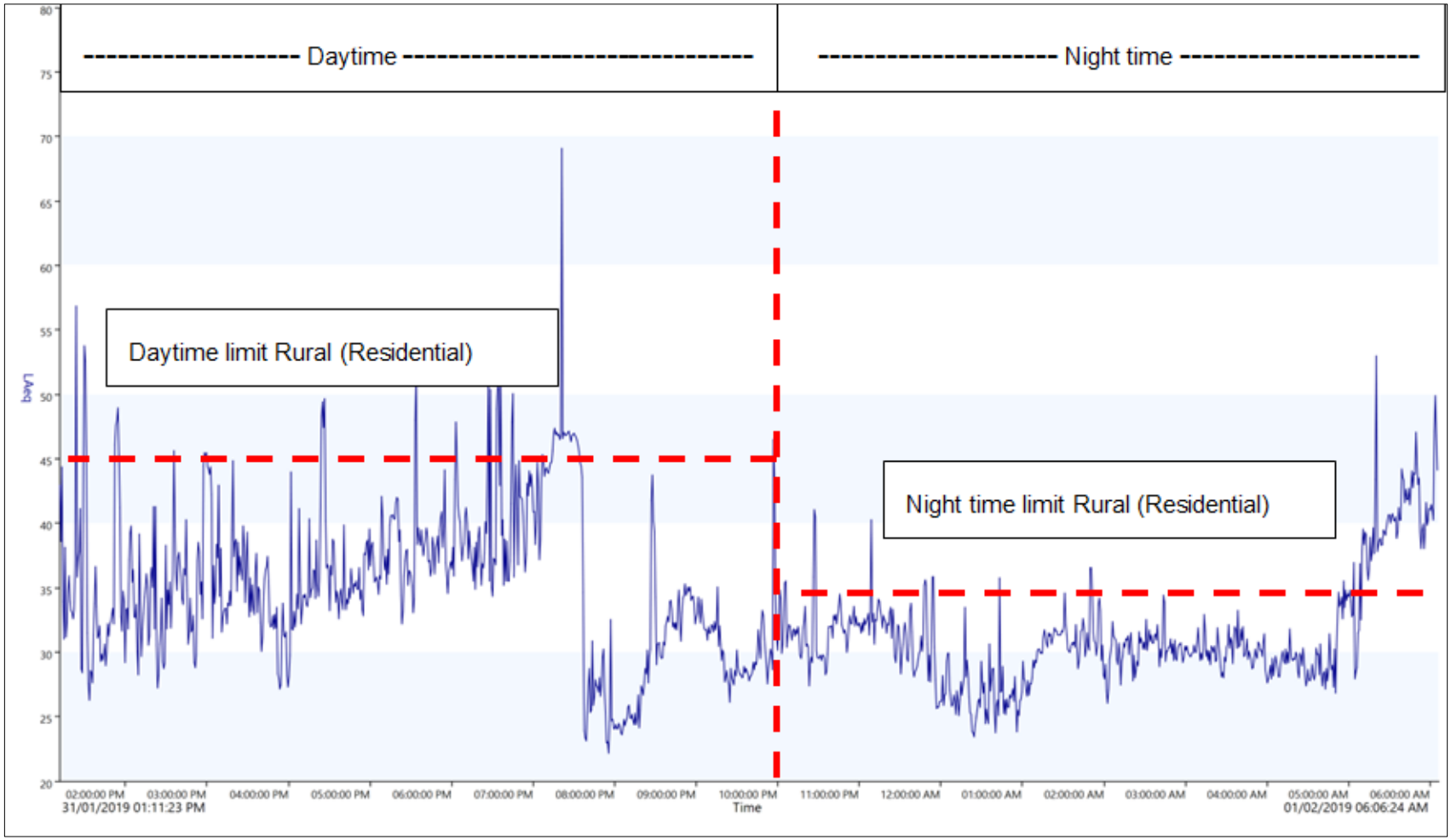

Figure 6-2: Noise time history graph for N2

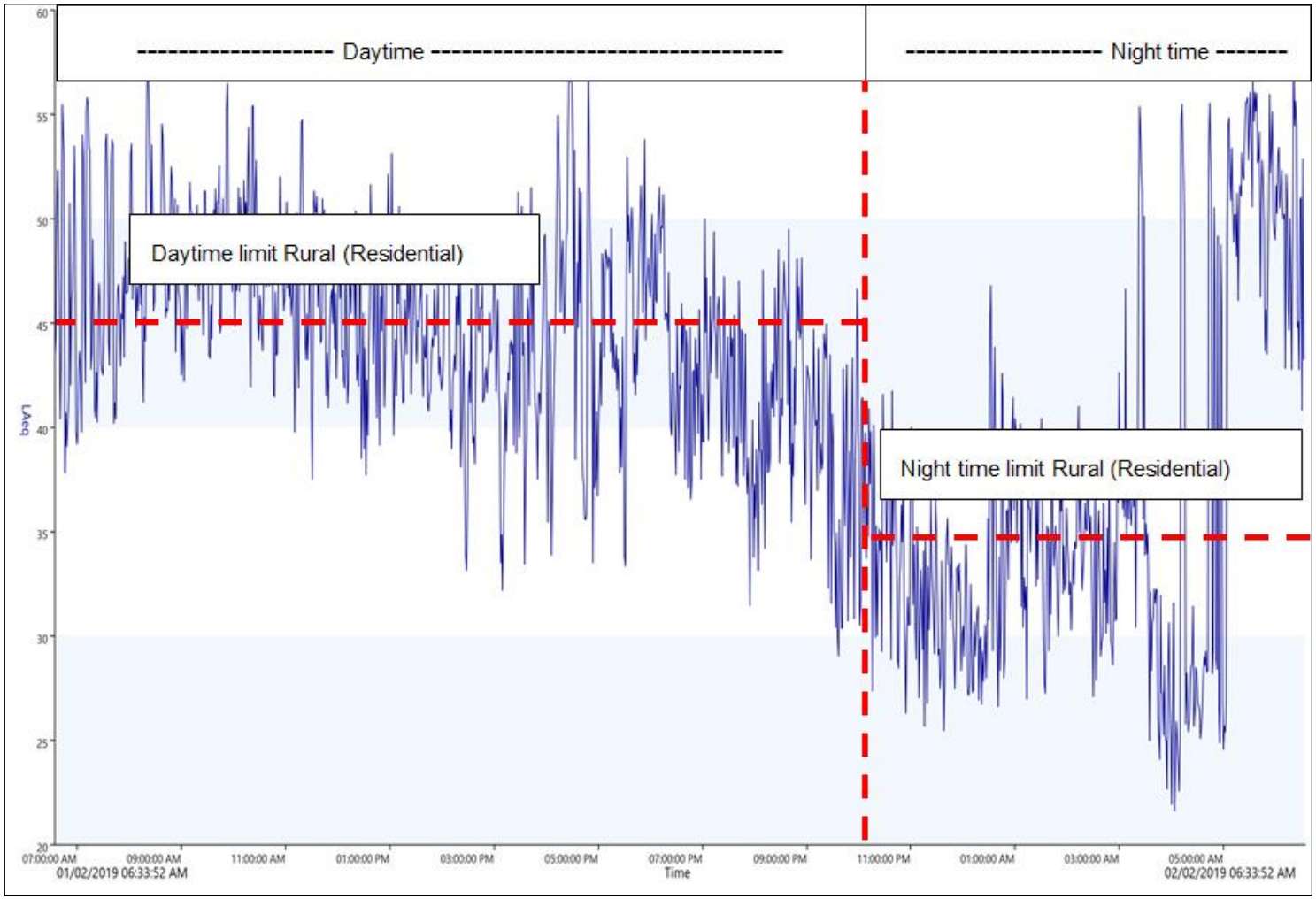

Figure 6-3: Noise time history graph for N3

The noise sources that were audible during the baseline measurements at the time of the noise survey and that were responsible for the day/night time measurements are summarised in Table 6-3.

Table 6-3: Summary: Noise Sources Audible during Baseline Measurements at Monitoring Locations

Noise Source Description				
ID	**Day**	**Duration**	**Night**	**Duration**
N1	Vehicles and human voices	Continuous	Birdsong, *Gryllidae*	Continuous
N2	Vehicles	Continuous	Birdsong, *Gryllidae*	Continuous
N3	Vehicles	Continuous	Birdsong, *Gryllidae*	Continuous

7 Noise Impact Assessment and Evaluation

Details of the impact assessment methodology used to determine the significance of the noise impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = CONSEQUENCE X PROBABILITY X NATURE

Where

Consequence = intensity + extent + duration

And

Probability = likelihood of an impact occurring

And

Nature = positive (+1) or negative (-1) impact

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 7-1. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation has been applied; post-mitigation is referred to as the residual impact. The significance of an impact is determined and categorised into one of seven categories (The descriptions of the significance ratings are presented in Table 7-3).

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

Table 7-1: Impact Assessment Parameter Ratings

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Irreplaceable loss or damage to biological or physical resources or **highly** sensitive environments. Irreplaceable damage to **highly sensitive** cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or **moderate to highly** sensitive environments. Irreplaceable damage to cultural/social resources of **moderate to highly** sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
5	Serious loss and/or damage to physical or biological resources or **highly** sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or **moderately** sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
3	Moderate loss and/or damage to biological or physical resources of **low to moderately** sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	**Minor loss and/or effects** to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
1	**Minimal to no loss** and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 7-2: Probability Consequence Matrix

Significance																																				
-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Consequence																																				

Table 7-3: Significance rating description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

7.1 Potential Noise Impacts for the Construction of the Rail Road and Road Diversion Project

This section presents the potential impacts that may result from the construction of the rail road and road diversion, based on the assumption that construction of the 22.5km length will occur in phases and will be short-term.

7.1.1 Construction Phase

7.1.1.1 Project Activity Assessed

The Construction Phase involves the following main noise producing activities that may cause a disturbance at the surrounding receptors:

- Site clearing (removal of vegetation);
- Topsoil removal and stockpiling; and
- Construction of rail loop and road diversion;

7.1.1.1.1 Impact Description

It was alluded to in the beginning of this report, that it should be read in conjunction with the "Noise Impact Assessment for Namane Generation Independent Power producer and Transmission Line Project" conducted 2016. In the previous report, the noise dispersion model confirmed that construction activities will result in noise disturbance reaching 46dBA. However, activities associated with the construction of the rail loop and road diversion will not be as intensive as the aforementioned study, hence, not likely to have significant impact on the background noise levels.

7.1.1.1.2 Management Objectives

To minimise/prevent the noise impact from causing a noise disturbance at the surrounding receptors as a result of the construction activities and subsequently comply with the national noise control regulations.

7.1.1.1.3 Management Actions and Targets

The following are the recommended management actions and targets to be implemented during construction phase:

- Construction related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers;
- Installing broadband reverse hooters to vehicles to minimise the hooter noise propagation; and
- Switching off equipment when not in use and leave as much natural vegetation where possible to aid in attenuating the noise.

7.1.1.1.4 Construction Phase Impact Ratings

Table 7-4 below summarises the rating of the impact significance for the construction phase.

Table 7-4: Pre-Mitigation and Post-Mitigation Significance Ratings for Impacts on Noise during the Construction Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction: Site clearance and vegetation removal; topsoil and softs removal and stockpiling; development and use of rail road and road diversion and use of heavy machinery.			
Impact Description: Noise will emanate from the machinery, pneumatic tools and vehicles operating during the construction activities.			
Prior to mitigation/ management			
Duration	Medium term (3)	Medium term (1-5 years)	Negligible (negative) – 21
Extent	Limited (2)	Limited to site and immediate surrounding	
Intensity x type of impact	Minor - negative (-2)	Minor impact during the construction	
Probability	Unlikely (3)	It is unlikely that noise impact will occur	
Nature	Negative		
Mitigation/ Management action			
▪ Construction related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Installing broadband reverse hooters to vehicles to minimise the hooter noise propagation; ▪ Switching off equipment when not in use; and ▪ Leave as much natural vegetation where possible to aid in attenuating the noise.			
Post- mitigation			
Duration	Medium term (3)	Medium term (1-5 years)	Negligible (negative) – 15
Extent	Very limited (1)	Noise will be very limited to site and immediate surrounding	
Intensity x type of impact	Minimal - negative (-1)	Minimal noise impact anticipated during construction	
Probability	Unlikely (3)	It is unlikely that noise impact will occur	
Nature	Negative		

7.1.2 Operational Phase

7.1.2.1 Project Activity Assessed

The Operational Phase involves the following activities that may cause a disturbance at the surrounding receptors:

- Loud blast from train air horns during the operational phase;
- Wheel squeal from trains traveling on track due to the friction between the steel wheel and the top of the steel rail; and
- Vehicular activity on access roads and D175 main road;

7.1.2.1.1 Impact Description

In the previous report, the noise dispersion model confirmed that operational phase will will not measure more than 6dBA above the existing baseline levels as defined by the national noise control regulations. Impacts will be minimal.

7.1.2.1.2 Management Objectives

To minimise/prevent noise from the operational phase activities from causing a noise disturbance at the surrounding receptors and that propagated noise comply with the national noise control regulations.

7.1.2.1.3 Management Actions and Targets

The following are the recommended management actions and targets to be implemented during the operational phase:

- Sound proofing;
- Railroad noise barriers;
- Installing broadband reverse hooters to vehicles to minimise the hooter noise propagation; and
- Switching off equipment when not in use.

7.1.2.1.4 Operational Phase Impact Ratings

Table 7-5 below summarises the rating of the impact significance for the operational phase.

Table 7-5: Pre-Mitigation and Post-Mitigation Significance Ratings for Impacts on Noise during the Operational Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction: Sound from the air horn and wheel squeal on rail, sound from off-road vehicles			

Impact Description: Noise will emanate from the train air horn and wheel squeal and vehicles operating during the operational activities.			
Prior to mitigation/ management			
Duration	Medium-term (3)	Medium term (1-5 years)	Negligible (negative) – 24
Extent	Local (3)	Noise will extend only as far as the development site area.	
Intensity x type of impact	Minor - negative (-2)	Minor impact anticipated	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors	
Nature	Negative		
Mitigation/ Management action			
▪ Sound proofing; ▪ Railroad noise barrier; and ▪ Train and vehicles to be serviced to their designed requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers.			
Post- mitigation			
Duration	Medium-term (3)	Medium term (1-5 years)	Negligible (negative) – 21
Extent	Limited (2)	Limited to the development site area.	
Intensity x type of impact	Minor - negative (-2)	Minor impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors	
Nature	Negative		

7.1.3 Decommissioning Phase

7.1.3.1 Project Activity Assessed

The Decommissioning Phase involves the following activities that may cause a disturbance at the surrounding receptors:

- Demolition of rail and road infrastructure not in use; and
- Rehabilitation of the affected area.

7.1.3.1.1 Impact Description

The impact during the Decommissioning Phase is expected to be lower than both that of the construction and operational phases due to the limited activities; therefore it is probable that

the noise from the decommissioning phase will also not impact on the surrounding communities.

7.1.3.1.2 Management Objectives

To minimise/prevent the noise impacts from the decommissioning activities to the surrounding receptors to ensure compliance with the national noise control regulations.

7.1.3.1.3 Management Actions and Targets

Machinery and vehicles should be switched off when not in use.

7.1.3.1.4 Decommissioning Phase Impact Ratings

Table 7-6 below summarises the rating of the impact significance for the decommissioning phase.

Table 7-6: Pre-Mitigation and Post-Mitigation Significance Ratings for Impacts on Noise during the Decommissioning Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction: Demolition of infrastructure and rehabilitation of the area.			
Impact Description: Noise will emanate from the machinery, pneumatic tools and vehicles operating during the decommissioning activities.			
Prior to mitigation/ management			
Duration	Short-term (2)	Noise produced duration this phase will be short-term	Negligible (negative) – 21
Extent	Local (3)	Decommissioning phase noise will be limited to the development site area	
Intensity x type of impact	Minor - negative (-2)	Noise impacts will have a minor	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors	
Nature	Negative		
Mitigation/ Management action			
▪ Machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Short-term (2)	Noise produced duration this phase will be short-term	Negligible (negative) – 10

Extent	Limited (2)	Decommissioning phase noise will be limited to the development area	
Intensity x type of impact	Minimal-negative (-1)	Decommissioning phase noise will have minimal impact	
Probability	Improbable (2)	It is improbable that noise will impact on the surrounding receptors	
Nature	Negative		

7.1.4 Post-closure Phase

The decommissioning, operational and decommissioning activities will have ceased and the subsequent noise levels from the activities will have ceased, therefore no post closure impacts are expected and no post closure monitoring programme is recommended.

8 Environmental Management Programme

An Environmental Management Programme Report (EMPr) is a delivery mechanism for the mitigation measures identified and ensures a systematic approach to bringing environmental and social considerations into decision making and day-to-day operations. It establishes a framework for tracking, evaluating and communicating environmental and social performance and helps ensure that environmental risks and liabilities are identified, minimized and managed. The EMPr details the additional mitigation measures that will implement throughout the project lifecycle.

The EMPr has been developed to meet national environmental requirements, in particular, the provisions of the NEMA and the EIA Regulations 2014. Temo coal will, therefore, need to commit to preventing pollution and making resources available to ensure that all reasonable safeguards are in place to do so. In addition, Temo coal will need to accept accountability and financial liability for any pollution that may occur as a result of project activities.

The EMPr will be a living document, and will continue to develop during the design and construction phase to enable continuous improvement of the Project's social and environmental performance. The EMPr will also be reviewed against changes in the regulatory regime and in the event of new policies or guidelines from the relevant Competent Authorities. Periodic reviews and updating will also be carried out throughout the project lifecycle, to incorporate changes in activities and any changes in the overarching management systems.

The EMPr is intended to cover those activities described in Section 8 of this report. It covers project activities during construction, operation and decommissioning.

The ultimate goal of the EMPr is to:

- Incorporate environmental management into project design and operating procedures;

- Serve as an action plan for environmental management for the Project and provide a framework for implementing project environmental commitments (i.e. mitigation measures identified in the EIA);
- Ensure that all workers, subcontractors and others involved in the Project meet legal and other requirements with regard to environmental management; and
- Prepare and maintain records of project environmental performance (i.e. monitoring, audits and non-compliance tracking).

8.1 Summary of Mitigation and Management

Table 8-1 to Table 8-3 provides a summary of the proposed project activities, environmental aspects and impacts on the receiving environment. Information on the frequency of mitigation, relevant legal requirements, recommended management plans, timing of implementation, and roles / responsibilities of persons implementing the EMPr.

Table 8-1: Project Activities requiring Management

Activities	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
▪ Site clearing (removal of vegetation); ▪ Topsoil removal and stockpiling; and ▪ Construction of rail loop and road diversion.	Construction	22.5km	▪ Construction related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Installing broadband reverse hooters to vehicles to minimise the hooter noise propagation; ▪ Switching off equipment when not in use; and ▪ Leave as much natural vegetation where possible to aid in attenuating the noise.	Mitigation measures will assist in keeping noise levels as low as possible to comply with the National Noise Control Regulations	During construction

Table 8-2: Potential Impacts and Outcomes of the EMPr

Activities	Potential Impacts	Phase	Mitigation	Standard to be Achieved/Objective
▪ Site clearing (removal of vegetation); ▪ Topsoil removal and stockpiling; and ▪ Construction of rail loop and road diversion.	Noise disturbance	Construction	▪ Construction related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Installing broadband reverse hooters to vehicles to minimise the hooter noise propagation; ▪ Switching off equipment when not in use; and ▪ Leave as much natural vegetation where possible to aid in attenuating the noise.	To comply with the definition of ‘noise disturbance’ as described by the National Noise Control Regulations

Table 8-3: Proposed Mitigation and Management Measures

Activities	Potential Impacts	Aspects Affected	Mitigation Type	Time Period for Implementation	Compliance with Standards
▪ Site clearing (removal of vegetation); ▪ Topsoil removal and stockpiling; and ▪ Construction of rail loop and road diversion.	Increase in background noise levels	Noise disturbance at surrounding receptors	▪ Construction related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Installing broadband reverse hooters to vehicles to minimise the hooter noise propagation; ▪ Switching off equipment when not in use; and ▪ Leave as much natural vegetation where possible to aid in attenuating the noise.	Upon commencement of construction	To comply with the definition of 'noise disturbance' as described by the National Noise Control Regulations

Table 8-4: Prescribed Environmental Management Standards, Practice, Guideline, Policy or Law

Applicable Standard, Practice, Guideline, Policy or Law		
Title	**Description of Requirements**	**Relevance to Project**
Legislation (National, Provincial, Local)		
National Noise Control Regulations, R.154 (10 January 1992) in terms of Section 25 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989)	Applicable to national, provincial and local level	Regulating the projects compliance in terms of noise impact
Applicable Guideline/Standards		
SANS 10103:2008	Gives guidelines to the measurement and rating of environmental noise with respect to annoyance and to speech communication	Provides guidelines to noise monitoring and impact rating of the projects noise impact

8.2 Monitoring Plan

It is recommended that during the construction and operation, noise monitoring be carried out on a quarterly basis. In the event of a complaint being received however, it is recommended to monitor the noise levels near the complainant. Components to be included when monitoring is required are presented in Table 8-5 below:

Table 8-5: Monitoring plan

Method	Monitoring locations	Frequency	Target	Reporting
Sampled in accordance with the National Noise Control Regulations in conjunction with the SANS 10103:2008 guidelines; Noise measurement should be taken for a period of not less than 10 minutes at each location	The noise measurements should only be conducted at selected locations base on expert opinion and as per results from baseline results.	To be conducted on a quarterly basis during the construction and operational phases, especially when specific noise complaints are received from surrounding receptors. The noise levels should then be taken at the complainant to assess whether the construction and operational phase activities are causing a noise disturbance.	Noise levels from the project should not measure above “acceptable rating limits” for daytime and night time at selected receptors.	A report must be compiled after the monitoring has been carried out then submitted to management to ascertain compliance with the required regulations and standards.

9 Conclusion and Recommendations

This investigation assessed the baseline ambient noise levels in the vicinity of the proposed Temo Coal Rail Loop and Road Diversion Project. The day-time and night-time noise levels measurements were conducted over a 24 hour period at three different locations i.e. Lerekhureng Combined School (at Steenbokpan) and two portions at Verloren Valey farm.

Based on the daytime results, the average (L_{Aeq}) ambient sound levels were measured above the SANS 10103:2008 guidelines for rural districts (45dBA) at locations N1 and N3, with of 57dBA and 47dBA respectively. The main sources of intermittent noise impacting on the measurements collected at these locations included sounds from vehicles N1 and at N3 vehicles passing by D175 road, birds songs and high pitch sound produced by the *gryllidae* (crickets). However, the background noise levels (L_{A90}) recorded was 34dBA and 26dBA and below the guidelines limit for daytime limit for rural district.

Night time results as recorded at the three sampling points indicated that two locations showed average noise values (L_{Aeq}) above the relevant SANS night-time rating limit guidelines for rural district. At N1, the L_{Aeq} was 40dBA which measured above the relevant SANS night-time rating limit guidelines (35dBA), with the main source of intermittent noise as a result of vehicles, travelling on the D175 road to the isolated homesteads in the area. At N3, the L_{Aeq} was 45dBA which is above the relevant SANS night-time rating limit guidelines (35dBA), with the main sources of intermittent noise arising vehicles passing by D175 road, birds songs and high pitch sound produced by the *gryllidae* (crickets. However, L_{A90} as recorded for both locations (N1 and N3) was below the relevant SANS nigh time rating limit guidelines (35dBA) with background noise levels at 34dBA and 26sBA respectively.

Based on the medium-term nature of the Project and considering the fact that it will be conducted in phases, it is not anticipated that construction phase activities will have significant impacts on background noise levels.

In conclusion, the background noise level measured during this investigation is within the SANS 10103:2008 guidelines for rural district for both day-time and night-time. With the construction anticipated to be medium-term in nature and conducted in phases, these were factored into the ratings to discern the potential impacts associated with construction. Monitoring on a quarterly basis have been recommended once construction commences to assess project performance (i.e. monitoring, audits and non-compliance tracking) to inform management decision making to ensure compliance.

10 References

South African National Standard - Code of practice, SANS 10103:2008, Edition Six, *The measurement and rating of environmental noise with respect to annoyance and to speech communication*. Available [online] http://www.sabs.co.za.

National Environmental Management Act (NEMA), Act 107 of 1998, *Gazette No. 401 in Government Notice. 19519* of 27 November 1998

National Conservation Act, Act 73 of 1989, *Gazette No. 11927 in Government Notice. 1188* of June 1989.

South African National Standard (SANS) - Code of practice (SANS 10103:2008), Edition Six, *The measurement and rating of environmental noise with respect to annoyance and to speech communication*. *Accessed on the 11 of February, 2019*.