ENVIRONMENTAL NOISE IMPACT ASSESSMENT FOR THE PROPOSED BRAKFONTEIN THERMAL COAL MINE

August 2012

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Report Title: **NOISE IMPACT ASSESSMENT FOR THE BRAKFONTEIN THERMAL COAL MINE**

Project Number: **UNI1292**

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EXECUTIVE SUMMARY

Digby Wells & Associates (Pty) Ltd (Digby Wells) was appointed as independent consultants to assess the environmental and social impacts associated with the proposed Brakfontein Thermal Coal Project.

The proposed project is located within the Western margins of the Witbank Coalfields within the jurisdiction of the Victor Khanye local and Nkangala district municipalities in Mpumalanga Province. The site is located approximately 16km north-east of Delmas town, 14km and 17km north of Devon and Leandra respectively. The centre co-ordinate of the largest part of the project area is located at: 26°12'31.237"S 28°51'39.698"E.

This environmental noise impact assessment report forms part of the EIA/EMP report and entailed the following tasks:

- Identification of sources of noise and potential noise sensitive receivers;
- Establish the existing noise climate at various locations surrounding the project area; and
- The assessment of the anticipated impacts associated with the Project relating noise impacts for the construction phase, operational phase, decommissioning and post closure phase.

It is expected that during the life of the proposed project, the noise levels generated by the mining activities will have a minor impact on the ambient noise level at noise sensitive receivers. It is expected that the impact will be of a minor significance due to the relatively short duration of the construction phase. During the operational phase the noise levels are expected to impact even less because of the pit walls, soil berms and overburden dumps that will mitigate the noise propagation by acting as natural noise barriers.

The mitigation measures to be put in place are:

- Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers.
- Switching off equipment when not in use.
- Fixed noise producing sources such as generators, pump stations and crushers to be to be either housed in enclosures or barriers put up around the noise source. The barriers should be installed between the noise source and sensitive noise receptor, as close to the noise source as possible.

As for the blasting operations, they are generally intermittent and should be limited to daylight hours when ambient noise levels are highest. The following is recommended with regards to blasting operations:

- The use of millisecond delays between rows of blast holes in a given blasting pattern in order to reduce the amount of explosive charge detonated at any given instant is recommended (Sengupta, M.1993);

- Reduction of the powder factor, that is, use of less explosive per cubic yard of overburden; Restriction of blasting to daylight hours are mitigation measures that should be followed (Sengupta, M.1993); and
- Maintaining good public relations with the surrounding communities, i.e. warning the communities in advance before blasts/ providing the balsting schedule.

In addition, berms should be constructed along the northern boundaries of the proposed opencast areas 1, 2 and 5 as well as along the eastern boundary of the proposed opencast area 3 (according to the latest mine plan) to allow for a natural sound barrier that will help with sound attenuation towards the nearest relevant noise sensitive receivers

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1 TERMS OF REFERENCE

Digby Wells Environmental (Digby Wells) was commissioned by Universal Coal (Pty) Ltd (Universal Coal) to conduct an environmental noise impact assessment for the proposed Brakfontein Thermal Coal Mine in the Nkangala District Municipality in the Mpumalanga Province. The purpose of the study was to assess the potential impact of the proposed activities on the ambient noise climate of the area, which is primarily rural with few exisitng coal mines in the area. The approach used in investigating noise impacts is based on guidelines provided by the South African National Standards (SANS). The following legislation was considered for this survey:

- The National Environmental Management Act (Act 107 of 1998), NEMA;
- The National Environmental Management Air Quality Act (Act 39 of 2004), NEMAQA; and
- The Environment Conservation Act, 1989 (Act 73 of 1989).

The Environmental Noise Impact Assessment report will include baseline noise measurements taken at identified and relevant noise sensitive receivers, predicted noise impacts on the identified noise sensitive receivers, during the various project phases as well as recommendations and mitigation measures for potential impacts.

2 INTRODUCTION

Mining is a contributor to environmental noise pollution, with noise sources such as blasting and machinery used during construction, operation and decommissioning. These noise sources impact on the local ambient noise levels. There are three major categories of noise sources associated with mining. They are:

- Fixed equipment or process operations (generators, pumps, electrical equipment, crushers, drilling);
- Mobile equipment or process operations (haulage, service operations); and
- Blasting operations.

For this project it is expected that the noise produced during the construction and operation of the proposed mine will be the main noise producing activities. Baseline noise measurements in support of an environmental noise impact assessment were performed for the proposed project. The baseline noise measurements were done to determine the present ambient noise levels at the relevant noise sensitive receivers.

SANS have no documented standards describing acceptable noise levels for mining. The SANS10103:2008 “The measurement and rating of environmental noise with respect to health, land use, annoyance and to speech communication” (SANS10103:2008), has thus been used to assess the noise impacts of the mining operation. The SANS10103:2008 addresses methods and provides guidelines to assess working and living environments with respect to acoustic comfort, excellence, preservation of health, land use and with respect to possible annoyance by noise. In addition the SANS 10103:2008 guidelines give the acceptable levels of noise in both residential and non-residential areas.

The results of the baseline measurements have been included in this report. Mitigation measures for the construction, operational and decommissioning phases and suitable recommendations are included in the report as well as monitoring plan to be followed throughout the life of mine.

3 STUDY AREA

The proposed project is located within the Western margins of the Witbank Coalfields within the jurisdiction of the Victor Khanye local and Nkangala district municipalities in Mpumalanga Province. The site is located approximately 16km north-east of Delmas town, 14km and 17km north of Devon and Leandra respectively. The centre co-ordinate of the largest part of the project area is located at: 26°12'31.237"S 28°51'39.698"E.

4 EXPERTISE OF THE SPECIALIST

A curriculum vitae (CV) and declaration of independence is attached in Appendix A.

5 METHODOLOGY

The approach used in investigating noise impacts is based on guidelines provided by SANS 10103:2008. According to the SANS 10103:2008 the sound pressure level is used as the measurement unit for noise guidelines. The acceptable rating levels according to SANS 10103:2008 for ambient noise in different districts (residential and non-residential) are presented in Table 5-1.

Table 5-1: Acceptable 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]
RESIDENTAIL 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.

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 $L_{R,dn}$ exceeds 55 dBA, residential buildings (e.g. dormitories, hotel accommodation and residences) should preferably be treated acoustically to obtain indoor $L_{Req,T}$ values in line with those given in table 1.

NOTE 4 For industrial districts, the $L_{R,dn}$ 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 5-2, where LReq,T is the equivalent continuous A-weighted sound pressure level, in decibels, determined over a time period of not less than 30 minutes. 'A-weighted' is a standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.

Table 5-2: Categories of community/group response (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 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 $\Delta L_{Req,T}$ should be calculated from the appropriate of the following:		
1) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS LReq,T of the residual noise (determined in the absence of the specific noise under investigation);		
2) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the maximum rating level for the ambient noise given in table 1;		
3) $\Delta L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation MINUS the typical rating level for the applicable district as determined from table 2; or		
4) $\Delta L_{Req,T}$ = Expected increase in $L_{Req,T}$ of ambient noise in an area because of a proposed development under investigation.		

Baseline noise measurements were taken at some sensitive noise sensitive receivers surrounding the proposed Brakfontein Thermal Coal Mine. The baseline noise measurements were carried out to assess the current ambient noise levels in the area.

According to the SANS 10103:2008 guidelines 'daytime' is defined as anytime between 06:00 to 22:00, and 'night time' between 22:00 to 06:00. As a result of these guidelines, most measurements were taken for a 24hour period to incorporate day and night time levels.

Predictive modelling was performed for the proposed mining activities through the use of the modelling software SoundPlan. The software specializes in computer simulations of noise pollution situations.

A Cirrus, Optimus Green, precision integrating sound level meter was used for the measurements. The instrument was field calibrated with a Cirrus, sound level calibrator. The baseline locations are presented in Table 5-3 as well as on plan 1 below.

Table 5-3: Baseline monitoring locations

Site ID	Farm/location	GPS coordinates
N1	Brakfontein264 IR (portion 24)	26°13'41.27"S & 28°50'11.07"E
N2	Brakfontein264 IR (portion 29)	26°12'27.99"S & 28°50'43.39"E
N3	Brakfontein264 IR (portion 28)	26°12'45.30"S & 28°50'21.57"E
N4	Vanggatfontein 251 IR (portion 8)	26°11'4.60"S & 28°51'1.56"E
N5	Brakfontein264 IR (portion 11)	26°12'57.01"S & 28°51'46.65"E

Plan 1

Universal Coal Brakfontein MRA

Noise Measurement Locations

Legend

- Noise Measurement Locations
- Project Boundary
- Arterial / National Route
- Main Road
- Minor Road
- Track
- Railway Line
- Power Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Wetlands
- Farm Boundary

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Projection: Transverse Mercator
Datum: Hartebeesthoek 1994
Central Meridian: 29°E

Ref #: amc.UNI1292.201208.057
Revision Number: 2
Date: 09/05/2012

N 0 0.375 0.75 1.5

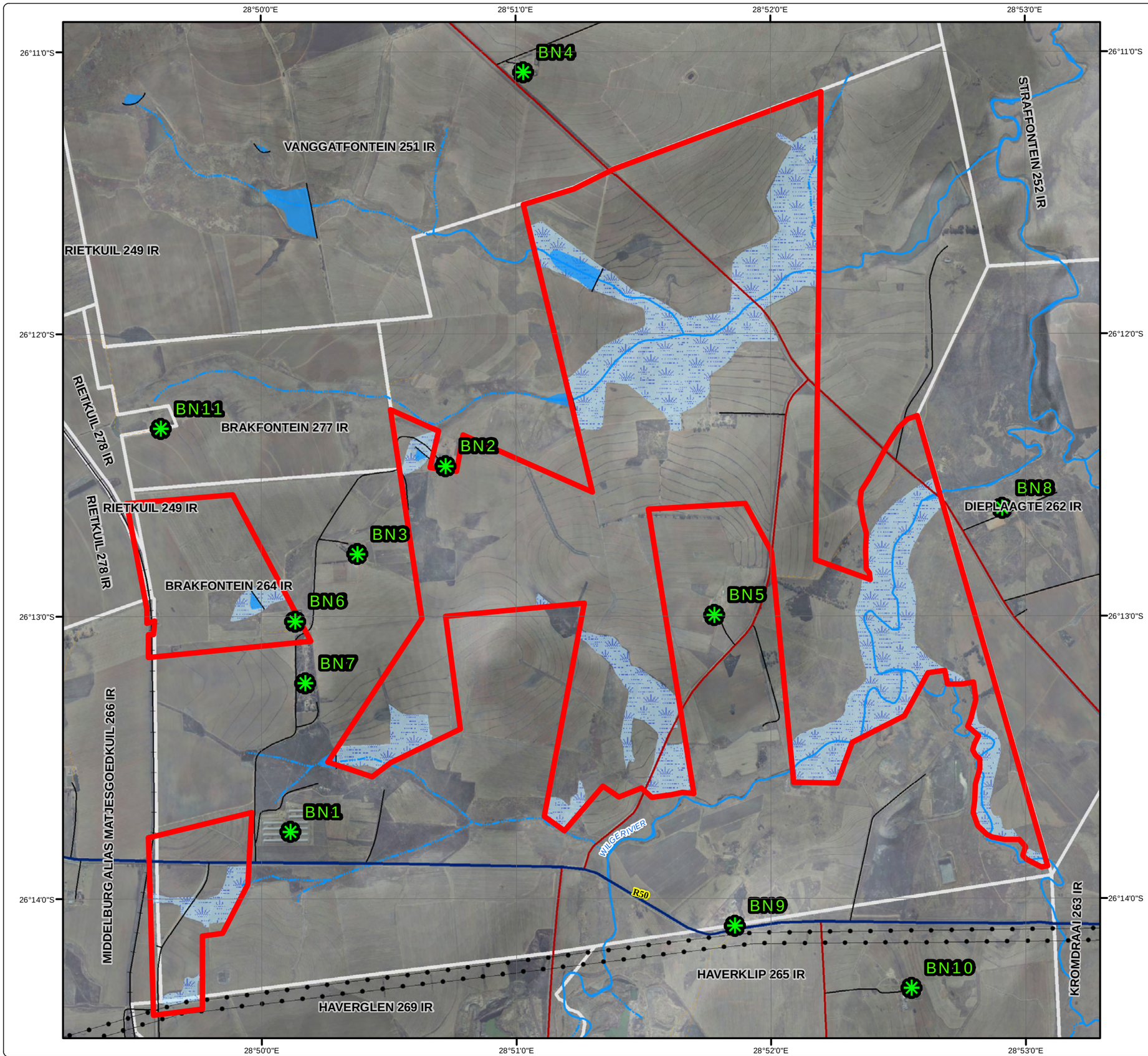
Kilometres
1:25,000

The Soundplan noise modelling software was used to predict the noise contribution from the proposed Brakfontein mining activities on the nearest noise sensitive receivers. The nearest noise sensitieve receivers, assessed as part of the impact assessment, is presented in plan 2 below

Plan 2

Universal Coal Brakfontein MRA

Relevant Noise Sensitive Receptors



Legend

- Noise Relevant Receptors
- Project Boundary
- Arterial / National Route
- Main Road
- Minor Road
- Track
- Railway Line
- Power Line
- Non-Perennial Stream
- Perennial Stream
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Datum: Hartebeesthoek 1994	Revision Number: 2
Central Meridian: 29°E	Date: 09/05/2012

N 0 0.375 0.75 1.5

Kilometres

1:25,000

6 BASELINE RESULTS

The results from the noise meter recordings for all the sampled points as well as the rating limits according to the SANS 10103:2008 guidelines are presented in Table 6-1. The average noise level from all the measurements performed in the area can be seen in Figure 6-1 and a typical 24hr ambient noise level cycle can be seen Figure 6-2 below.

Table 6-1: Results of the baseline noise measurements taken at certain noise sensitive receivers located around the proposed mining activities

Sample ID	SANS 10103:2008 rating limit					
	Type of district	Period	Acceptable rating level dBA	$L_{Areq,T}$ dBA	Maximum/Minimum dBA	Date
N1	Rural	Daytime	45	45	75 / 40	02/07/2012
		Night time	35	47	69 / 37	02/07/2012
N2	Rural	Daytime	45	49	81 / 19	03/07/2012
		Night time	35	34	77 / 21	03/07/2012
N3	Rural	Daytime	45	46	91 / 34	04/07/2012
		Night time	35	34	77 / 21	04/07/2012
N4	Rural	Daytime	45	52	91 / 34	05/07/2012
		Night time	35	53	64 / 48	05/07/2012
N5	Rural	Daytime	45	51	102 / 30	06/07/2012
		Night time	35	53	93 / 30	06/07/2012
	Indicates current LAeq,T levels above either the daytime rating limit or the night time rating limit					

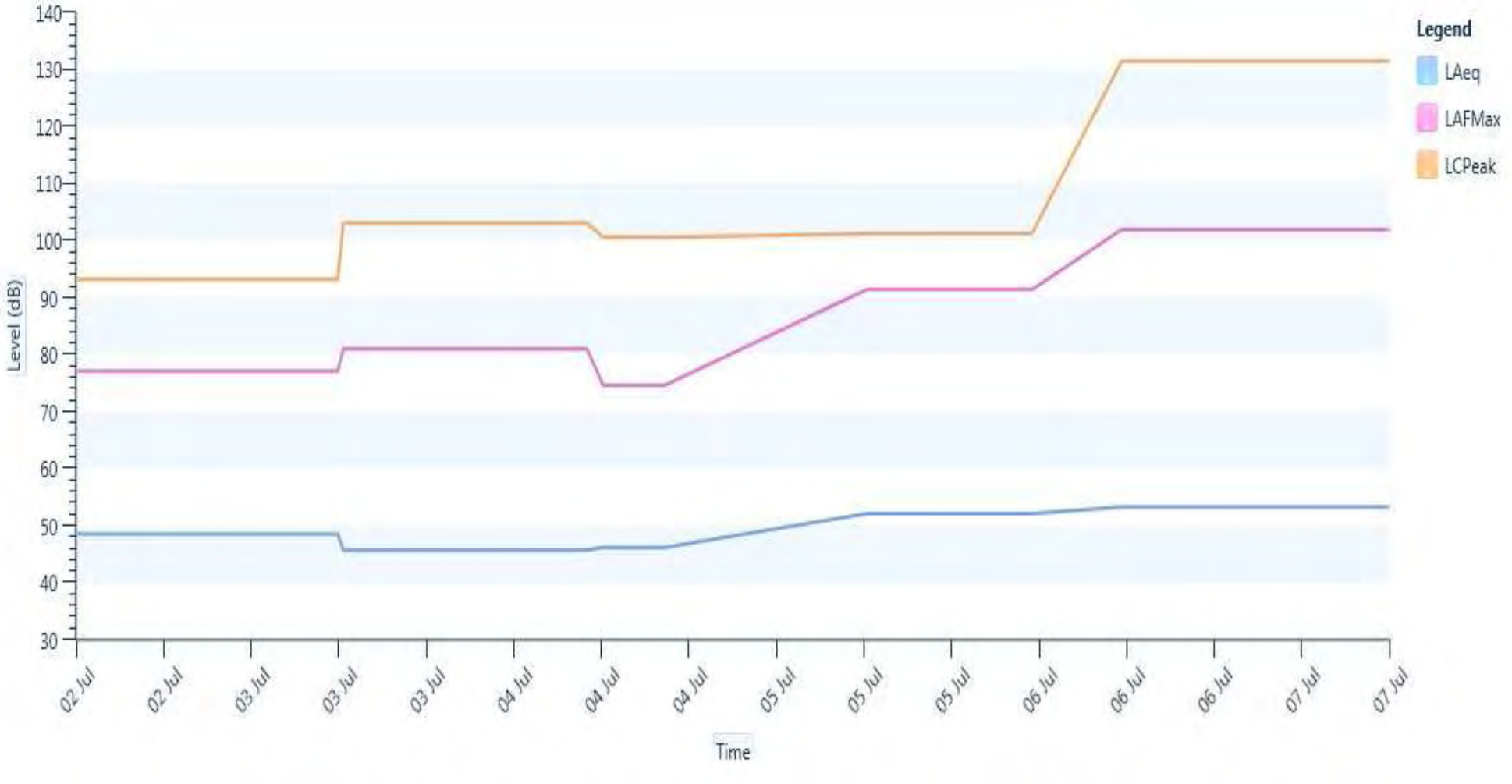

Figure 6-1: Average noise levels from all measurements

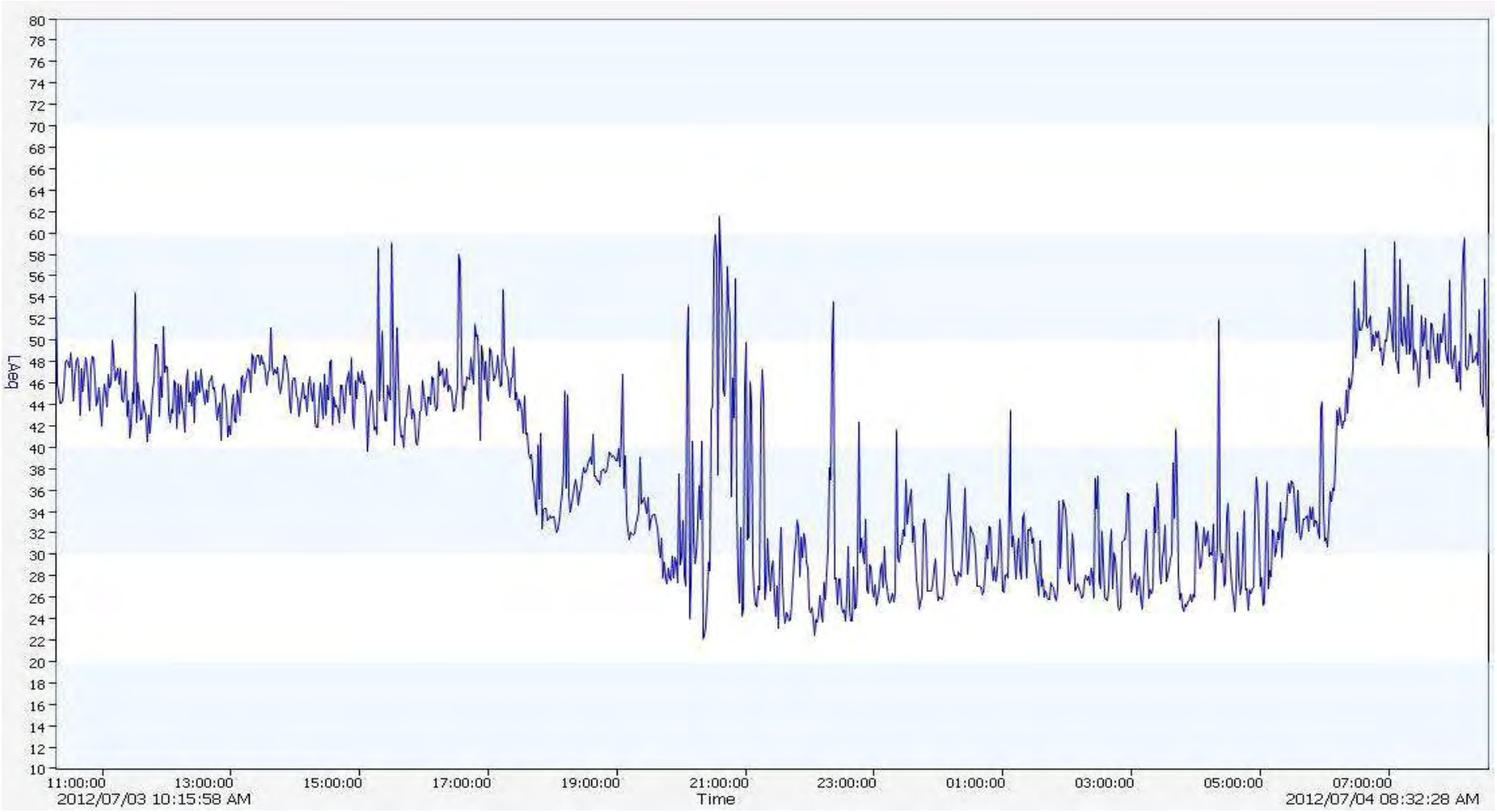

Figure 6-2: 24 hour time history graph of the ambient noise levels

7 DISCUSSION OF BASELINE RESULTS

Based on the daytime results from the baseline environmental noise measurements it is noted that the L_{Aeq} levels at most locations measured above the SANS guidelines for the maximum allowable outdoor daytime limit for ambient noise in rural districts.

The night time ambient L_{Aeq} levels mostly measured above the SANS guidelines for the maximum allowable outdoor limit for night time ambient noise in rural districts.

The total L_{Aeq} level for all the measurements is 50dBA and the highest maximum during all measurements is 102dBA. As indicated by the time history graph, the highest averages during the 24 hour measurement periods are between 06:00 and 10:00 in the morning and 16:00 and 18:00 in the evening.

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 level are summarised in Table 7-1.

Table 7-1: Summary of noise sources influencing ambient noise levels at noise noise sensitive receivers around the proposed site.

Noise source description			
Day	**Duration**	**Night**	**Duration**
Birdsong	Continuous	Domestic animals (dogs)	Intermittent
Domestic animals (dogs)	Intermittent	Mining activities to the north of measurement location N4	Continuous
Vehicular activity on the R50 and the Goedgedacht road	Intermittent	Vehicular activity on the R50 and the Goedgedacht road	Intermittent
Mining activities to the north of measurement location N4	Continuous		

8 FINDINGS

8.1 Predicted impacts

Mining activities do generate noise from the various sources. The predicted noise levels of the primary noise sources are presented in Table 8-1.

Table 8-1: Predicted n**oise levels at source**

Noise source	Noise level at source measured in dBA
Blasting	±127
Dozer	± 95
Front end Loader	± 95
Haul trucks	± 90

The earth moving equipment and haul trucks on site will be the primary source for continuous noise generated during construction, operational and decommissioning phases..

8.2 The findings for the various mining phases

SoundPlan noise dispersion modelling software is used to assess whether the noise from the mining activities will impact on the relevant noise sensitive receivers, by comparing the predicted propagating noise levels with the current ambient baseline noise levels. An increase of 8 to 10 dBA is required before the sound subjectively appears to be significantly louder (Brüel & Kjær, 2001).

8.2.1. Construction phase

It is assumed that the construction activities will only take place during daylight hours.

The following activities during the construction phase are identified as possible noise sources and may impact on the ambient noise level of the area:

- Activity 1: Site Clearing: Removal of topsoil & vegetation;
- Activity 2: Construction of any surface infrastructure e.g. haul roads, pipes, storm water diversion berms (including transportation of materials & stockpiling); and
- Activity 3: Blasting and development of initial boxcut for mining (incl. stockpiling from initial cuts)

Potential impact: The construction machinery will be a source of continuous noise throughout the construction phase. The blasting activities during the construction phase are identified as the highest noise producing source, the noise from blasting is called impulsive noise, it is brief and abrupt, and its startling effect causes greater annoyance than would be expected from continuous noise sources.

The grid noise map, shown in Figure 8-1, presents the noise contour lines and visually indicates the noise propagation during the construction phase. The single receiver map, shown in Figure 8-2, presents the predicted contribution from the proposed mining activities on the single receivers during the construction phase.

The grid noise map, shown in Figure 8-3, presents the noise contour lines and visually indicates the noise propagation for the blasting activities during the construction phase. The single receiver map, shown in Figure 8-4, presents the predicted contribution from the proposed blasting activities on the single receivers during the construction phase.

According to the noise dispersion model for the construction phase, the noise from the proposed mining activities will be similar or lower to that of the current ambient noise levels at the indicated noise sensitive receivers.

The blasting activities are expected to, at the time of the blasts, measure above the baseline noise levels at BN2 and BN5.

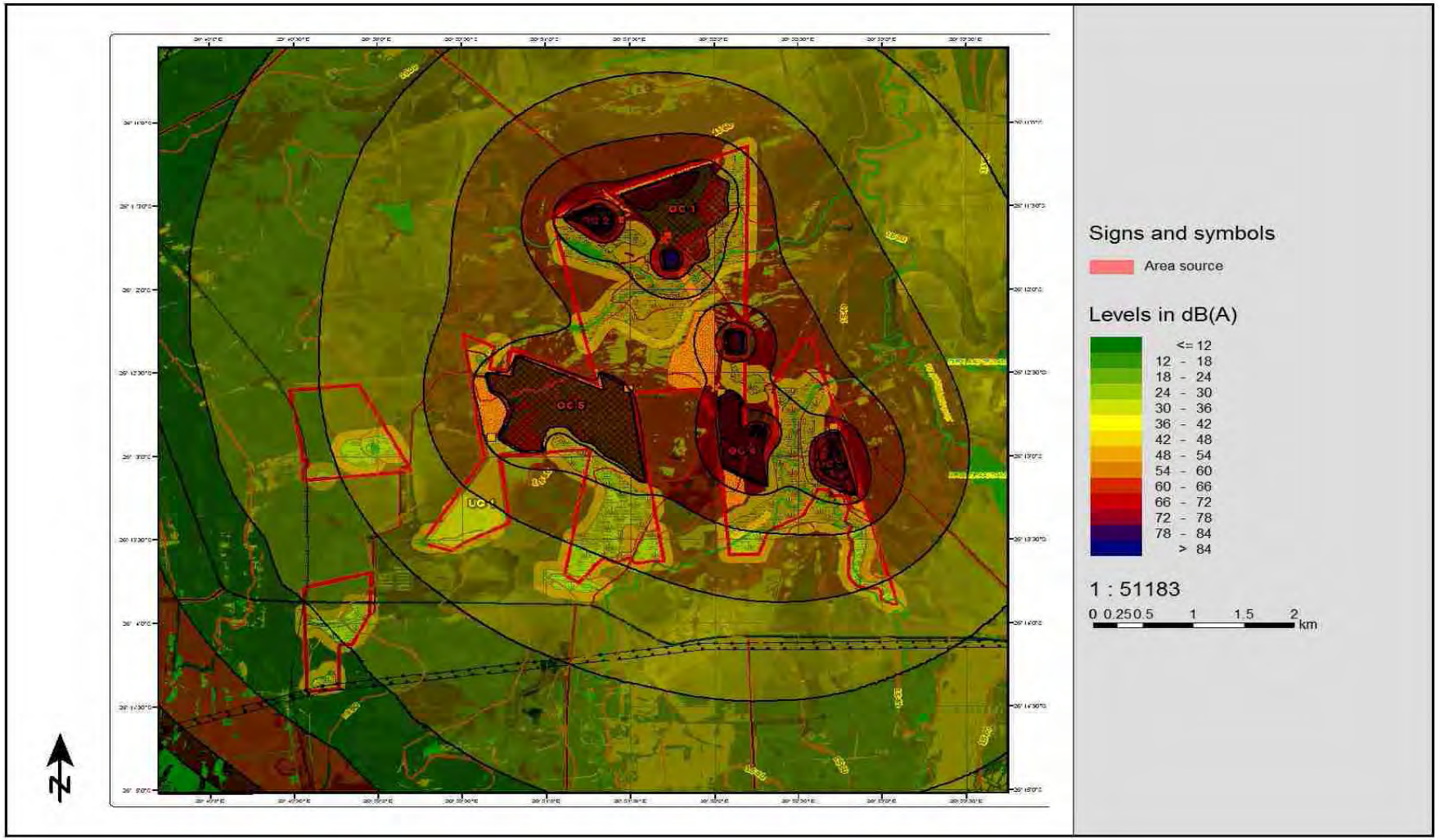

Figure 8-1: Noise contour map for construction phase

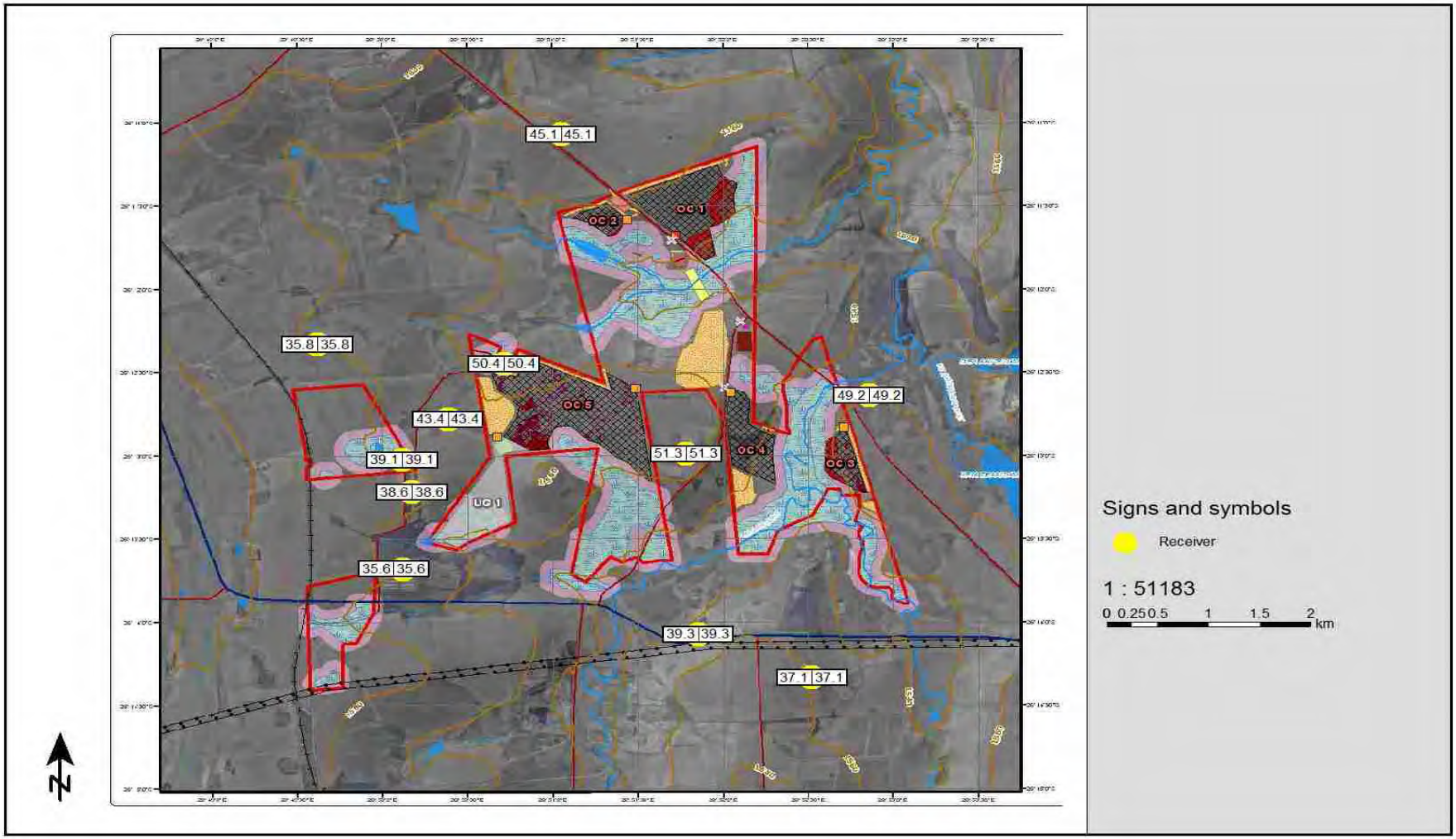

Figure 8-2: Single receivers map construction phase

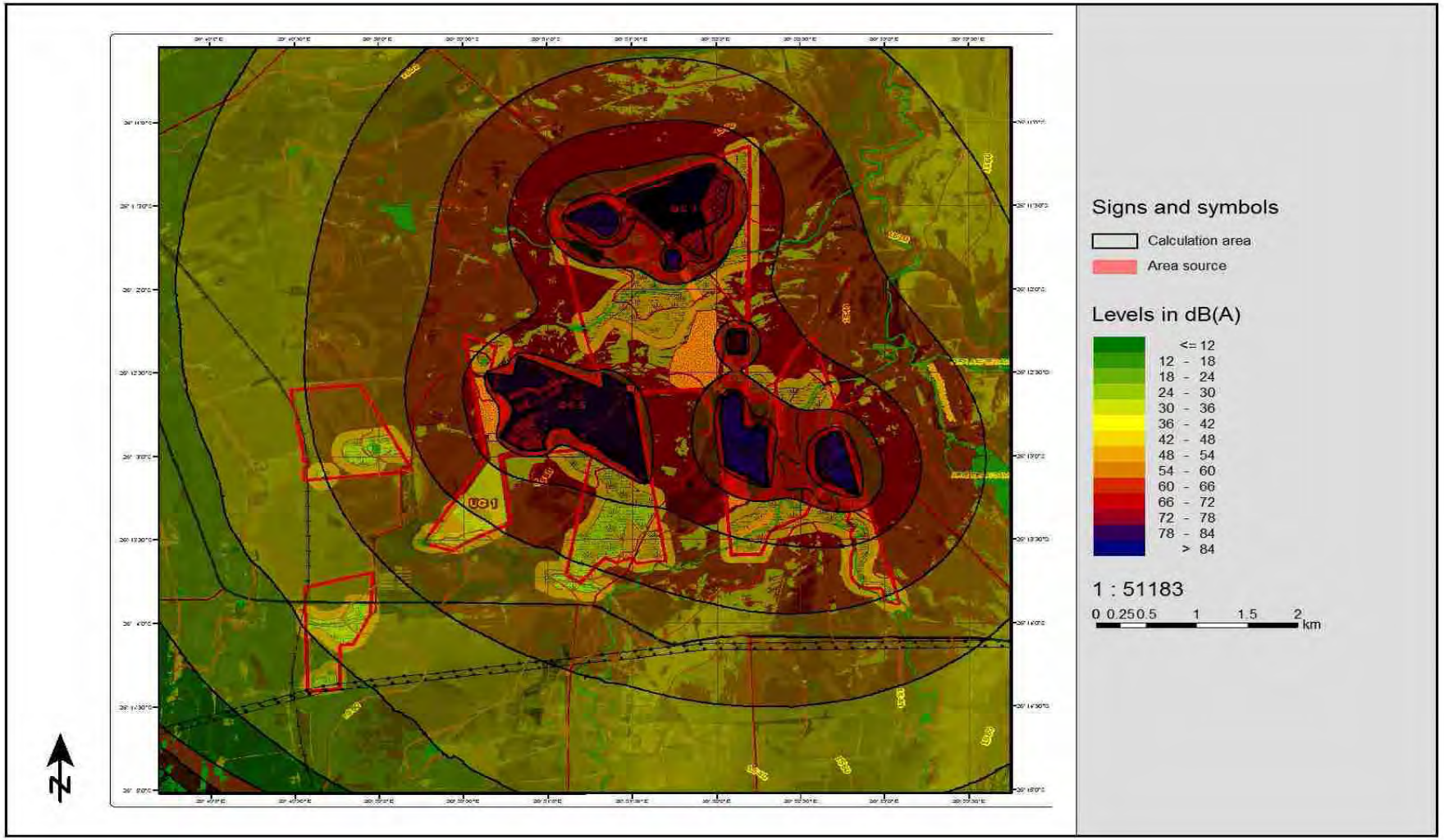

Figure 8-3: Noise contour map for the blasting during construction phase

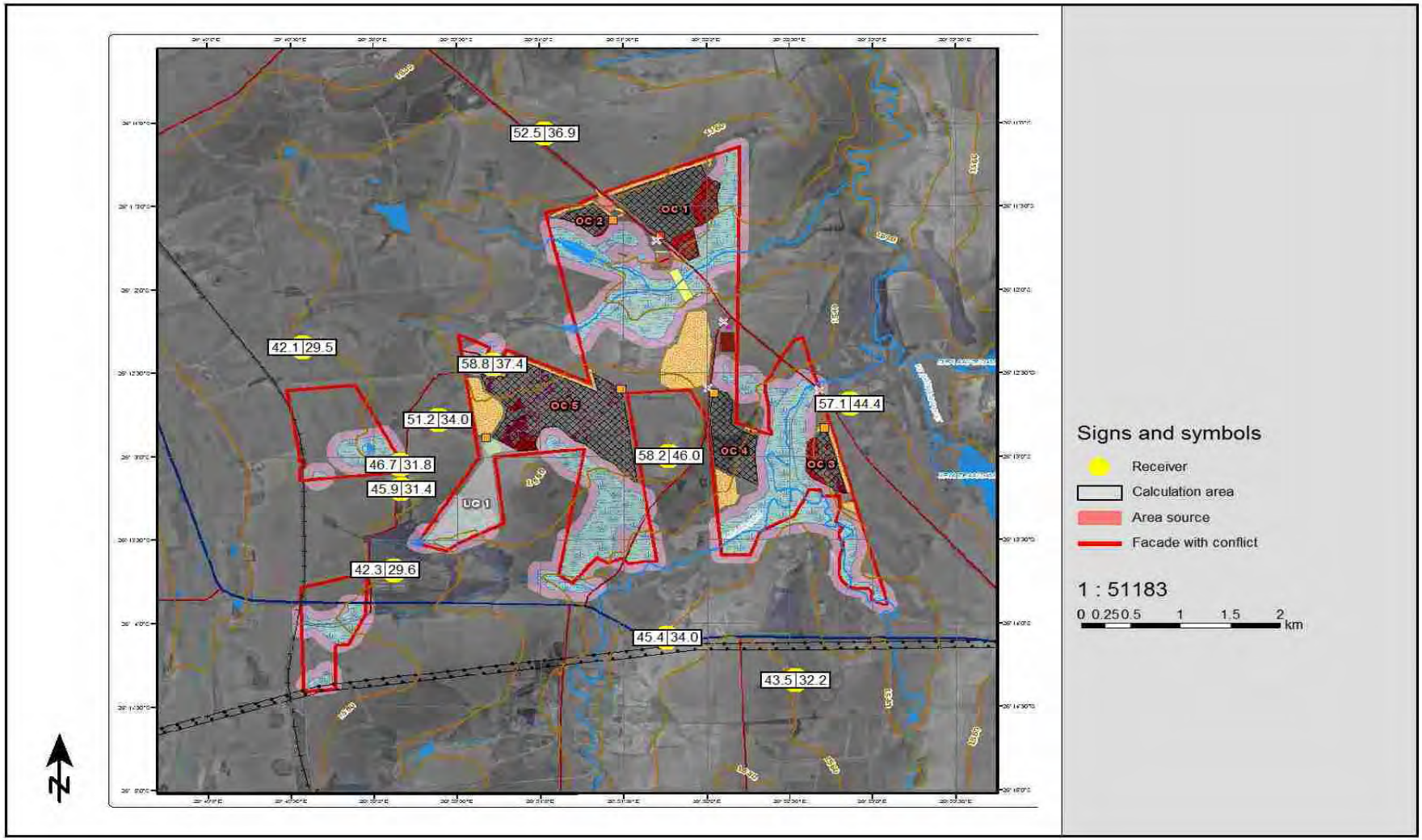

Figure 8-4: Single receivers map for the blasting activities during construction phase

8.2.2. Operational phase

The following activities during the operational phase are identified as possible noise sources and may impact on the ambient noise level at the relevant noise sensitive receivers:

- Activity 5: Removal of overburden and backfilling when possible (including drilling/blasting hard overburden & stockpiling);
- Activity 6: Use and maintenance of haul roads (incl. transportation of coal to washing plant);
- Activity 7: Removal of coal (mining process) and ROM coal Stockpile; and
- Activity 10: Concurrent replacement of overburden, topsoil and revegetation.

Potential impact: The machinery involved with the above mentioned activities will be a source of continuous noise throughout the operational phase. The blasting activities during the operational phase are identified as the highest noise producing source, the noise from blasting is called impulsive noise, it is brief and abrupt, and its startling effect causes greater annoyance than would be expected from continuous noise sources.

The grid noise map, shown in Figure 8-5, presents the noise contour lines and visually indicates the noise propagation during the operational phase for the day and night time. The single receiver map, shown by in Figure 8-6, presents the predicted contribution from the proposed mining activities on the single receivers during the operational phase for day and night time.

According to the noise dispersion model for the operational phase, the noise from the proposed mining activities will be lower to that of the current ambient noise levels at the indicated noise sensitive receivers due to the noise attenuation effects from the pit walls as well as the overburden dumps and soil berms.

It is also expected that the blasting activities throughout the operational phase will not measure above the current ambient noise levels at any of the noise sensitive receivers because of the noise attenuation effects from the pit walls as well as the overburden dumps and soil berms

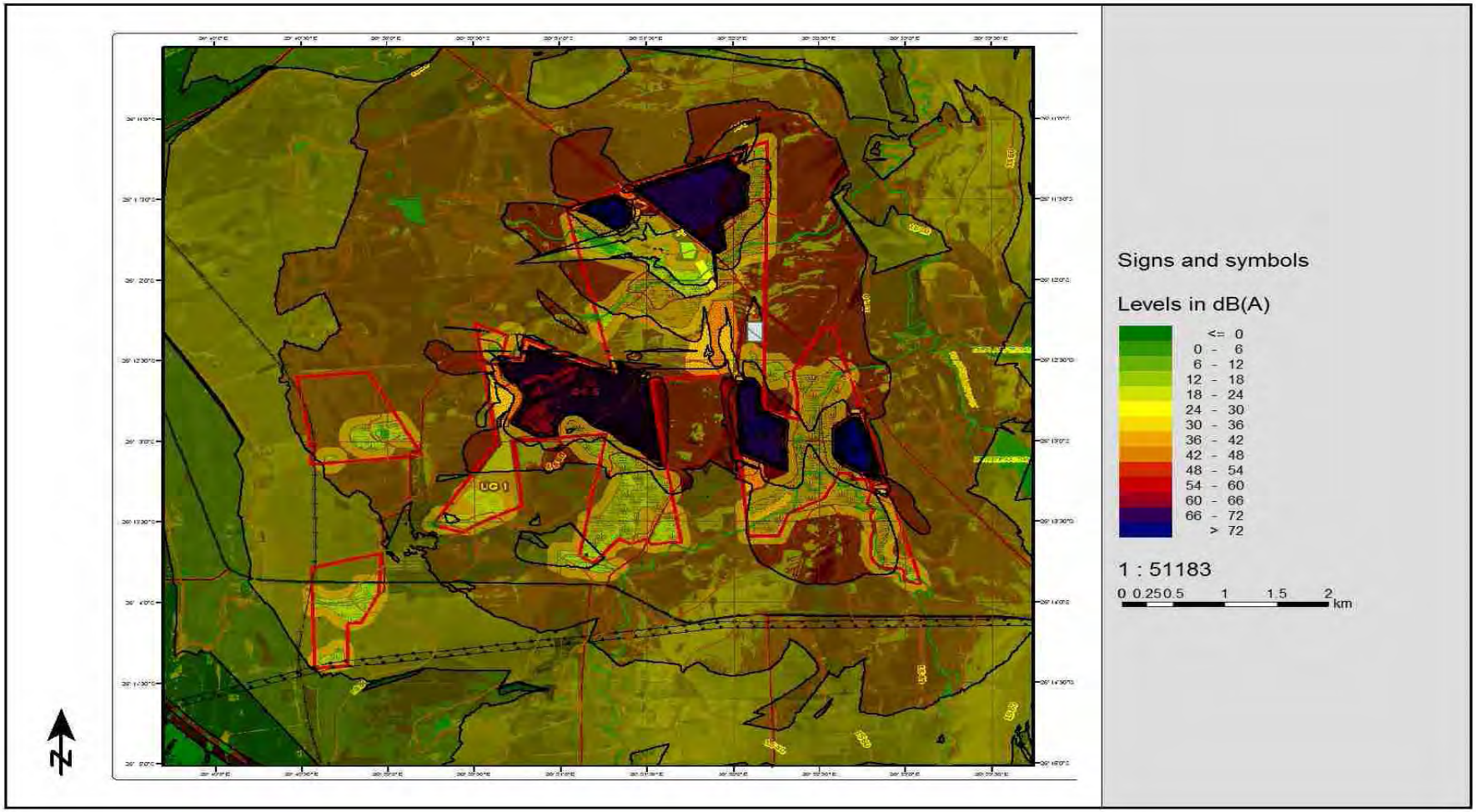

Figure 8-5: Noise contour map for operational phase

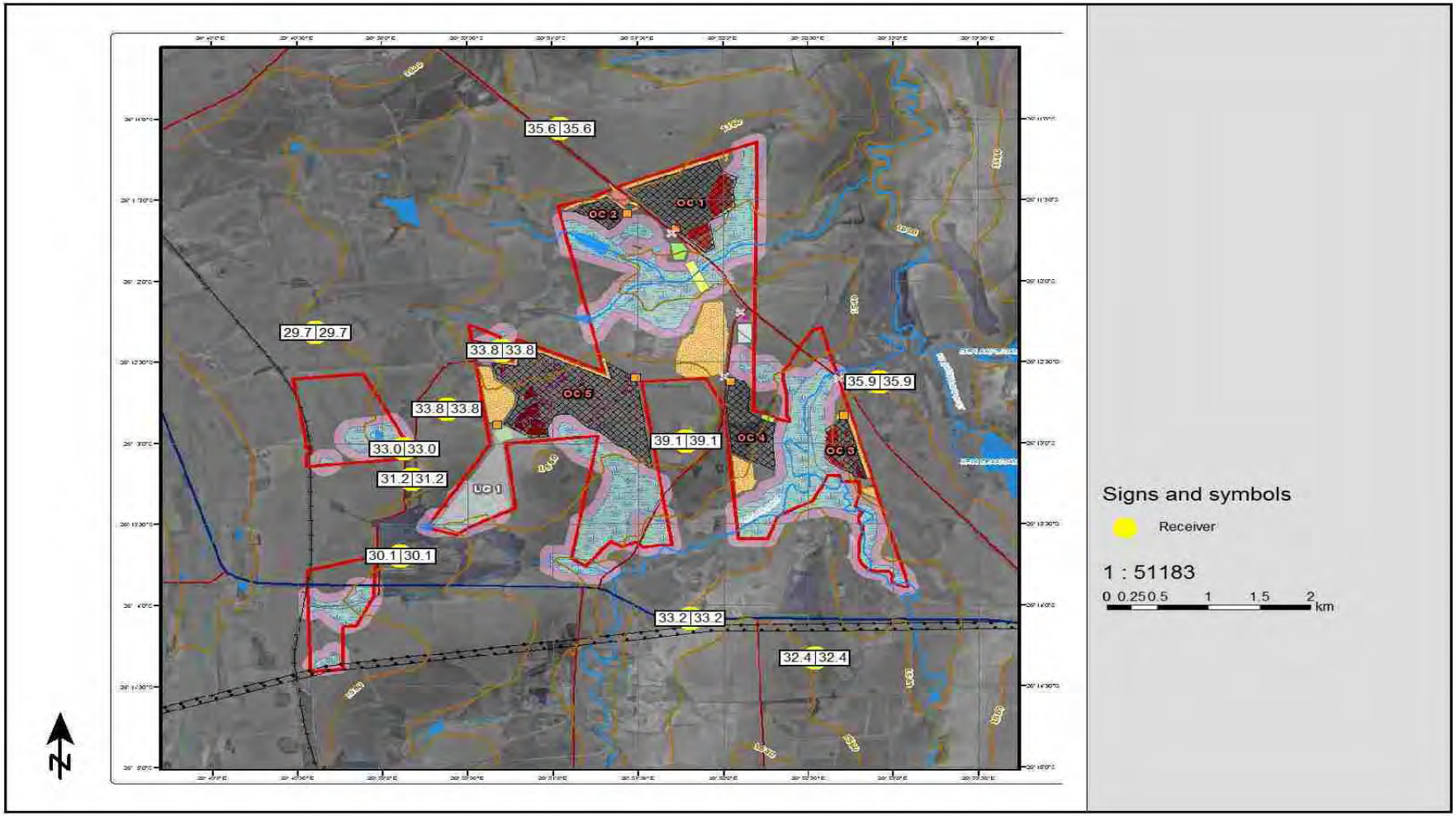

Figure 8-6: Single receivers map operational phase

8.2.3. Decommissioning phase

It is assumed that the decommissioning activities will only take place during daylight hours. The following activities during the decommissioning phase are identified as possible noise sources and may impact on the ambient noise level at the relevant noise sensitive receivers:

- Activity 11: Demolition & Removal of all infrastructure (incl. transportation off site); and
- Activity 12: Rehabilitation (spreading of soil, re-vegetation & profiling/contouring);

Potential impact: The machinery involved with the above mentioned activities will be a source of continuous noise throughout the decommissioning phase.

The results will be similar to that of the construction phase with regards to the expected noise levels, therefore it is probable that the noise from the proposed mining activities will be similar or lower to that of the current ambient noise levels at the indicated noise sensitive receivers.

9 IMPACT ASSESSMENT

Impacts and risks are identified based on a description of the proposed future activities to be undertaken as part of the project. The impact assessment and significance ratings are determined for these proposed activities.

The mitigation measures for all impacts and risks will be incorporated into an EMP.

Table 9-1: Severity, Spatial Scale, Duration and Probability Categories

Rating	Severity	Spatial scale	Duration	Probability
7	Very significant impact on the environment. Irreparable damage to highly valued species, habitat or eco system. Persistent severe damage.	International The effect will occur across international borders	Permanent: No Mitigation No mitigation measures of natural process will reduce the impact after implementation.	Certain/ Definite. The impact will occur regardless of the implementation of any preventative or corrective actions.
6	Significant impact on highly valued species, habitat or ecosystem.	National Will affect the entire country	Permanent: Mitigation Mitigation measures of natural process will reduce the impact.	Almost certain/Highly probable It is most likely that the impact will occur.
5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate	Province/ Region Will affect the entire province or region	Project Life The impact will cease after the operational life span of the project.	Likely The impact may occur.
4	Serious medium term environmental effects. Environmental damage can be reversed in less than a year	Municipal Area Will affect the whole municipal area	Long term 6-15 years	Probable Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem function. Rehabilitation requires intervention of external specialists and can be done in less than a month.	Local Local extending only as far as the development site area	Medium term 1-5 years	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.
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants.	Limited Limited to the site and its immediate surroundings	Short term Less than 1 year	Rare/ improbable Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures

Rating	Severity	Spatial scale	Duration	Probability
1	Limited damage to minimal area of low significance, (eg ad hoc spills within plant area). Will have no impact on the environment.	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month	Highly unlikely/None Expected never to happen.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in the EMP. The significance of an impact is then determined and categorised into one of four categories, as indicated in **Error! Reference source not found.** and **Error! Reference source not found.**.

Table 9-2: **Significance scale**

Significance									
		Consequence (severity + scale + duration)							
		1	3	5	7	9	11	15	18	21
Probability / Likelihood	1	1	3	5	7	9	11	15	18	21
	2	2	6	10	14	18	22	30	36	42
	3	3	9	15	21	27	33	45	54	63
	4	4	12	20	28	36	44	60	72	84
	5	5	15	25	35	45	55	75	90	105
	6	6	18	30	42	54	66	90	108	126
	7	7	21	35	49	63	77	105	126	147

Table 9-3: **Significance rating**

Significance		
High (Major)	**108- 147**	
Medium-High (Moderate)	**73 - 107**	
Medium-Low (Minor)	**36 - 72**	
Low (Negligible)	**0 - 35**	

The project activities listed in **Error! Reference source not found.** below will be assessed as part of the impact assessment.

Table 9-4: Project activities

Phase	#	**Activity**

Construction	1	Site Clearing: Removal of topsoil & vegetation
	2	Construction of any surface infrastructure e.g. haul roads, pipes, storm water diversion berms (including transportation of materials & stockpiling)
	3	Blasting and development of initial boxcut for mining (incl. stockpiling from initial cuts).
Operation	5	Removal of overburden and backfilling when possible (including drilling/blasting hard overburden & stockpiling)
	6	Use and maintenance of haul roads (incl. transportation of coal to washing plant)
	7	Removal of coal (mining process) and ROM coal Stockpile
	10	Concurrent replacement of overburden, topsoil and revegetation
Decommissioning	11	Demolition & Removal of all infrastructure (incl. transportation off site)
	12	Rehabilitation (spreading of soil, re-vegetation & profiling/contouring)

9.1 Construction phase

9.1.1. Site clearing

The noise from the machinery could potentially impact on the noise sensitive receivers

Table 9-5: Site clearing impact assessment

Parameter	Impact Pre-Mitigation		Impact Post-Mitigation	
Duration (7)	Short term	2	Short term	2
Scale (7)	Local	3	Local	3
Severity (7)	Minor impacts	2	Minor impacts	2
Likelihood (7)	Probable	4	Unlikely	3
Significance	Low	28	Low	21

Mitigation measures: Please refer to section 12 for the mitigation measures that give effect to the post-mitigation significance value

9.1.2. Construction of any surface infrastructure

The noise from the machinery could potentially impact on the noise sensitive receivers

Table 9-6: Construction of infrastructure impact assessment

Parameter	Impact Pre-Mitigation		Impact Post-Mitigation	
Duration (7)	Short term	2	Short term	2
Scale (7)	Local	3	Local	3
Severity (7)	Minor impacts	2	Minor impacts	2
Likelihood (7)	Probable	4	Unlikely	3
Significance	Low	28	Low	21

Mitigation measures: Please refer to section 12 for the mitigation measures that give effect to the post-mitigation significance value

9.1.3. Blasting and development of initial box cut

The noise from the blasting activities could potentially impact on the noise sensitive receivers

Table 9-7: Blasting impact assessment

Parameter	Impact Pre-Mitigation		Impact Post-Mitigation	
Duration (7)	Short term	2	Short term	2
Scale (7)	Local	3	Local	3
Severity (7)	Serious medium term	4	Serious medium term	4
Likelihood (7)	Almost certain	6	Likely	5
Significance	Medium low	54	Medium low	45

Mitigation measures: Please refer to section 12 for the mitigation measures that give effect to the post-mitigation significance value

9.2 Operational phase

9.2.1. Removal of overburden and backfilling

The noise from the machinery could potentially impact on the noise sensitive receivers

Table 9-8: Removal of overburden and backfilling impact assessment

Parameter	Impact Pre-Mitigation		Impact Post-Mitigation	
Duration (7)	Project life	5	Project life	5
Scale (7)	Local	3	Local	3
Severity (7)	Minor impacts	2	Minor impacts	2
Likelihood (7)	Probable	4	Unlikely	3
Significance	Medium low	40	Medium low	30

Mitigation measures: Please refer to section 12 for the mitigation measures that give effect to the post-mitigation significance value

Table 9-9: Blasting impact assessment

Parameter	Impact Pre-Mitigation		Impact Post-Mitigation	
Duration (7)	Project life	5	Project life	5
Scale (7)	Local	3	Local	3
Severity (7)	Minor impacts	2	Minor impacts	2
Likelihood (7)	Probable	4	Unlikely	3
Significance	Medium low	40	Medium low	30

Mitigation measures: Please refer to section 12 for the mitigation measures that give effect to the post-mitigation significance value

9.2.2. Use and maintenance of haul roads

The noise from the haul trucks could potentially impact on the noise sensitive receivers

Table 9-10: Use and maintenance of haul roads impact assessment

Parameter	Impact Pre-Mitigation		Impact Post-Mitigation	
Duration (7)	Project life	5	Project life	5
Scale (7)	Local	3	Local	3
Severity (7)	Minor impacts	2	Minor impacts	2

Likelihood (7)	Probable	4	Unlikely	3
Significance	Medium low	40	Medium low	30

Mitigation measures: Please refer to section 12 for the mitigation measures that give effect to the post-mitigation significance value

9.2.3. Removal of coal

The noise from the front end loader as well as haul trucks could potentially impact on the noise sensitive receivers

Table 9-11: Removal of coal impact assessment

Parameter	Impact Pre-Mitigation		Impact Post-Mitigation	
Duration (7)	Project life	5	Project life	5
Scale (7)	Local	3	Local	3
Severity (7)	Minor impacts	2	Minor impacts	2
Likelihood (7)	Probable	4	Unlikely	3
Significance	Medium low	40	Medium low	30

Mitigation measures: Please refer to section 12 for the mitigation measures that give effect to the post-mitigation significance value

9.2.4. Concurrent replacement of overburden and revegetation

The noise from the machinery could potentially impact on the noise sensitive receivers

Table 9-12: Concurrent replacement of overburden and revegetation impact assessment

Parameter	Impact Pre-Mitigation		Impact Post-Mitigation	
Duration (7)	Project life	5	Project life	5
Scale (7)	Local	3	Local	3
Severity (7)	Minor impacts	2	Minor impacts	2
Likelihood (7)	Probable	4	Unlikely	3
Significance	Medium low	40	Medium low	30

Mitigation measures: Please refer to section 12 for the mitigation measures that give effect to the post-mitigation significance value

9.3 Decommissioning phase

9.3.1. Demolition and removal of all infrastructure

The noise from the machinery could potentially impact on the noise sensitive receivers

Table 9-13: Demolition and removal of all infrastructure impact assessment

Parameter	Impact Pre-Mitigation		Impact Post-Mitigation	
Duration (7)	Short term	2	Short term	2
Scale (7)	Local	3	Local	3
Severity (7)	Minor impacts	2	Minor impacts	2
Likelihood (7)	Probable	4	Unlikely	3
Significance	Low	28	Low	21

Mitigation measures: Please refer to section 12 for the mitigation measures that give effect to the post-mitigation significance value

9.3.2. Rehabilitation

The noise from the machinery could potentially impact on the noise sensitive receivers

Table 9-14: Rehabilitation impact assessment

Parameter	Impact Pre-Mitigation		Impact Post-Mitigation	
Duration (7)	Short term	2	Short term	2
Scale (7)	Local	3	Local	3
Severity (7)	Minor impacts	2	Minor impacts	2
Likelihood (7)	Probable	4	Unlikely	3
Significance	Low	28	Low	21

Mitigation measures: Please refer to section 12 for the mitigation measures that give effect to the post-mitigation significance value

10 RECOMMENDATIONS

It is recommended that the current placement of the soil berms and overburden dumps be kept as per the current mine plan. The current placement of the soil berms and overburden dumps offers significant noise protection towards the surrounding noise sensitive receivers as calculated by the noise dispersion model.

It is also recommended that a noise monitoring programme be implemented to monitor noise levels at the noise sensitive receivers. For details on the monitoring programme please refer to section 14.

11 MITIGATION MEASURES

The objectives described for the recommended mitigation and/or management measures for each identified impact associated with each activity are presented below in Table 11-1 to Table 11-3. The before mentioned tables list the relevant activities for each phase of the mining operation and provides information pertaining to the legal requirements, recommended actions plans, timing, responsible person and significance after mitigation.

Table 11-1: Information pertaining to the recommended mitigation measures for the construction phase.

Activity	Objectives	Mitigation/Management measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person
Infrastructure construction; Water management activities and Mining development area.	To prevent the noise emanating from the construction machinery from impacting on the sensitive noise sensitive receivers	A noise barrier in the form of a berm should be constructed on the northern boundary of the proposed opencast area 5 as soon as possible, so that it is situated between the main noise source noise sensitive receiver BN2. The berm will help with the attenuation of noise produced by the mining activities. A basic rule of thumb for barrier height is: Any noise barrier should be at least as tall as the line-of-sight between the noise source and the receiver, plus 30%. So if the line-of-sight is 10m high, then the barrier should be at least 13m tall for best performance (Sound Fighter Systems, 2007). Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; Switching off equipment when not in use; and Fixed noise producing sources such as generators, pump stations and crushers to be to be either housed in enclosures or barriers put up around the noise source. The barriers should be installed between the noise source and sensitive noise receptor, as close to the noise source as possible.	Vehicles to be service according to service plan. Machinery to be switched off when not in use.	National Environmental Management Air Quality Act (Act 39 of 2004) Environmental Conservation Act (Act 73 of 1989)	Noise monitoring programme to be followed. Regular vehicle inspections.	Construction	Environmental Manager
Blasting activities	To prevent the noise emanating from the blasting from impacting on the sensitive noise sensitive receivers	As for the blasting operations it is generally intermittent and should be limited to daylight hours when ambient noise levels are highest. The following with regards to blasting operations is recommended: The use of millisecond delays between rows of blast holes in a given blasting pattern in order to reduce the amount of explosive charge detonated at any given instant is recommended (Sengupta,1993); Reduction of the powder factor, that is, use of less explosive per cubic yard of overburden; Restriction of blasting to daylight hours are mitigation measures that should be followed (Sengupta, 1993); and Maintaining good public relations with the surrounding communities i.e warning the local communities in advance before blasts.	Before every blast.	National Environmental Management Air Quality Act (Act 39 of 2004) Environmental Conservation Act (Act 73 of 1989)	Noise and Vibration monitoring	Construction	Environmental Manager

Table 11-2: Information pertaining to the recommended mitigation measures for the operational phase.

Activity	Objectives	Mitigation/Management measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person
Mining and process activities	To prevent the noise emanating from the mining machinery from impacting on the sensitive noise sensitive receivers	Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; Switching off equipment when not in use; and Fixed noise producing sources such as generators, pump stations and crushers to be to be either housed in enclosures or barriers put up around the noise source. The barriers should be installed between the noise source and sensitive noise receptor, as close to the noise source as possible. A basic rule of thumb for barrier height is: Any noise barrier should be at least as tall as the line-of-sight between the noise source and the receiver, plus 30%. So if the line-of-sight is 10m high, then the barrier should be at least 13m tall for best performance (Sound Fighter Systems, 2007).	Vehicles to be service according to service plan. Machinery to be switched off when not in use.	National Environmental Management Air Quality Act (Act 39 of 2004) Environmental Conservation Act (Act 73 of 1989)	Noise monitoring programme to be followed. Regular vehicle inspections.	Operational phase	Environmental Manager
Blasting activities	To prevent the noise emanating from the blasting from impacting on the sensitive noise sensitive receivers	As for the blasting operations it is generally intermittent and should be limited to daylight hours when ambient noise levels are highest. The following with regards to blasting operations is recommended: The use of millisecond delays between rows of blast holes in a given blasting pattern in order to reduce the amount of explosive charge detonated at any given instant is recommended (Sengupta, 1993); Reduction of the powder factor, that is, use of less explosive per cubic yard of overburden; Restriction of blasting to daylight hours are mitigation measures that should be followed (Sengupta, 1993); and Maintaining good public relations with the surrounding communities, i.e warning the local communities in advance before blasts.	Before every blast.	National Environmental Management Air Quality Act (Act 39 of 2004) Environmental Conservation Act (Act 73 of 1989)	Noise and Vibration monitoring	Operational phase	Environmental Manager

Table 11-3: Information pertaining to the recommended mitigation measures for the decommissioning phase.

Activity	Objectives	Mitigation/Management measure	Frequency of mitigation	Legal Requirements	Recommended Action Plans	Timing of implementation	Responsible Person
Rehabilitation activities.	To prevent the noise emanating from the machinery from impacting on the sensitive noise sensitive receivers	Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; Switching off equipment when not in use; and Limiting decommissioning activities to daylight hours where possible.	Vehicles to be service according to service plan. Machinery to be switched off when not in use.	National Environmental Management Air Quality Act (Act 39 of 2004) Environmental Conservation Act (Act 73 of 1989)	Noise monitoring programme to be followed. Regular vehicle inspections.	Decommissioning phase	Environmental Manager

12 CUMULATIVE IMPACTS

Cumulative impacts should be considered for the overall improvement of ambient noise levels. The proposed project is considered a causative source of noise pollution of a minor significance that may contribute to the increase of the ambient noise levels in the area.

The existing noise sources in the area of the proposed project is the mining activities 1.5km to the north of the proposed Brakfontein open cast areas 1 and 2 as well as the surrounding agricultural activities.

If the dormant Norwesco coal mine becomes operational and if more coal mines start up in the area then the cumulative impacts in terms of the Brakfontein coal mine may potentially be more significant

Noise levels from the proposed project must therefore be monitored to determine potential sources of noise, increases and decreases in noise levels, and determine level of mitigation required. A grievance mechanism should be introduced whereby noise sensitive receivers and people in the area can may a complaint regarding noise levels. In this event each complaint is to be investigated to determine the source and possible noise reduction measures. The grievance mechanism forms part of the public participation programme.

After post closure phase of the proposed project, overall ambient levels will decrease to the pre-mining baseline and the cumulative impacts in the area could improve.

13 KNOWLEDGE GAPS

Due to the nature of the environmental noise impact assessment as well as that all baseline noise measurements were carried out to satisfactory requirements, No knowledge gaps were identified.

14 ENVIRONMENTAL MONITORING PROGRAMME

It is recommended that the monitoring plan be implemented to determine potential sources of noise, increases and decreases in noise levels, and determine level of mitigation required. Components to be included in the proposed monitoring plan are discussed below.

Noise monitoring is to be conducted on a quarterly basis throughout the construction phase to determine the impact of the noise levels on the relevant noise sensitive receivers as well as determine the level of mitigation. Once it is established that the mitigation measures have decreased the specific noise levels from the mining activities, the noise monitoring should be carried out on a bi-annual basis thereafter throughout the life of mine. The noise measurements should be taken as per the baseline noise measurement locations of this report. A report must be compiled quarterly/ bi-annual, depending on the intervals of the monitoring programme then submitted to management to ascertain compliance with the required standards. Mine management should be advised of any significant increase in the ambient sound level as operations continue. At each measurement point the ambient noise level will be sampled in terms of the following parameters:

- The A-weighted equivalent sound pressure level (LAeq) for duration not less than 30 minutes per monitoring point.
- Measurements to be taken during both daytime (06:00 to 22:00) and the night time (22:00 to 06:00).

15 CONCLUSION

It is expected that, during the life of mine of the proposed project, the noise levels generated by the mining activities will have a minor significant impact on the ambient noise level at noise sensitive receivers. It is expected that the impact will be of a minor significance because of the relative short duration of the construction phase. During the operational phase the noise levels are expected to impact even less because of the pit walls, soil berms and overburden dumps that will mitigate the noise propagation by acting as natural noise barriers.

16 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

South African National Standard - Code of practice, SABS 0357:2004, *The Calculation of Sound Propagation by the Concawe Method.*

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Brüel & Kjær, Sound & Vibration Measurement A/S. *Environmental Noise,* 2001

Sound Fighter Systems 2007, *Sound Fighter Systems USA*, Shreveport, Los Angeles, viewed 22 October 2009, < http://www.soundfighter.com/content.asp?page=20 >

Sengupta, M. *Environmental Impacts of Mining: Monitoring, Restoration, and Control*. CRC Press, 1993.

Appendix A: CV & Declaration of Independence

SPECIALIST DECLARATION OF INDEPENDENCE

I, Lukas Sadler, declare that I –

- Act as the independent specialist for the undertaking of a specialist section for the proposed project;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2006;
- Do no have nor will have a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2006;

Lukas Sadler

Name of the specialist

Signature of the specialist

Digby Wells Environmental

Name of company

15/08/12

Date

Curriculum Vitae

Lukas Sadler

Environmental Consultant

Digby Wells Environmental

EDUCATION

2002 – 2004: BCom Environmental Management (North West University)

2009: Short course in Occupational and Environmental Noise

2010: Short course in Air Quality Management

PROFESSIONAL AFFILIATIONS

The National Association for Clean Air (NACA)

EMPLOYMENT

May 2006 – July 2007: West View Rail (Pty) Ltd (London)

November 2007 - Present: Digby Wells and Associates

EXPERIENCE

During my two year stay in London from September 2005 – September 2007, I worked for West View Rail (pty) ltd on the London Underground.

I am currently working at Digby Wells Environmental in the GIS and Air Quality Department, where I am responsible for the Air Quality and Noise Impact Assessments relating to EIA/EMP's, as well as assisting with the compilation of reports such as environmental impact assessments.

PAST PROJECTS

Xstrata, Mpumulanga: Duiker 15 – Air Quality Impact Assessment

Xtrata, Mpumulanga: Spitzkop – Environmental Noise Impact Assessment

Xtrata, Mpumulanga: Tselentis – Environmental Noise Impact Assessment

Mineral Corporation, Mpumalanga : Bankfontein – Air Quality and Noise Impact Assessments

Mashala Resources, Mpumalanga : Dust fallout monitoring programme

Universal Coal, Kangala: Noise Impact Assessment