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Sibanye Gold Limited's West Rand Tailings Retreatment Project

Noise Impact Assessment Report

Project Number:

GOL2376

Prepared for:

Sibanye Gold Limited

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Digby Wells and Associates (South Africa) (Pty) Ltd
(Subsidiary of Digby Wells & Associates (Pty) Ltd). Co. Reg. No. 2010/008577/07. Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191. Private Bag X10046, Randburg, 2125, South Africa
Tel: +27 11 789 9495, Fax: +27 11 789 9498, info@digbywells.com, www.digbywells.com

Directors: DJ Otto, GB Beringer, LF Koeslag, AJ Reynolds (Chairman) (British)*, J Leaver*, GE Trusler (C.E.O)
*Non-Executive

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Name	Responsibility	Signature	Date
Lukas Sadler	Report Compiler		July 2015
Renée van Aardt	Report Reviewer		July 2015

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EXECUTIVE SUMMARY

Sibanye Gold Limited (SGL) proposes to develop the West Rand Tailings Retreatment Project (hereafter referred to as the WRTRP). The ultimate WRTRP involves the construction of a large-scale Central Processing Plant (CPP) for the recovery of gold, uranium and sulfur from the available resources. The CPP, centrally located to the West Rand resources, will be developed in phases to eventually treat up to 4Mt/month of historic tailings inclusive of current arisings. The secondary tailings will be deposited on a modern tailings storage facility (TSF) called the regional TSF (RTSF).

Once commissioned the project will initially reclaim and treat the TSFs at a rate of 1.5 Mt/m (1Mt/m from Driefontein 3 (followed sequentially by Driefontein 5 and C4S) and 0.5 Mt/m from Cooke TSF). Reclamation and processing capacity will ultimately ramp up to 4 Mt/m over an anticipated period of 8 years. At the 4 Mt/m tailings retreatment capacity, each of the Northern, Southern and Western blocks will be reclaimed and processed simultaneously.

Digby Wells Environmental (Digby Wells) has been appointed by SGL as the independent Environmental Assessment Practitioner (EAP) to conduct an Environmental Impact Assessment (EIA). The EIA is undertaken in terms of the Minerals and Petroleum Resource Development Act, 2002 (Act No. 28 of 2002) (MPRDA) as well as National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

This report assesses the potential noise impacts of the proposed project on the ambient noise climate of the area. The approach used the Gauteng Noise Control Regulations (GN 5479:1999), which in turn refers to the SANS 10103:2008 (The measurement and rating of environmental noise with respect to nuisance and speech communication), to assess the baseline and potential impacts.

This environmental noise impact assessment report forms part of the larger EIA/EMP report and entails:

- Identification of noise sources and potential noise sensitive receptors;
- Screening assessment of the ultimate project;
- Establish baseline noise climate at various locations around the proposed project area;
- Assess the anticipated noise impacts associated with the project activities during the construction, operational, decommissioning and post-closure phases; and
- Provide relevant mitigation measures, a management plan and monitoring programme.

The baseline conditions indicate that the existing ambient noise levels at the surrounding receptors are typical of suburban and rural districts with frequent road traffic. The daytime levels measured between 44 dBA and 52 dBA, while the night time levels measured

between 40 dBA and 52 dBA. The surrounding receptors include residential homesteads, farm steads as well as townships.

Noise dispersion modelling was undertaken for the worst case LAeq at any receiver located 360 degrees in the horizontal plane around the noise sources. The noise modelling software is limited to calculating the predominant wind direction (or downwind conditions of propagation) per single receptor only. Calm wind conditions have therefore been included in the model due to the number of surrounding receptors. Thus, the noise dispersion plots do not represent a typical seasonal scenario in the predominant wind direction but rather a yearly average of the area's meteorological conditions in all directions.

The anticipated impacts are considered negligible and are not likely to cause disturbance to the surrounding receptors. The main reason for the negligible impact is that the expected noise levels from the project will measure below the existing day and night time baseline noise levels and subsequently measure below the SANS 10103:2008 rating levels as referred to by the Gauteng Noise Control Regulations.

The conclusion of the screening assessment of the ultimate project is firstly, the reclamation process of the TSFs via hydraulic method using water monitors generally do not cause high noise levels because very little infrastructure and machinery is used. The main infrastructure including the water monitor, sump and pump station are situated on site and therefore the noise will be limited to site.

Secondly, the associated pipelines will have a negligible noise impact on the surrounding noise sensitive environment due to the short term duration of the construction phase. During the operational phase of the ultimate project the slurry flow rate may cause water hammer noise produced from inside the pipelines but with regular service maintenance it can be mitigated.

The overall conclusion of the ultimate project, taking into account the conclusion for the project components assessed in detail in this report as well as the conclusion of the screening assessment, is that the noise impact is negligible. It is recommended that the project should go ahead without additional engineering noise control measures than what is stipulated in the EMP section of this report.

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Abbreviation	Description
Acronyms and Abbreviations	
AWTF	Advanced Water Treatment Facility
BWSF	Bulk Water Storage Facility
C4S	Cooke 4 South TSF
CPP	Central Processing Plant
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
ESIA	Environmental and Social Impact Assessment
NBT	North Block Thickener
PCDs	Pollution Control Dams
RTSF	Regional Tailings Storage Facility
RWD	Return Water Dam
SANS	South African National Standards
SBT	South Block Thickener
TSF	Tailings Storage Facility
WBT	West Block Thickener
WRD	Waste Rock Dump
WRTRP	West Rand Tailings Retreatment Project
Terms	
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 2 of SANS 10103:2008
Water hammer	When a pipe is suddenly closed at the outlet (downstream), the mass of water/slurry before the closure is still moving, thereby building up high pressure and a resulting shock wave. This is experienced as a loud banging, resembling a hammering noise.

1 Introduction

There is a long history of gold and uranium mining in the broader West Rand area with an estimated 1.3 billion tonnes of surface tailings, containing in excess of 170 million pounds of uranium and 11 million ounces of gold. Sibanye Gold Limited (SGL) currently owns the majority of the tonnage and its gold and uranium content. SGL plans to ultimately exploit all these resources to develop a strong, long life and high yield surface business. Key to the successful execution of this development strategy is the West Rand Tailings Retreatment Project (WRTRP). The concept of the WRTRP is well understood with an 8 year history of extensive metallurgical test work, feasibility studies and design by a number of major mining houses. A pre-feasibility study (PFS) completed during 2013 for the WRTRP has confirmed that there is a significant opportunity to extract value from the SGL surface resources in a cost effective sequence.

1.1 Project Background

Simplistically, SGL's surface historical TSF holdings in the West Rand can be divided into three blocks; the Northern, Southern and Western Blocks. Each of these blocks contains a number of historical TSFs. Each of the blocks will be reclaimed in a phased approach. Initially the Driefontein 3 TSF (Western Block) together with the Cooke TSF (Northern Block) will be reclaimed first. Following reclamation of Driefontein 3 TSF, Driefontein 5 TSF (Western Block) and Cooke 4 Dam south (C4S) (Southern Block) will be reclaimed.

- Western Block comprises: Driefontein 1, 2, 3, 4 and 5 TSF, and Libanon TSF. Once the Driefontein 3 and 5 TSFs have been depleted the remainder of the Driefontein TSFs, namely Driefontein 1, 2 and 4 and the Libanon TSF, will be processed through the CPP;
- Northern Block comprises: Cooke TSF, Venterspost North TSF, Venterspost South TSF and Millsite Complex (38, 39 and 40/41 and Valley). Venterspost North and South TSFs and Millsite Complex (38, 39 and 40/41 and Valley) will be processed with the concurrent construction of Module 2 float and gold plants; and
- Southern Block comprises: Kloof No.1 TSF, Kloof No.2 TSF, South Shaft TSF (future), Twin Shaft TSF (future), Leeudoorn TSF and C4S TSF. Following completion of the Module 3 float and gold plants, Kloof 1 and 2 TSFs, South Shaft TSF (future), Twin Shaft TSF (future) and Leeudoorn TSF will be reclaimed.

Once commissioned the project will initially reclaim and treat the TSFs at a rate of 1.5 Mt/m (1 Mt/m from Driefontein 3 (followed sequentially by Driefontein 5 and C4S) and 0.5 Mt/m from Cooke TSF). Reclamation and processing capacity will ultimately ramp up to 4 Mt/m over an anticipated period of 8 years. At the 4 Mt/m tailings retreatment capacity, each of the blocks will be reclaimed and processed simultaneously.

The tailings material will be centrally treated in the CPP. In addition to gold and uranium extraction, sulfur will be extracted to produce sulphuric acid, an important reagent required for uranium leaching.

To minimise the upfront capital required for the WRTRP, only essential infrastructure will be developed during initial implementation. Use of existing and available infrastructure may be used to process gold and uranium until the volumetric increase in tonnage necessitates the need to expand the CPP.

The authorisation, construction and operation of a new deposition site for the residue from the CPP will be located in an area that has been extensively studied as part of the original West Wits Project (WWP) and Cooke Uranium Project (CUP). The “deposition area” on which the project is focussing, has been termed the RTSF and is anticipated to accommodate the entire tonnage from the district. The RTSF if proved viable will be one large facility as opposed to the two independent deposition facilities proposed by the WWP and CUP respectively.

Note: Amendments to various Mine Works Programmes (MWPs) and Environmental Management Plans (EMPs) will be applied for in due course pending the inclusion of additional TSFs as the WRTRP grows to process 4 Mt/m. The RTSF will be assessed for the complete footprint to ensure that the site is suitable for all future deposition requirements.

1.2 Initial Implementation

Due to capital constraints in developing a project of this magnitude, it needs to be implemented over time. The initial investment and development will be focused on those assets that will put the project in a position to partially fund the remaining development.

This entails the design and construction of the CPP (gold module, floatation plant, uranium plant, acid plant and a roaster), to retreat up to 1.5 Mt/m from the Driefontein 3 and 5 TSFs, C4S TSF and the Cooke TSF. Driefontein 3, 5 and C4S TSFs will be mined sequentially over 11 years, whilst the Cooke TSF will be mined concurrent to these for a period of 16 years. The resultant tailings will be deposited onto the new RTSF.

A high grade uranium concentrate, produced at the CPP, will be transported to Ezulwini (50k tonnes per month) for the extraction of uranium and gold. The tailings from this process will be deposited on the existing operational Ezulwini North TSF.

The following primary activities of the WRTRP need to be assessed in the EIA:

Table 1-1: Primary activities of the WRTRP's initial implementation

Category	Activity
Kloof Mining Right area	
Infrastructure	Pipeline Routes (residual tailings).
	Central processing Plant (CPP) incorporating Module 1 float and gold plants and uranium, roaster and acid plants.
	The Regional Tailings Storage Facility (RTSF), RTSF Return Water Dam (RWD) and the Advanced Water Treatment Facility (AWTF). Collectively known as the RTSF complex.
Processes	Abstraction of water from K10 shaft
	Disposal of the residue from the AWTF.
	Gold, uranium and sulfur extraction at the CPP (tailings to RTSF)
	Water distribution at the AWTF for discharge.
Pumping	Pumping of up to 1.5 Mt/m of tailings to the RTSF.
	Pumping water from the RTSF return water dams to the AWTF.
	Discharging treated water to the Leeuspruit.
Electricity supply	Power supply from Kloof 1 substation to the CPP.
	Power supply from Kloof 4 substation to the RTSF and AWTF.
Driefontein Mining Right area	
Infrastructure	Pipeline Routes (water, slurry and thickened tailings).
	West block Thickener (WBT) and Bulk Water Storage Facility (BWSF) complex.
	Collection sumps and pump stations at the Driefontein 3 and 5 TSFs
Processes	Hydraulic reclamation of the Driefontein 3 and 5 TSFs.
Pumping	Pumping water from K10 to the BWSF located next to the WBT.
	Pumping water from the BWSF to the Driefontein TSFs that will be reclaimed.(Dri3 & 5 TSFs)
	Pumping slurry from the TSF sump to the WBT (for Driefontein 3 and 5 TSFs).
	Pumping the thickened slurry from the WBT to the CPP.
Electricity supply	Power supply from West Driefontein 6 substation to Driefontein 3 TSF.
	Power supply from West Driefontein Gold substation to Driefontein 5 TSF.
	Power supply from East Driefontein Shaft substation to WBT and BWSF.

Category	Activity
Cooke Mining Right area	
Infrastructure	Pipeline Routes (water, slurry and thickened tailings).
	Cooke thickener and BWSF.
	Collection sumps and pump stations at the Cooke TSF.
Processes	Abstraction of water from Cooke 1 shaft.
	Hydraulic reclamation of the Cooke TSF (which include temporary storage of the slurry in a sump).
Pumping	Pumping 500 kt/m of tailings from the Cooke TSF to the Cooke thickener.
	Pumping from the Cooke thickener to the CPP via Ezulwini.
Electricity supply	Power supply from the Cooke substation to the Cooke thickener.
	Power supply from the Cooke Plant to the Cooke TSF
Ezulwini Mining Right area	
Processes	Uranium extraction at Ezulwini (tailings to Ezulwini North Dump).
	Abstraction of water from Cooke shaft.
Pumping	Pumping water from the Cooke 4 shaft to C4S TSF
	Pumping slurry from the CPP to the Ezulwini plant
	Pumping slurry from Ezulwini plant to Ezulwini North Dump
Electricity supply	Power supply from Ezulwini plant to the C4S TSF

The activities in the table below were assessed due to their noise producing components. The activities were broken up into construction, operational and decommissioning phases for each mining right area they fall under (refer to section 9.3 of this report).

Table 1-2: Activities assessed as part of the environmental noise impact assessment

Category	Activity
Infrastructure	Pipeline Routes (residual tailings).
	Central processing Plant (CPP) incorporating Module 1 float and gold plants and uranium, roaster and acid plants.
	The Regional Tailings Storage Facility (RTSF), RTSF Return Water Dam (RWD) and the Advanced Water Treatment Facility (AWTF). Collectively known as the RTSF complex.
	Pipeline Routes (water, slurry and thickened tailings).
	Collection sumps and pump stations at the Driefontein 3 and 5 TSFs
	Pipeline Routes (water, slurry and thickened tailings).
	Collection sumps and pump stations at the Cooke TSF.
Processes	Gold, uranium and sulfur extraction at the CPP (tailings to RTSF)
	Hydraulic reclamation of the Driefontein 3 and 5 TSFs.
	Hydraulic reclamation of the Cooke TSF (which include temporary storage of the slurry in a sump).
Pumping	Pumping of up to 1.5 Mt/m of tailings to the RTSF.
	Pumping water from the RTSF return water dams to the AWTF.
	Pumping water from K10 to the BWSF located next to the WBT.
	Pumping water from the BWSF to the Driefontein TSFs that will be reclaimed.(Dri3 & 5 TSFs)
	Pumping slurry from the TSF sump to the WBT (for Driefontein 3 and 5 TSFs).
	Pumping the thickened slurry from the WBT to the CPP.
	Pumping 500 kt/m of tailings from the Cooke TSF to the Cooke thickener.
	Pumping from the Cooke thickener to the CPP via Ezulwini.
	Pumping water from the Cooke 4 shaft to C4S TSF
	Pumping slurry from the CPP to the Ezulwini plant
	Pumping slurry from Ezulwini plant to Ezulwini North Dump

1.3 Terms of Reference

This report will determine the baseline noise levels and assesses the potential noise impacts of the proposed WRTRP on the ambient noise climate of the area. Based on this the potential impacts will be identified and assessed using dispersion noise modelling. The following legislation and standards are considered during the assessment:

- South African National Standards SANS 10103:2008 (The measurement and rating of environmental noise with respect to annoyance and to speech communication) (SANS 10103:2008);
- Gauteng Noise Control Regulations, GN 5479 of 1999 (PG 75 of 20 August 1999);
- The National Environmental Management Act,1998 (Act No.107 of 1998), NEMA; and
- The National Environmental Management Air Quality Act, 2004 (Act No. 39 of 2004), NEMAQA.

The Environmental Noise Impact Assessment Report includes a screening assessment for the ultimate project, baseline assessment and predicted noise impacts on the identified noise sensitive receptors for initial implementation. Potential impacts are identified and assessed using noise dispersion modelling and mitigation measures and recommendations proposed.

2 Details of the Specialist

Lukas Sadler has a B.COM degree in Geography and Environmental Management, including short courses in Environmental Noise Assessments, Environmental Noise Control and Air Quality Management as well as local and international work experience in the environmental sciences field. This includes experience working with projects in accordance with the International Finance Corporation (IFC) and World Bank standards. Lukas has also gained experience working in Mali, Senegal, Ghana, Sierra Leone, DRC, Liberia, Mozambique and Namibia. At Digby Wells, Lukas' core focus is working on environmental noise impact assessments, which includes baseline noise monitoring surveys, noise dispersion modelling and noise management programmes. A declaration of independence is attached in Appendix A and a curriculum vita (CV) is attached in Appendix B.

3 Aims and Objectives

The objective of the study is to determine the current ambient noise levels in the area and, based on the status quo, assess the significance of the potential noise impact of the proposed WRTRP. Because the project will be implemented over time, a screening level assessment is also undertaken to identify potential fatal flaws relating to implementation of the ultimate project. Mitigation and management measures will be recommended according to the significance of the potential noise impact.

4 Methodology

4.1 Literature Review and Desktop Assessment

The approach used in investigating the noise impacts is based on the Gauteng Noise Control Regulations, GN 5479 of 1999 (PG 75 of 20 August 1999) in terms of Section 25 of the Environmental Conservation Act, 1989 (Act No.73 of 1989) and the guidelines provided by SANS 10103:2008. According to the SANS 10103:2008, the sound pressure level is used as the measurement unit for noise levels. The acceptable rating levels according to SANS 10103:2008 for ambient noise in different districts (residential and non-residential) are presented in Table 4-1.

Table 4-1: 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]
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.						
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						

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 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 4-2, where LReq,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
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;		

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

4.2 Field Work

The baseline noise soundscape of the study area is characterised through noise measurements near major noise emitting components of the WRTRP. These are:

- The reclamation activities at the TSFs: Driefontein TSF 3, Driefontein TSF 5, Cook TSF and Cooke TSF 4 South the WBT, including booster slurry and water pump station locations;
- The proposed CPP;
- The RTSF, AWTF and RWD.

The criteria used to site the measurement locations are:

- The noise sensitive receptors nearest to the above mentioned TSF's,and WBT as well as nearest to the proposed CPP, RTSF, AWTF and pipeline route;
- The locations served as suitable reference points for the measurement of ambient sound levels surrounding the proposed project area. The noise measurement locations cover rural as well as suburban and urban areas that represent a comprehensive soundscape of the area; and
- The various thickener locations were excluded due to them firstly not being significant noise producers and secondly most of them being located within existing mining right processing areas.

Recent noise measurements were carried to assess the baseline conditions near the following:

- Driefontein TSF 3;
- Driefontein TSF 5;
- CPP; and
- RTSF and AWTF

The measurements were logged using a Cirrus Optimus Green, precision integrating sound level meter. The instrument was field calibrated with a Cirrus, sound level calibrator. The baseline locations are presented in Table 4-3 (refer to Plan 1 in Appendix C). Photos of the measurement locations are presented in Figure 1 to Figure 4.

Table 4-3: Recent noise measurement locations

Site ID	Farm/location	Category of Receiver	Proposed activity	GPS Coordinates
N1	Leslie Williams Private Hospital	Urban/industrial	Hydraulic mining and slurry and HP water pump station at Dri 5	26° 24.077'S & 27° 25.322'E
N2	Wildebeestkuil 360 IQ portion 6	Rural	Construction and operation of the RTSF	26° 28.459'S & 27° 36.615'E
N3	Letsatsing Village	Suburban	Hydraulic mining and slurry and HP water pump station at Dri 3	26°15'17.95"S & 28°29'22.04"E
N4	Rietfontein 349 IQ portion 42	Rural	Construction and operation of the CPP	26° 25.346'S & 27° 37.832'E

Figure 1: N1 measurement location

Figure 2: N2 measurement location

Figure 3: N3 measurement location

Figure 4: N4 measurement location

Historical baseline measurements were also used from previous studies done in the area, such as baseline information from J H Consulting for the proposed Uranium Plant and Cooke Dump reprocessing infrastructure (Hassall, J.R. 2009) as well as from Gijima AST for the proposed new Goldfields Driefontein Recovery Plant and proposed Tailings Storage Facility site (Cornelius, J. 2009). Additional baseline noise measurements were also taken at Dr. Olivier's residence on portion 2 of the farm Raatskraal 524 IQ as well as at two schools in the townships of Bekkersdal and Simunye in Westonaria in 2012.

A Cirrus Optimus Green, Type 1, integrating sound level meter with outdoor kit was used for the additional measurements. The instrument was field calibrated with a Cirrus sound level calibrator. Certificates of calibration for these instruments are available on request.

Ambient noise levels from a total of ten locations were used to describe the existing environmental noise conditions for the proposed project. The noise measurement locations are presented in Table 4-4 and illustrated on Plan 1 below. Photographs of the locations are also presented in Figure 5 to Figure 10 (no photos were taken at locations N4, N5, N6 and N7).

Table 4-4: Historical noise measurement locations

ID	Location	District	Proposed activity	GPS coordinates
N1	On the tarred access road to the site from the R559 (Hassall, J.R.2009)	Rural	Hydraulic mining and slurry and HP water pump station at Cooke TSF	26°13'7.56"S 27°43'28.68"E
N2	Near the southern boundary of the proposed uranium plant site (Hassall, J.R.2009)	Rural	Hydraulic mining and slurry and HP water pump station at Cooke TSF	26°13'18.24"S 27°44'0.00"E
N3	On the tarred access road to the Cooke site from the R559, 10m from the access road centreline and 285m from the centreline of the R559 (Hassall, J.R.2009)	Rural	Hydraulic mining and slurry and HP water pump station at Cooke TSF	26°13'21.18"S 27°42'59.34"E
N4	Tar road (road between R500 & R28) intersection (Cornelius, J.2009)	Rural	Construction and operation of the RTSF	26°28'7.93"S 27°37'11.63"E
N5	Rural land (Cornelius, J.2009).	Rural	Construction and operation of the RTSF	26°30'31.25"S 27°37'13.90"E
N6	Rural land (Cornelius, J.2009).	Rural	Construction and operation of the RTSF	26°31'24.50"S 27°40'35.08"E
N7	Rural land (Cornelius, J.2009).	Rural	Construction and operation of the RTSF	26°29'40.30"S 27°41'3.41"E
N8	Dr.Olivier's residence	Rural	Construction and operation of the RTSF	26°32'57.68"S 27°39'27.82"E
N9	Simunye Secondary School	Urban	Construction of Cooke pipeline	26°17'11.19"S 27°43'1.26"E
N10	Kamogelo Primary School	Urban	Construction of Cooke pipeline	26°19'45.18"S 27°42'4.44"E

Figure 5: N1 (Hassall, J.R.2009)

Figure 6: N2 (Hassall, J.R.2009)

Figure 7: N3 (Hassall, J.R.2009)

Figure 8: N8

Figure 9: N9

Figure 10: N10

4.3 Noise propagation modelling and impact assessment

Predictive modelling was performed for the proposed activities through the use of the modelling software SoundPlan. The software specialises in computer simulations of noise pollution dispersion. Estimates of the cumulative mining noise levels from the study were derived from the noise emissions from all the major noise-generating components and activities of the proposed project.

The following table indicates the noise power levels used in the model simulations. The sound power levels were derived from a number of previous studies.

Table 4-5: Sound power levels from main noise causing sources

Noise source	**Sound power levels dB**						
Octave band frequencies	***63Hz***	***125Hz***	***250Hz***	***500Hz***	***1000Hz***	***2000Hz***	***4000Hz***
Construction Phase							
Haul truck	107	114	115	116	111	107	101
Excavators	113	117	107	108	106	101	95
Front-end Loader	108	116	107	108	105	99	95
Track dozer	110	122	113	114	110	108	104
Rotary drill	109	118	113	113	113	112	110
Operational Phase							
Haul truck	107	114	115	116	111	107	101
Booster Pump Station	69	79	86	92	95	96	96
Concentrator Plant (CPP)	108	106	107	103	99	94	86
Octave band frequencies	***Cumulative level***						
Hydraulic Gun	108						

The noise dispersion modelling software was used to assess whether the noise from the proposed project activities will impact on the relevant noise sensitive receivers, by comparing the predicted propagating noise levels with the current ambient baseline noise levels.

According to the Gauteng Noise Control Regulations "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 2 of SANS 10103 (refer to Table 4-1 in this report). The measured ambient sound level is described in Section 7.1 and the results of the noise dispersion modelling are presented in Section 7.2.

5 Assumptions and Limitations

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

- The construction phase is assumed to be carried out during daytime hours (06:00-22:00), therefore only daytime scenarios were modelled for the construction phase.
- The resulting noise contours represent worst case (unmitigated), LAeq at any receiver located 360 degrees in the horizontal plane around the noise sources. The noise modelling software is limited to calculating the predominant wind direction (or downwind conditions of propagation) per single receptor only. Calm wind conditions have therefore been included in the model due to the number of surrounding receptors. Thus, the noise dispersion plots do not represent a typical seasonal scenario in the predominant wind direction but rather a yearly average of the area's meteorological conditions in all directions.

6 Screening Assessment

The following TSF's and associated pipelines do not form part of this environmental noise impact assessment and were only assessed at a desktop screening level:

- Western block: Driefontein TSF 1, Driefontein TSF 2, Driefontein TSF 4 and Libanon TSF;
- Northern Block: Venterspost North TSF, Venterspost South TSF and Millsite complex;
- Southern Block: Kloof TSF 1, Kloof TSF 2, South Shaft TSF, Twin Shaft TSF and Leeudoorn TSF.

The reclamation process of the TSFs via hydraulic method using water monitors generally do not cause high noise levels because very little infrastructure and machinery is used. The main infrastructure including the water monitor, sump and pump station are situated on site and therefore the noise will be limited to site. The noise will also be attenuated by the tsfs' itself assuming that reclamation starts at the following locations per TSF:

- Western side at Driefontein TSF 5;
- Northern side at Driefontein TSF 3;
- Western side at Cooke 4 South TSF; and
- Western side at Cooke TSF.

The associated pipelines will have a negligible noise impact on the surrounding noise sensitive environment due to the linear construction being of short term duration per section. During the operational phase of the ultimate project the slurry flow rate may cause water hammer noise produced from inside the pipelines but with regular service maintenance and design it can be mitigated.

From a noise perspective there are no fatal flaws for the ultimate project. Although they need to be assessed prior to implementing the future reclamation activities, it is not anticipated that there will be any significant impact.

7 Baseline Environment

7.1 Baseline Results

7.1.1 Recent Baseline Results

Agriculture is the dominant land use (primarily livestock grazing and maize farming), with the various gold mines and associated infrastructure and TSFs scattered around the project location.

The recent baseline noise measurements (N1 – N4) were taken near the following major components of the project:

- Driefontein TSF 5;
- Driefontein TSF 3;
- Proposed CPP; and
- Proposed RTSF and AWTF.

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 7-1. The noise level time history graph per noise measurement location can be seen in Figure 5 to Figure 8.

Table 7-1: Results of the baseline noise measurements

Sample ID	SANS 10103:2008 Rating Limit					
	Type of district	**Period**	**Acceptable rating level dBA**	**$L_{Areq,T}$ dBA**	**Maximum/Minimum dBA**	**Date**
N1	Urban	Daytime	60	52	80/ 39	23/02/2015
		Night time	50	52	68 / 41	23/02/2015
N2	Rural	Daytime	45	51	87 / 29	26/02/2015
		Night time	35	43	67 / 28	26/02/2015
N3	Urban	Daytime	60	44	77 / 38	02/03/2015
		Night time	50	40	66 / 37	02/03/2015
N4	Rural	Daytime	45	45	72 / 29	05/03/2015
		Night time	35	48	70 / 37	05/03/2015
	Indicates current $L_{Aeq,T}$ levels above either the daytime rating limit or the night time rating limit					

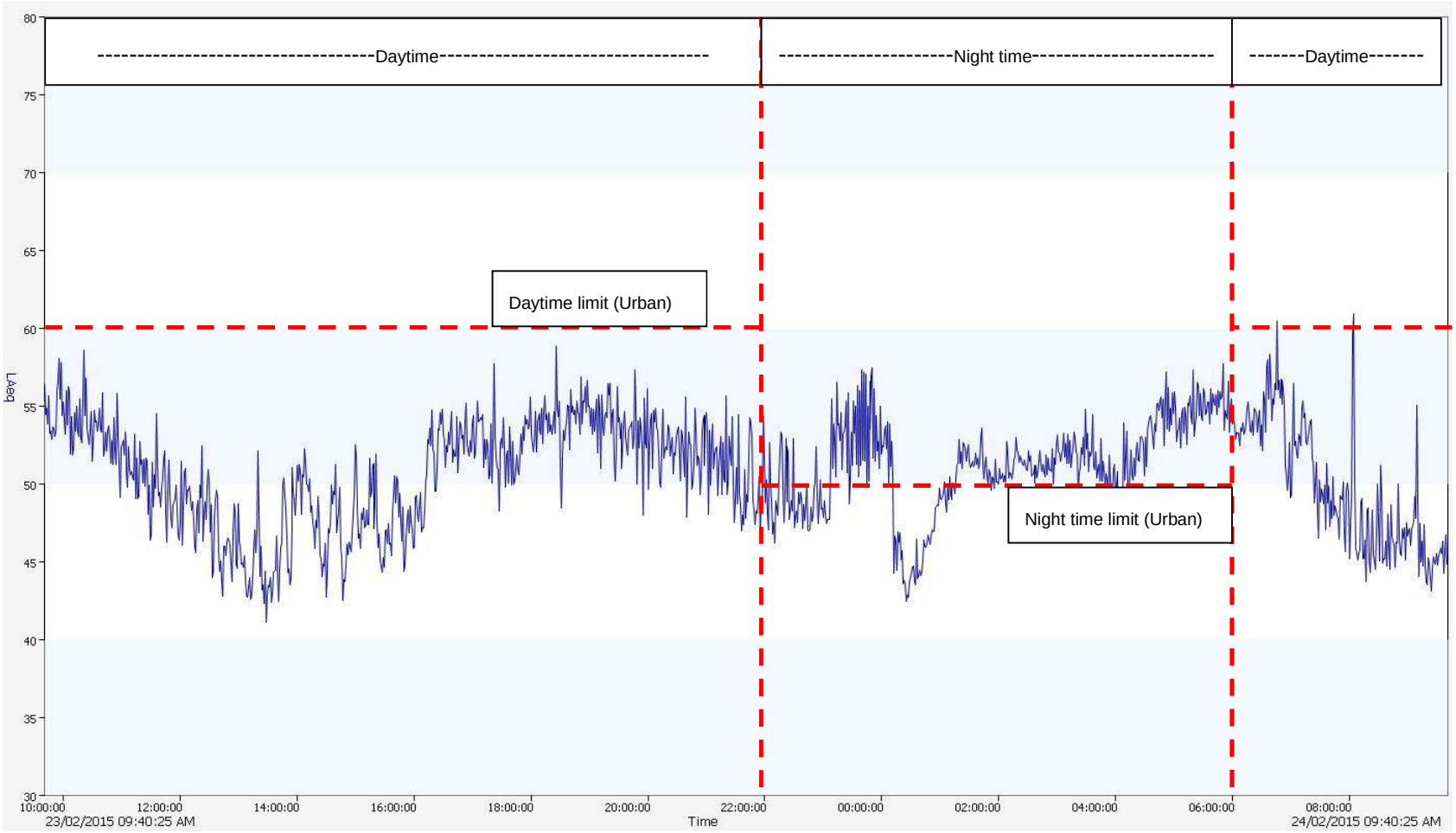

Figure 11: Noise time history graph for N1

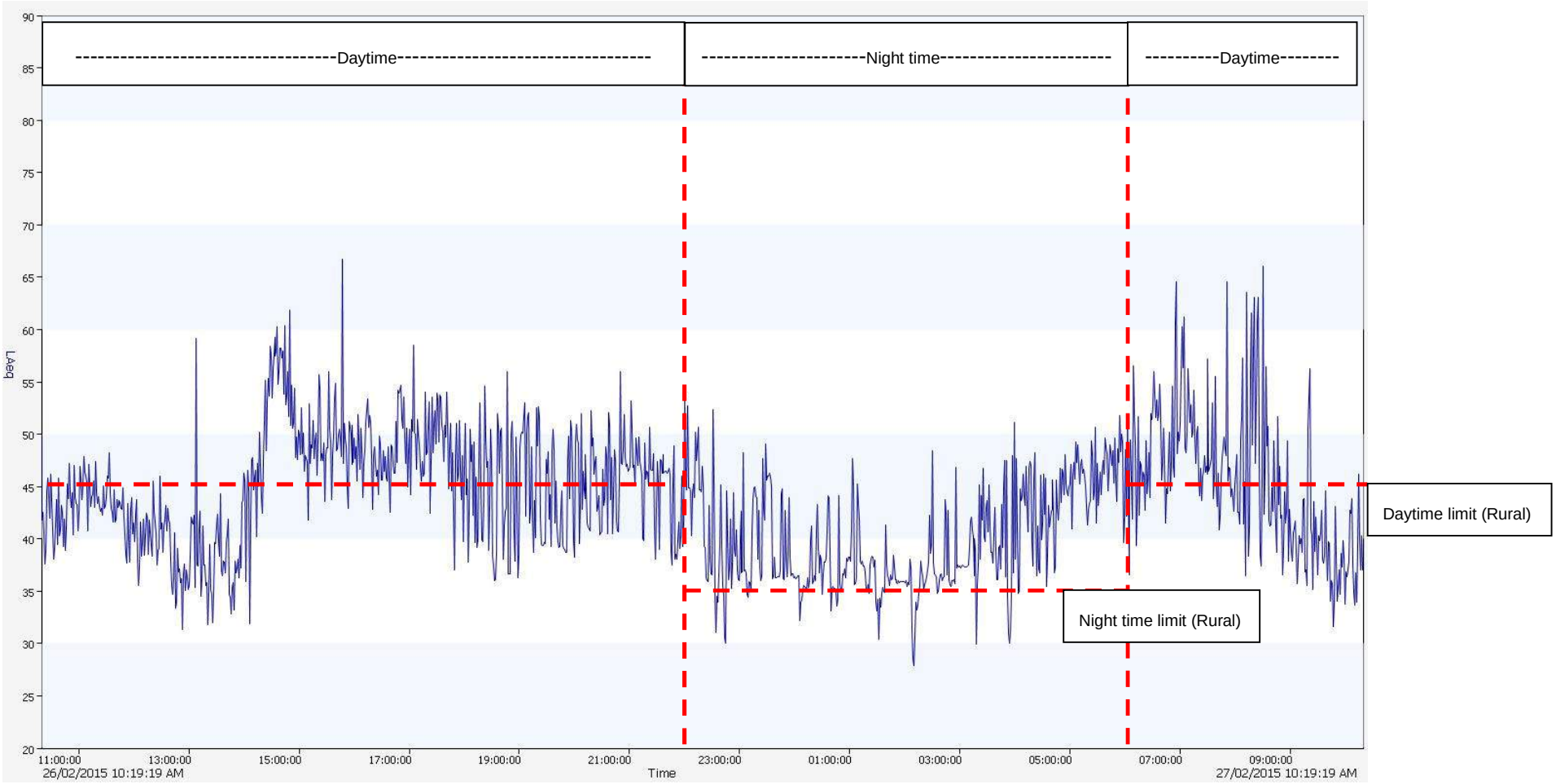

Figure 12: Noise time history graph for N2

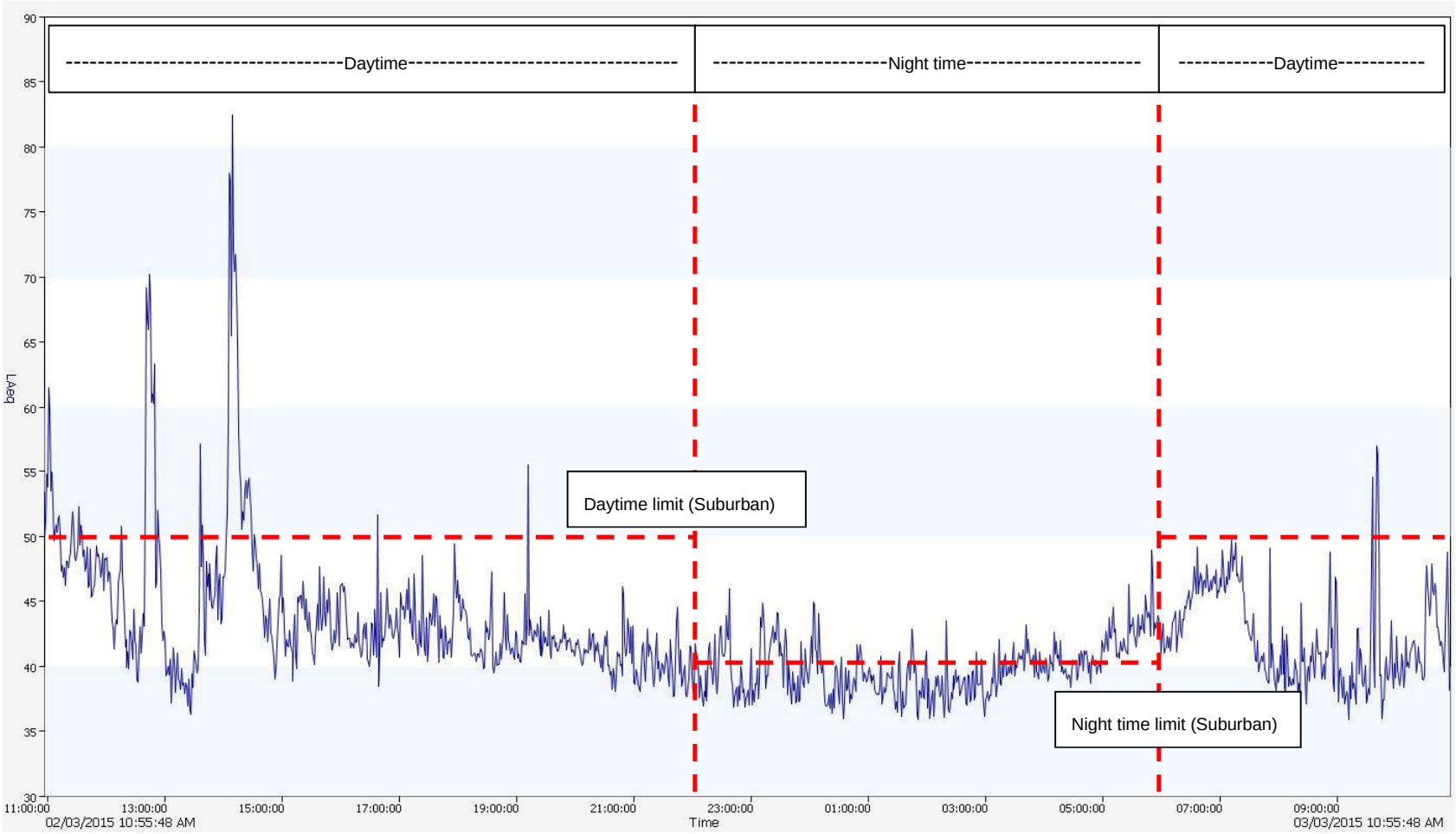

Figure 13: Noise time history graph for N3

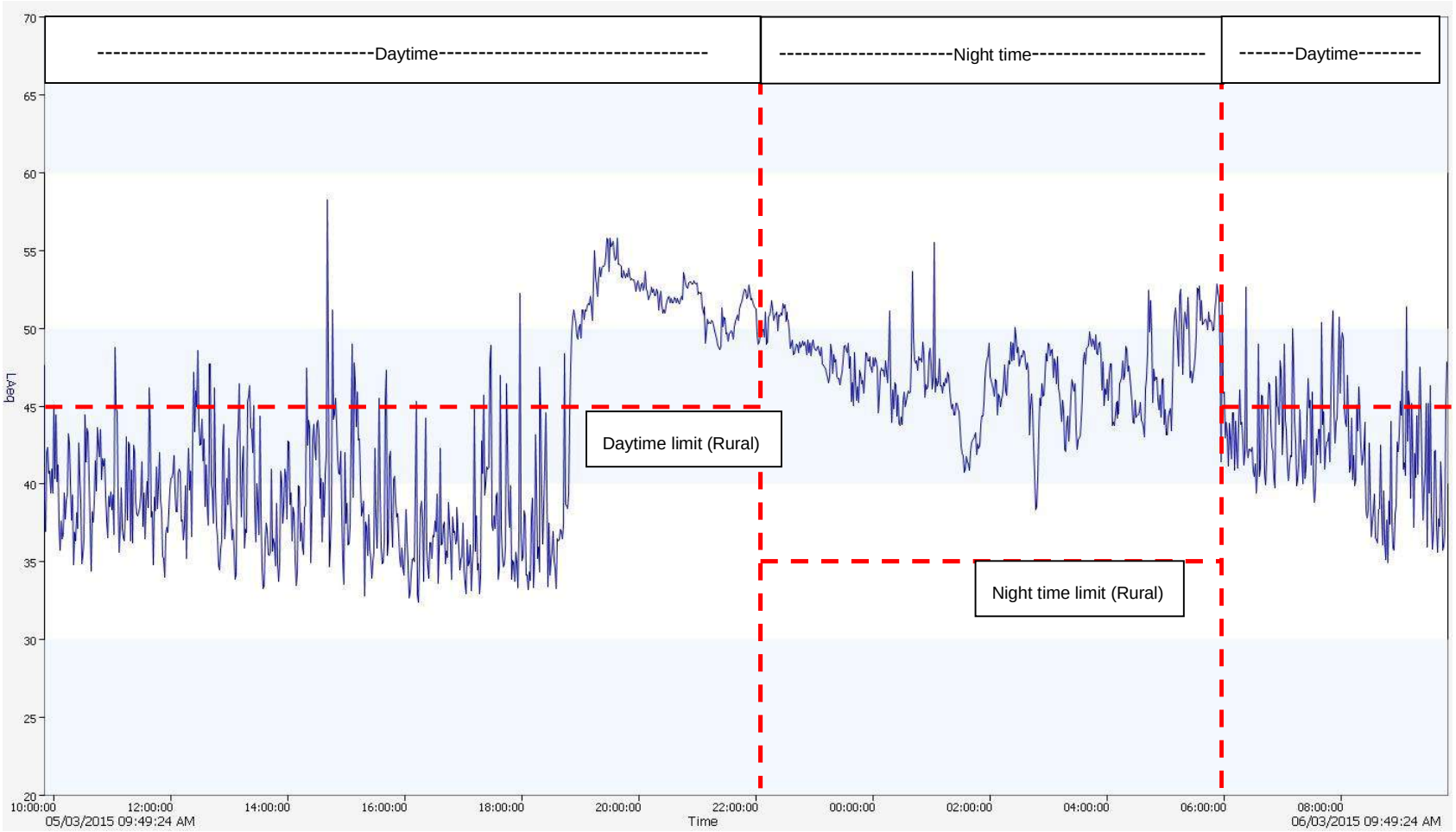

Figure 14: Noise time history graph for N4

7.1.1.1 Daytime Results

7.1.1.1.1 Driefontein TSF 5

The measurement N1 was taken at the nearest noise sensitive receptor, Leslie Williams Private Hospital, and assumed to be within an industrial area. It is deemed to be industrial as it is within the Driefontein mining right area.

Based on the daytime results, the existing ambient noise levels are below the SANS rating levels for the maximum allowable outdoor daytime limit for ambient noise in urban/industrial districts. The overall ambient noise levels at N1 were impacted by mining operations at the Driefontein Processing Plant across the road as well as the frequent vehicle traffic on the R500 road.

7.1.1.1.2 RTSF

The measurement N2 was taken at the nearest noise sensitive receptor, which was the farmstead of Mr Frans de Bruyn on Portion 6 of Wildebeestkuil 360 IQ. The location is on agricultural farmstead and seen as rural.

The baseline results indicated that the existing ambient noise is above the daytime noise guideline for rural districts. The overall ambient noise levels at N2 were impacted by birdsong and vehicle movement on the Fochville Road 200 m south of the measurement location. During the night time *Gryllidae* (crickets) were the main noise source.

7.1.1.1.3 Driefontein TSF 3

The measurement N3 was taken at the nearest noise sensitive receptor, which is Letsatsing Village. The location is seen as urban industrial zone as it is located within the Driefontein Gold Mine.

The baseline results indicated that the existing ambient noise is below the daytime noise guideline for urban districts. The overall ambient noise levels at N3 were impacted by vehicle movement on the surrounding roads, especially busses used for the local people commuting to work in the mornings and returning in the evenings. The noise from the children playing at the Letsatsing Combined School, adjacent to the residential village, can also be heard during break times. The high noise level spikes in the graph (refer to Figure 13) during the times of 13:00 and 14:00 respectively were caused by gardening services mowing the lawn near the noise meter. It was excluded as lawn mowing activities are not seen as a daily activity.

7.1.1.1.4 CPP

The measurement N4 was taken at the nearest noise sensitive receptor, which is the farmstead, portion 42 of Rietfontein 349 IQ, leased by SGL. The location is on an agricultural farmstead and seen as rural.

The baseline results indicated that the existing ambient noise is at the same level as the daytime noise guideline for rural districts. The overall ambient noise levels at N4 were impacted by operational activities at Kloof 4, birdsong and intermittent aircraft flying over the area.

7.1.1.2 Night time Results

7.1.1.2.1 Driefontein TSF 5

Based on the night time results, the existing ambient noise levels are slightly above the SANS rating levels for the maximum allowable outdoor night time limit for ambient noise in urban/industrial districts. The overall night time ambient noise levels at N1 were also impacted by mining operations at the Driefontein Processing Plant across the road as well as the frequent vehicle traffic on the R500 road.

7.1.1.2.2 RTSF

The baseline results indicated that the existing ambient noise is above the night time noise guideline for rural districts. The overall ambient noise levels at N2 were impacted by *Gryllidae* (crickets), *Cicada* and vehicle movement on the Fochville road 200 m south of the measurement location.

7.1.1.2.3 Driefontein TSF 3

The baseline results indicated that the existing ambient noise is below the level of the night time noise guideline for an urban industrial zone. The overall ambient noise levels at N3 were mainly impacted by intermittent train movement on the railway line running adjacent to the south of Letsatsing Village.

7.1.1.2.4 CPP

The baseline results indicated that the existing ambient noise is above the night time noise guideline for rural districts. The overall ambient noise levels at N4 were impacted by noise from the Kloof 4 operations as well as *Gryllidae* (crickets) and *Cicada* with intermittent birdsong.

7.2 Historical baseline results

Historical baseline results are included as they cover the project areas of:

- Cooke TSF;
- RTSF and AWTF; and
- Cooke 4 South TSF.

The measurement results taken from J H Consulting as mentioned in section 7.2 are presented in Table 7-2 to Table 7-4 respectively.

Table 7-2: Noise levels at N1 (Hassall, J.R.2009)

Date	Time	T°C	RH %	Wind m/s	$L_{Areq,I}$	L_{90}
Mon 19/10/09	15:10-15:20	25	24		42.1	37
Mon 19/10/09	15:22-15:32	25	24		42.9	39
Wed 22/04/09	15:19-15:29	19.5	44	<4.5	50.1	42
Wed 22/04/09	15:30-15:40	19.5	44	<4.5	44.1	40
Mon 19/10/09	16:09-16:19	24.5	24		49.9	40
Mon 19/10/09	16:23-16:33	24.5	24		42.9	40
Thu 28/04/09	16:28-16:38	24.5	13	<3.1	44.8	41
Thu 28/04/09	16:40-16:50	24.5	13	<3.1	44.1	40
Mon 19/10/09	17:10-17:20	24.5	24		44.9	40

These values are typical of a rural area with the continuously operating industrial plant dominating the noise climate and $L_{Aeq,I}$ value. The L_{90} (the sound level exceeded for 90% of the time, and usually taken as the background noise without intruding events such as vehicles and aircraft) also dominates the background noise and indicates the very consistent plant noise bounded between 40 and 42 dB(A) during the day (Hassall, J.R. 2009).

Table 7-3: Noise levels at N2 (Hassall, J.R.2009)

Date	Time	T°C	RH %	Wind m/s	$L_{Areq,I}$	L_{90}
Wed 22/04/09	15:52-16:02	19.5	44	<3.8	49.6	49
Wed 22/04/09	16:04-16:14	19.5	44	<3.8	49.2	49
Thu 28/04/09	15:06-15:16	24.5	13	<2.7	49.7	49
Thu 28/04/09	15:18-15:28	24.5	13	<2.7	49.3	48

These values are typical of a rural area with the continuously operating industrial plant dominating the $L_{Aeq,I}$ and L_{90} values. The plant noise is consistently 48/49 dB(A) at this position and represents well the current impact of the Cooke Gold Plant (Hassall, J.R.2009).

Table 7-4: Noise levels at N3 (Hassall, J.R.2009)

Date	Time	T°C	RH %	Wind m/s	$L_{Areq,I}$	L_{90}
Mon 19/10/09	14:40-14:50	25	24	0.8	49.2	39
Mon 19/10/09	14:52-15:02	25	24	0.8	47.5	41
Mon 19/10/09	15:38-15:48	25	24	1.3	49.9	41
Mon 19/10/09	15:50-16:00	25	24	1.5	51.9	48
Mon 19/10/09	16:40-16:50	24.5	24	<1.1	49.7	44
Mon 19/10/09	16:52-17:02	24.5	24	<1.1	51.6	45

These values are typical of a rural area with the heavily trafficked R559 dominating the noise climate, $L_{Aeq,I}$ and the L_{90} (the sound level exceeded for 90% of the time, and usually taken as the background noise without intruding events such as vehicles and aircraft). It should be noted that this measurement position is in the area suggested for future residential development (Hassall, J.R.2009).

The daytime and night time measurement results taken from GijimaAST as mentioned in section 7.2 are presented in Table 7-5 and Table 7-6 respectively.

Table 7-5: Daytime noise levels (Cornelius, J.2009)

Location	Measured typical noise rating ($L_{req,T}$) range dBA	Measured noise rating level dBA ($L_{req,T}$)	Maximum/Acceptable rating level dBA
N4	41.6 – 97.4	71.8	45
N5	41.6 – 48	42	45
N6	41.6 – 63.8	48.8	45
N7	39.1 – 73.9	55.1	45

Table 7-6: Night time noise levels (Cornelius, J.2009)

Location	Measured typical noise rating ($L_{req,T}$) range dBA	Measured noise rating level dBA ($L_{req,T}$)	Maximum/Acceptable rating level dBA
N4	33.6 – 92.5	70.4	35
N5	33.5 – 44.5	34.8	35
N6	41.2 – 57.8	45.9	35
N7	34.5 – 54.9	45.6	35

The additional measurements taken in 2012, as mentioned in section 7.2, are presented in Table 7-7 as well as the time history graphs for each measurement presented in Figure 11 to Figure 17.

Table 7-7: Noise measurement levels

Sample ID	SANS rating limit					
	Type of district	**Period**	**Acceptable rating level dBA**	**$L_{Areq,T}$ dBA**	**Maximum/Minimum dBA**	**Date**
N8	Rural	Daytime	45	49	93 / 18	07/05/2012
		Night time	35	39	67 / 18	07/05/2012
N9	Suburban	Daytime	50	55	85 / 34	15/05/2012
		Night time	40	45	68 / 31	15/05/2012
N10	Suburban	Daytime	50	50	70 / 36	14/03/2012
		Night time	40	47	66 / 30	14/03/2012
	Indicates current LAeq,T levels above either the daytime rating limit or the night time rating limit					

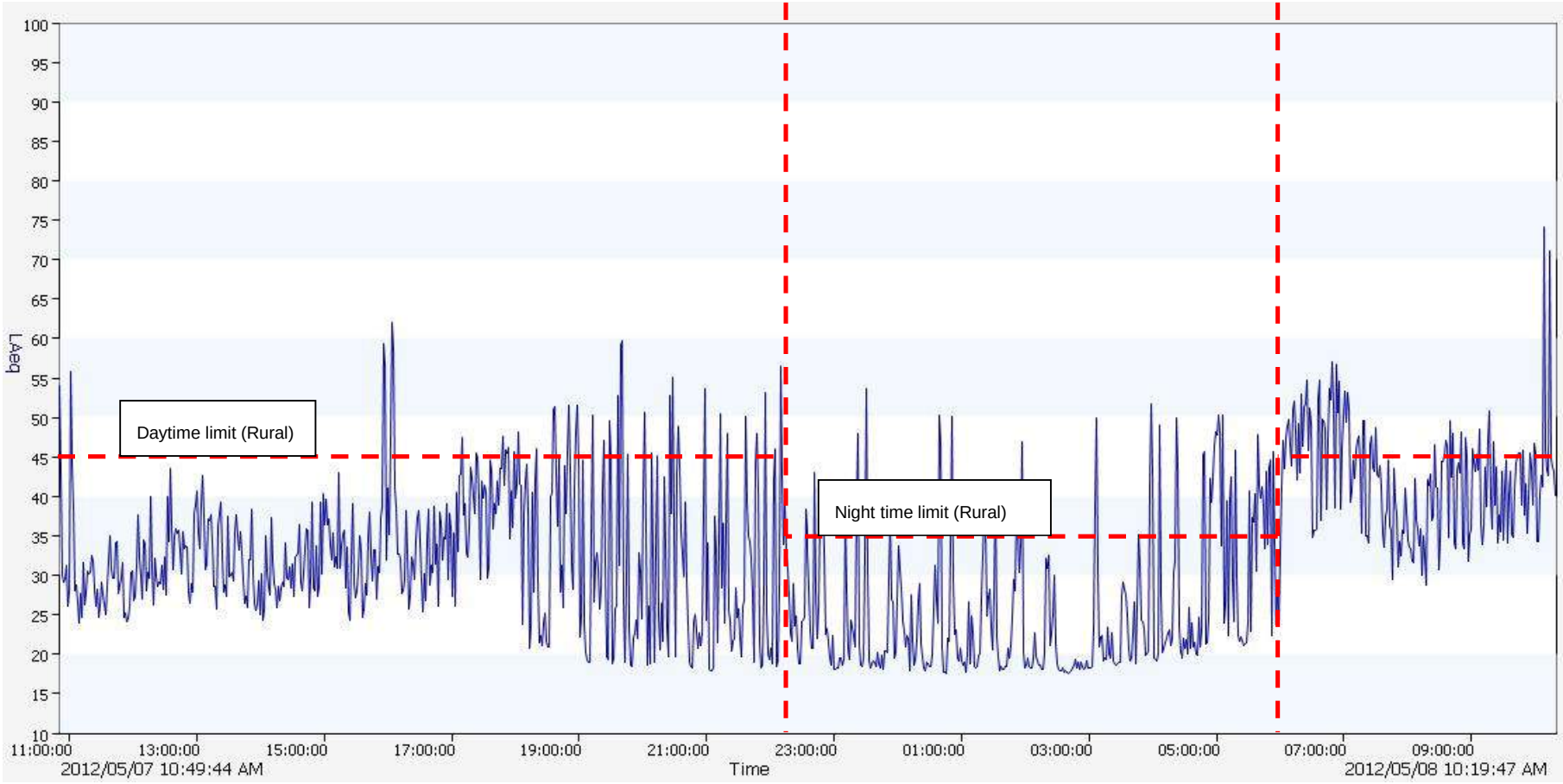

Figure 15: Time history graph for N8

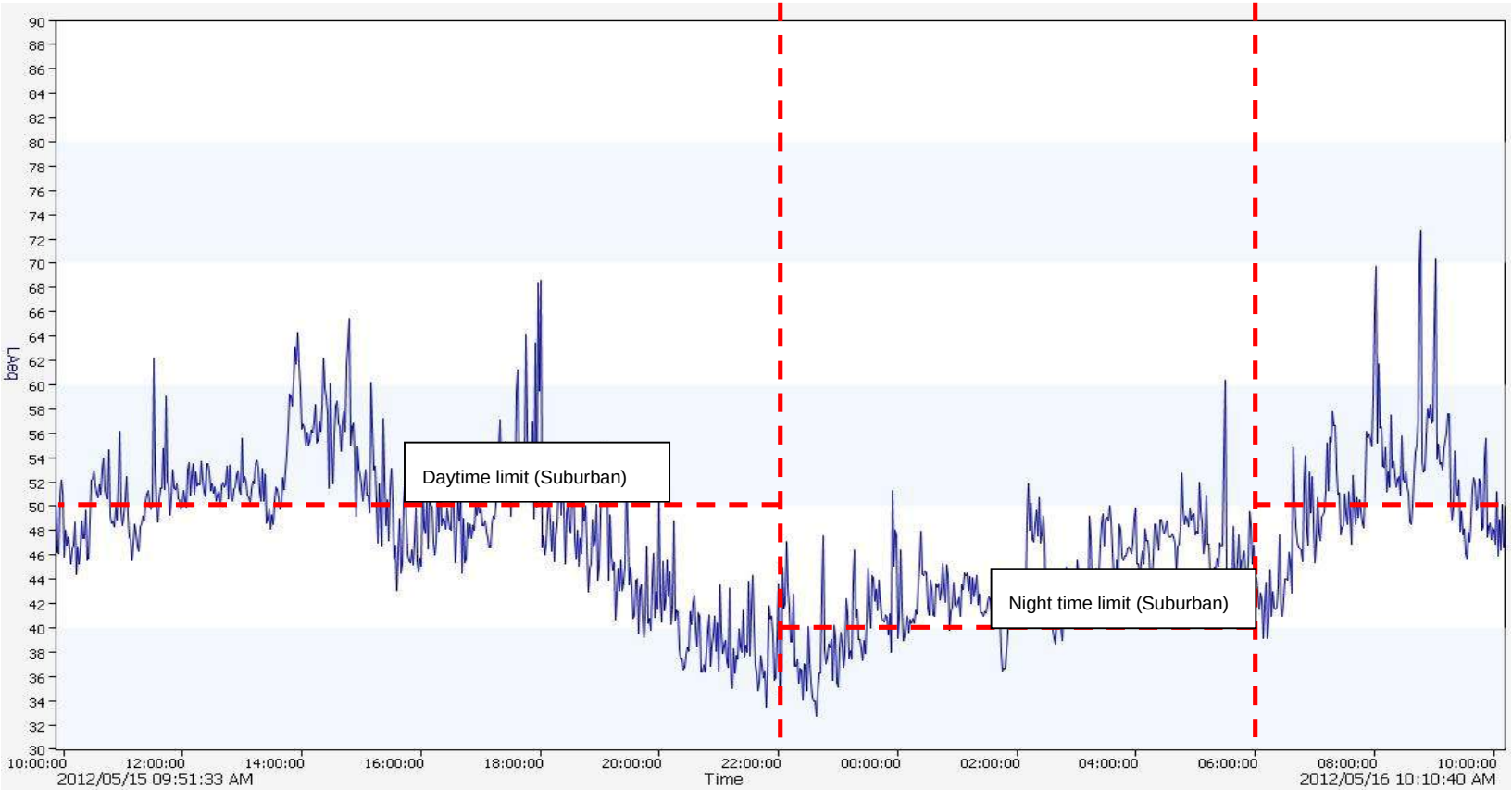

Figure 16: Time history graph for N9

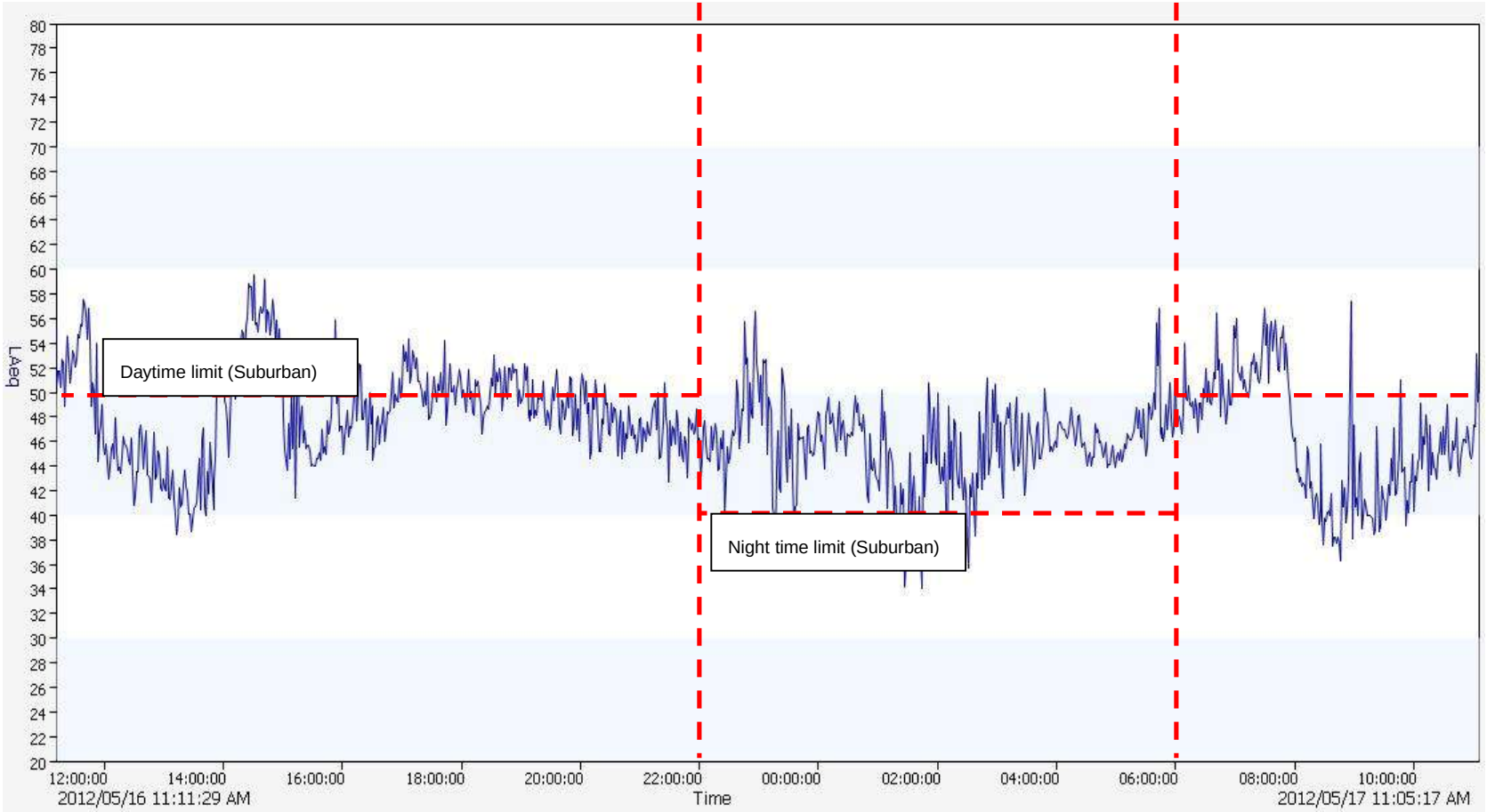

Figure 17: Time history graph for N10

The overall baseline results from the additional measurements taken at N8, N9 and N10 in 2012 indicate that ambient noise levels are slightly higher than the SANS limit for rural districts because of the vehicular activity on the main roads passing through the rural areas. The ambient noise levels at the suburban areas are at levels expected for these districts.

8 Sensitivity Analyses and No-go Areas

In terms of the current project location and infrastructure layout it is not expected that there are any noise sensitive or 'No-Go' areas that would affect the layout. The reason for this is that the linear development (pipeline infrastructure) of the project is primarily along existing road servitudes and the point and areas sources (pump stations and dump reclamation activities) are within mining right or gold processing areas.

9 Impact Assessment and Evaluation

9.1 Environmental Impact Assessment Methodology

Impacts are broadly assessed based on magnitude and receptor sensitivity permitting the assessment practitioner to determine impact significance and mitigation.

Based on international guidelines and South African legislation, the following criteria should be taken into account when examining potentially significant impacts:

- Nature of impacts (induced/direct/indirect, positive/negative);
- Duration (short/medium/long-term, permanent(irreversible) / temporary (reversible), frequent/seldom);
- Extent (geographical area, size of affected population/habitat/species);
- Intensity (minimal, severe, replaceable/irreplaceable);
- Probability (high/medium/low probability); and
- Mitigation (as per mitigation hierarchy: avoid, mitigate or offset significant adverse impacts).

9.2 Impact Rating in Terms of its Nature, Extent, Duration, Probability and Significance

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

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 9-1. 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 9-3.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed. If the specialist determines the potential impact is too high, additional mitigation measures are proposed.

Table 9-1: Noise impact assessment parameter ratings

Rating	Intensity/Replace ability		Extent	Duration/reversibility	Probability
	Negative impacts	**Positive impacts**			
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/Replace ability		Extent	Duration/reversibility	Probability
	Negative impacts	**Positive impacts**			
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/Replace ability		Extent	Duration/reversibility	Probability
	Negative impacts	**Positive impacts**			
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/Replace ability		Extent	Duration/reversibility	Probability
	Negative impacts	**Positive impacts**			
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 9-2: Probability consequence matrix

Probability	Significance																																					
7	-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
6	-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
5	-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
4	-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
3	-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
2	-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
1	-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 9-3: Significance rating description

Score	Description	Rating
109 to 147	A very beneficial impact which 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	An important positive impact. The impact is insufficient by itself to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. 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 social and/or natural environment.	Negligible (negative)
-36 to -72	An important negative impact which 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 social and/or natural environment.	Minor (negative)

Score	Description	Rating
-73 to -108	A serious negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects.	Moderate (negative)
-109 to -147	A very serious negative impact which 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.	Major (negative)

9.3 Potential Environmental Noise Impacts for each Mining Right Area of the Project

This section discusses the significance of the noise impact on the surrounding noise sensitive receptors by comparing the results of the noise dispersion modelling with the SANS 10103:2008 rating levels (as referred to by the Gauteng Noise Control regulations for defining 'disturbing noise').

The results of the predictive modelling are indicated on graphic plots (refer to Plan 2 to Plan 13 in Appendix C) for the construction and operational phases. The graphic plots indicate the noise attenuation from the proposed project for the Kloof, Driefontein, Cooke and Ezulwini Mining Right areas. The decommissioning phase was not modelled specifically as it would produce the same results because of similar vehicle and machinery involved.

9.4 Kloof Mining Right Area

9.4.1.1 Construction Phase

9.4.1.1.1 Project activities assessed

The Construction Phase noise was assessed in terms of the activities in Table 9-4.

Table 9-4: Interactions and Impacts of the construction activities

Interaction	Impact
Construction of pipelines	Noise disturbance from the construction vehicles and machinery
Construction of the CPP	Noise disturbance from the construction vehicles and machinery
Construction of the RTSF complex	Noise disturbance from the construction vehicles and machinery

9.4.1.1.2 Impact description

The construction activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, the noise dispersion model run for the construction of the CPP, RTSF/AWTF and pipeline (refer to Plan 2 in Appendix C) indicate that the expected noise will not measure above the SANS 10103:2008 rating levels (50 dBA daytime and 45 dBA night time) at the surrounding suburban and rural receptors and therefore not impact on the surrounding receptors. Based on the definition of disturbing noise in the Gauteng Noise Control Regulations there will be no disturbance although certain noise sources may still be audible and therefore rated as a negligible impact on the surrounding receptors.

9.4.1.1.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the construction activities and subsequently comply with the Gauteng Noise Control Regulations.

9.4.1.1.4 Management Actions and Targets

Construction activities should be restricted to daylight hours (this will keep the night time noise levels to a minimum) as well as not on weekends and public holidays. Mining related machinery and vehicles should be switched off when not in use.

9.4.1.1.5 Impact Ratings

The table below summarises the rating of the impact significance for the construction phase.

Table 9-5: 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 for the CPP, RTSF and pipeline)			
Impact Description: Noise will emanate from the machinery and vehicles operating during the construction activities.			
Prior to mitigation/ management			
Duration	Medium term (3)	Noise will be produced for the duration of the construction phase	Negligible (negative) – 21
Extent	Local (3)	It is expected that during construction noise will extend as far as development site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors.	

Dimension	Rating	Motivation	Significance
Nature	Negative		
Mitigation/ Management action			
▪ Restricting construction activities to daylight hours; ▪ Mining 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; ▪ Switching off equipment when not in use; and ▪ Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the construction phase	Negligible (negative) – 12
Extent	Local (3)	It is expected that during construction noise will be limited to site if mitigation measures are implemented.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal social impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		

9.4.1.2 Operational Phase

9.4.1.2.1 Project activities assessed

The Operational Phase noise was assessed in terms of the activities in Table 9-6.

Table 9-6: Interactions and Impacts of the operational activities

Interaction	Impact
Abstraction of water from K10 shaft	Noise disturbance from the pump stations
Disposal of the residue from the AWTF.	Noise disturbance from the pump stations
Gold, uranium and sulfur extraction at the CPP (tailings to RTSF)	Noise disturbance from the operation of the CPP which includes the air blowers of the acid plant, boiler, roaster and UF Mill as well as pump stations
Water distribution at the AWTF for discharge.	Noise disturbance from the pump stations
Pumping of up to 1.5 Mt/m of tailings to the RTSF.	Noise disturbance from the pump stations

Interaction	Impact
Pumping water from the RTSF return water dams to the AWTF.	Noise disturbance from the pump stations
Discharging treated water to the Leeuspruit.	Noise disturbance from the pump stations

9.4.1.2.2 Impact description

The operational activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, the operational scenarios were run for day and night times (refer to Plan 3 and Plan 4 in Appendix C). The noise modelling results indicate that the expected noise will not measure above the SANS 10103:2008 daytime rating levels (50 dBA and 45 dBA) as well as night time rating levels (40 dBA and 35dBA) at the surrounding suburban and rural receptors, therefore not impacting on the surrounding receptors. Based on the definition of disturbing noise in the Gauteng Noise Control Regulations there will be no disturbance although certain noise sources may still be audible and therefore rated as a negligible impact on the surrounding receptors.

9.4.1.2.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the operational activities and subsequently comply with the Gauteng Noise Control Regulations.

9.4.1.2.4 Management Actions and Targets

If complaints are received about the noise from the pump stations then noise barriers should be installed between the pump station and the specific complainant, as close to the pump stations as possible. Regular service maintenance on the pumps and pipelines to mitigate water hammer noise as well as maintaining a constant flow rate during pumping of water and slurry, include design prevention appurtenances like rupture discs where warranted. Mining 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. Switching off equipment when not in use.

9.4.1.2.5 Operational Phase Impact Ratings

The table below summarises the rating of the impact significance for the operational phase.

Table 9-7: Pre-Mitigation and Post-Mitigation Significance Ratings for Impacts on Noise during the Operational Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Operation of the CPP and pump station at the RTSF)			
Impact Description: Noise will emanate from the CPP such as blow down noise of the boilers and acid plant blower as well as pump stations at the RTSF/AWTF during the operational phase.			
Prior to mitigation/ management			
Duration	Project Life (5)	Noise will be produced for the duration of life of mine	Negligible (negative) – 27
Extent	Local (3)	It is expected that during operation noise will extend as far as development site area.	
Intensity x type of impact	Minor - negative (-1)	It is expected that during operational phase noise will have a minor social impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding communities.	
Nature	Negative		
Mitigation/ Management action			
▪ If complaints are received about the noise from the pump stations then noise barriers should be installed between the pump station and the specific complainant, as close to the pump stations as possible; ▪ Regular service maintenance on the pumps and pipelines to mitigate water hammer noise as well as maintaining a constant flow rate during pumping of water and slurry,include design prevention appurtenances like rupture discs where warranted; ▪ Mining 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; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Project Life (5)	Noise will be produced for the duration of life of mine	Negligible (negative) – 18
Extent	Local (3)	It is expected that the disturbing noise will be limited to the site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during operational phase noise will have a minor impact	
Probability	Unlikely (2)	It is unlikely that noise will impact on the surrounding receptors.	
Nature	Negative		

9.4.1.3 Decommissioning Phase

9.4.1.3.1 Project activities assessed

The Decommissioning Phase noise was assessed in terms of the activities in Table 9-8.

Table 9-8: Interactions and Impacts of the decommissioning activities

Interaction	Impact
Demolition of CPP	Noise disturbance from the demolition
Dismantling and removal of pipelines	Noise disturbance from the decommissioning activities
Dismantling and removal of the AWTF	Noise disturbance from the decommissioning activities
Rehabilitation of CPP footprint	Noise disturbance from the rehabilitation activities
Rehabilitation of RTSF	Noise disturbance from the rehabilitation activities

9.4.1.3.2 Impact description

The decommissioning activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, with the decommissioning activities using similar machinery and vehicles than the construction phase, it is expected that the significance of the noise impact during this phase will be similar.

9.4.1.3.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the decommissioning activities and subsequently comply with the Gauteng Noise Control Regulations.

9.4.1.3.4 Management Actions and Targets

Decommissioning activities should be restricted to daylight hours (this will keep the night time noise levels to a minimum) as well as not on weekends and public holidays. Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound. Mining 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. Switching off equipment when not in use.

9.4.1.3.5 Impact Ratings

The table below summarises the rating of the impact significance for the decommissioning phase.

Table 9-9: Pre-Mitigation and Post-Mitigation Significance Ratings for Impacts on Noise during the Decommissioning Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Dismantling and removal of the pump stations and pipeline infrastructure)			
Impact Description: Noise will emanate from the machinery and vehicles operating during the decommissioning activities.			
Prior to mitigation/ management			
Duration	Medium term (3)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) – 21
Extent	Local (3)	It is expected that during decommissioning noise will extend as far as development site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors.	
Nature	Negative		
Mitigation/ Management action			
▪ Restricting decommissioning activities to daylight hours; ▪ Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound ▪ Mining 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; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) – 12
Extent	Local (3)	It is expected that during decommissioning noise will be limited to site if mitigation measures are implemented.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal social impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		

9.4.1.4 Post-closure Phase

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

9.5 Driefontein Mining Right Area

9.5.1.1 Construction Phase

9.5.1.1.1 Project activities assessed

The Construction Phase noise was assessed in terms of the activities in Table 9-10.

Table 9-10: Interactions and Impacts of the construction activities

Interaction	Impact
Construction of pipelines	Noise disturbance from the construction vehicles and machinery
Construction of the West block Thickener (WBT) and Bulk Water Storage Facility (BWSF) complex	Noise disturbance from the construction vehicles and machinery
Construction of sumps and pump stations at the Driefontein 3 and 5 TSFs	Noise disturbance from the construction vehicles and machinery

9.5.1.1.2 Impact description

The construction activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, the noise dispersion model for the construction of the pump stations and pipelines (refer to Plan 5 in Appendix C) indicate that the expected noise levels will not measure above the SANS 10103:2008 ratings (50 dBA daytime) at the surrounding suburban receptors. Based on the definition of disturbing noise in the Gauteng Noise Control Regulations there will be no disturbance although certain noise sources may still be audible and therefore rated as a negligible impact on the surrounding receptors.

9.5.1.1.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the construction activities and subsequently comply with the Gauteng Noise Control Regulations.

9.5.1.1.4 Management Actions and Targets

Construction activities should be restricted to daylight hours (this will keep the night time noise levels to a minimum) as well as not on weekends and public holidays. Mining related machinery and vehicles should be switched off when not in use.

9.5.1.1.5 Impact Ratings

The table below summarises the rating of the impact significance for the construction phase.

Table 9-11: 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 for the pipeline and pump stations as well as the construction of the pipeline and pump stations)			
Impact Description: Noise will emanate from the machinery and vehicles operating during site clearing and construction of pump stations and booster pump stations,pipelines and WBT infrastructure.			
Prior to mitigation/ management			
Duration	immediate (1)	Noise will be produced for the duration of the construction phase.	Negligible (negative) – 18
Extent	Local (3)	It is expected that during construction noise will extend as far as development site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors.	
Nature	Negative		
Mitigation/ Management action			
▪ Restricting construction activities to daylight hours; ▪ Mining 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; ▪ Switching off equipment when not in use; and ▪ Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound			
Post- mitigation			
Duration	immediate (1)	Noise will be produced for the duration of the construction phase.	Negligible (negative) – 12
Extent	Local (3)	It is expected that during construction noise will be limited to site if mitigation measures are implemented.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal social impact	

Dimension	Rating	Motivation	Significance
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors as pumpstation are located in remote areas.	
Nature	Negative		

9.5.1.2 Operational Phase

9.5.1.2.1 Project activities assessed

The Operational Phase noise was assessed in terms of the activities in Table 9-12.

Table 9-12: Interactions and Impacts of the operational activities

Interaction	Impact
Hydraulic reclamation of the Driefontein 3 and 5 TSFs.	Noise disturbance from the reclamation activities
Pumping water from K10 to the BWSF located next to the WBT.	Noise disturbance from the pump stations
Pumping water from the BWSF to the Driefontein TSFs that will be reclaimed.(Dri3 & 5 TSFs)	Noise disturbance from the pump stations
Pumping slurry from the TSF sump to the WBT (for Driefontein 3 and 5 TSFs).	Noise disturbance from the pump stations

9.5.1.2.2 Impact description

The operational activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, the operational scenarios were run for day and night time (refer to Plan 6 and Plan 7 in Appendix C). The noise modelling results indicate that the expected noise will not measure above the SANS 10103:2008 daytime rating levels (50 dBA) as well as night time rating levels (40 dBA) at the surrounding suburban receptors. Based on the definition of disturbing noise in the Gauteng Noise Control Regulations there will be no disturbance although certain noise sources may still be audible and therefore rated as a negligible impact on the surrounding receptors.

9.5.1.2.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the operational activities and subsequently comply with the Gauteng Noise Control Regulations.

9.5.1.2.4 Management Actions and Targets

If complaints are received about the noise from the pump stations then noise barriers should be installed between the pump station and the specific complainant, as close to the pump stations as possible. Regular service maintenance on the pumps and pipelines to mitigate water hammer noise as well as maintaining a constant flow rate during pumping of water and slurry, include design prevention appurtenances like rupture discs where warranted. Mining 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. Switching off equipment when not in use.

9.5.1.2.5 Impact Ratings

The table below summarises the rating of the impact significance for the operational phase.

Table 9-13: Pre-Mitigation and Post-Mitigation Significance Ratings for Impacts on Noise during the Operational Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Reclamation activities and operation of the pump stations at Driefontein 3 and Driefontein 5)			
Impact Description: Noise will emanate from the reclamation activities and pump stations during the operational phase.			
Prior to mitigation/ management			
Duration	Long term (4)	Noise will be produced for the duration of the reclamation activities of between 5 to 6 years	Negligible (negative) – 24
Extent	Local (3)	It is expected that during operation noise will be limited to site.	
Intensity x type of impact	Minor - negative (-1)	It is expected that during operational phase noise will have a minor social impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding communities as the pumpstations and WBT are remotely located.	
Nature	Negative		
Mitigation/ Management action			

Dimension	Rating	Motivation	Significance
▪ If complaints are received about the noise from the pump stations then noise barriers should be installed between the pump station and the specific complainant, as close to the pump stations as possible; ▪ Regular service maintenance on the pumps and pipelines to mitigate water hammer noise as well as maintaining a constant flow rate during pumping of water and slurry,include design prevention appurtenances like rupture discs where warranted; ▪ Mining 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; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Long term (4)	Noise will be produced for the duration of the reclamation activities of between 5 to 6 years(but in sequence Dri 3 then Dri 5	Negligible (negative) – 16
Extent	Local (3)	It is expected that the disturbing noise will be limited to the site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during operational phase noise will have a minor impact	
Probability	Unlikely (2)	It is unlikely that noise will impact on the surrounding receptors as the pumpstations and WBT infrastructure are remotely located.	
Nature	Negative		

9.5.1.3 Decommissioning Phase

9.5.1.3.1 Project activities assessed

The Decommissioning Phase noise was assessed in terms of the activities in Table 9-14.

Table 9-14: Interactions and Impacts of the decommissioning activities

Interaction	Impact
Dismantling and removal of the pump stations, WBT and water reservoirs as well as pipelines	Noise disturbance from the decommissioning activities
Rehabilitation of TSF footprints	Noise disturbance from the rehabilitation activities

9.5.1.3.2 Impact description

The decommissioning activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, with the decommissioning activities using similar machinery and vehicles than the construction phase, it is expected that the significance of the noise impact during this phase will be similar.

9.5.1.3.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the decommissioning activities and subsequently comply with the Gauteng Noise Control Regulations.

9.5.1.3.4 Management Actions and Targets

Decommissioning activities should be restricted to daylight hours (this will keep the night time noise levels to a minimum) as well as not on weekends and public holidays. Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound. Mining 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. Switching off equipment when not in use.

9.5.1.3.5 Impact Ratings

The table below summarises the rating of the impact significance for the decommissioning phase.

Table 9-15: Pre-Mitigation and Post-Mitigation Significance Ratings for Impacts on Noise during the Decommissioning Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Dismantling and removal of the pump stations and pipeline infrastructure)			
Impact Description: Noise will emanate from the machinery and vehicles operating during the decommissioning activities.			
Prior to mitigation/ management			
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) – 18
Extent	Local (3)	It is expected that during decommissioning noise will extend as far as development site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors due to remote locations.	
Nature	Negative		
Mitigation/ Management action			

Dimension	Rating	Motivation	Significance
▪ Restricting decommissioning activities to daylight hours; ▪ Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound ▪ Mining related machines and vehicles to be serviced according to service plan to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning /rehabilitation phase ie 2/3 years	Negligible (negative) – 12
Extent	Local (3)	It is expected that during decommissioning noise will be limited to site if mitigation measures are implemented.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal social impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	
Nature	Negative		

9.5.1.4 Post-closure Phase

The construction, operational and decommissioning activities will have ceased ,rehabilitation activities reduced to maintenance and the subsequent noise levels from the activities will have ceased, therefore no post closure impacts expected and also no post closure monitoring programme is recommended.

9.6 Cooke Mining Right Area

9.6.1.1 Construction Phase

9.6.1.1.1 Project activities assessed

The Construction Phase noise was assessed in terms of the activities in Table 9-16.

Table 9-16: Interactions and Impacts of the construction activities

Interaction	Impact
Construction of pipelines	Noise disturbance from the construction vehicles and machinery
Construction of the Cooke thickener and BWSF	Noise disturbance from the construction vehicles and machinery

Interaction	Impact
Construction of sumps and pump stations at the Cooke TSF	Noise disturbance from the construction vehicles and machinery

9.6.1.1.2 Impact description

The construction activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, the noise dispersion model run for the construction of the pump stations and pipeline (refer to Plan 8 in Appendix C) indicate that the expected noise will not measure above the SANS 10103:2008 rating levels (50 dBA daytime) at the surrounding suburban receptors and therefore not impact on the surrounding receptors. Based on the definition of disturbing noise in the Gauteng Noise Control Regulations there will be no disturbance although certain noise sources may still be audible and therefore rated as a negligible impact on the surrounding receptors.

9.6.1.1.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the construction activities and subsequently comply with the Gauteng Noise Control Regulations.

9.6.1.1.4 Management Actions and Targets

Construction activities should be restricted to daylight hours (this will keep the night time noise levels to a minimum) as well as not on weekends and public holidays. Mining related machinery and vehicles should be switched off when not in use.

9.6.1.1.5 Impact Ratings

The table below summarises the rating of the impact significance for the construction phase.

Table 9-17: 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 for the pipeline and pump stations)			
Impact Description: Noise will emanate from the machinery and vehicles operating during the construction activities along the pipe routes and at the pumpstations.			
Prior to mitigation/ management			
Duration	immediate (1)	Noise will be produced for the duration of the construction phase.	Negligible (negative) – 18

Dimension	Rating	Motivation	Significance
Extent	Local (3)	It is expected that during construction noise will extend as far as development site area ie along the pipe routes and at the pumpstations and thickener infrastructure.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors as the locations of pumpstations and pipe routes are largely remote.	
Nature	Negative		
Mitigation/ Management action			
▪ Restricting construction activities to daylight hours; ▪ Mining 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; ▪ Switching off equipment when not in use; and ▪ Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the construction phase	Negligible (negative) – 12
Extent	Local (3)	It is expected that during construction noise will be limited to site if mitigation measures are implemented.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal social impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors as the locations of pumpstations and pipe routes are largely remote..	
Nature	Negative		

9.6.1.2 Operational Phase

9.6.1.2.1 Project activities assessed

The Operational Phase noise was assessed in terms of the activities in Table 9-18.

Table 9-18: Interactions and Impacts of the operational activities

Interaction	Impact
Abstraction of water from Cooke 1 shaft.	Noise disturbance from the reclamation activities
Hydraulic reclamation of the Cooke TSF (which include temporary storage of the slurry in a sump).	Noise disturbance from the reclamation activities
Pumping 500 kt/m of tailings from the Cooke TSF to the Cooke thickener.	Noise disturbance from the pump stations
Pumping from the Cooke thickener to the CPP via Ezulwini.	Noise disturbance from the pump stations

9.6.1.2.2 Impact description

The operational activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, the operational scenarios were run for the daytime and night time (refer to Plan 9 and Plan 10 in Appendix C). The noise modelling results indicate that the expected noise will not measure above the SANS 10103:2008 daytime rating levels (50 dBA) as well as night time rating levels (40 dBA) at the surrounding suburban receptors and therefore not impact on the surrounding receptors. Based on the definition of disturbing noise in the Gauteng Noise Control Regulations there will be no disturbance although certain noise sources may still be audible and therefore rated as a negligible impact on the surrounding receptors.

9.6.1.2.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the operational activities and subsequently comply with the Gauteng Noise Control Regulations.

9.6.1.2.4 Management Actions and Targets

If complaints are received about the noise from the pump stations then noise barriers should be installed between the pump station and the specific complainant, as close to the pump stations as possible. Regular service maintenance on the pumps and pipelines to mitigate water hammer noise as well as maintaining a constant flow rate during pumping of water and slurry, include design prevention appurtenances like rupture discs where warranted. Mining 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. Switching off equipment when not in use.

9.6.1.2.5 Impact Ratings

The table below summarises the rating of the impact significance for the operational phase.

Table 9-19: Pre-mitigation and Post-mitigation significance ratings for impacts on noise during the operational phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Reclamation activities and operation of the pump stations at Cooke TSF)			
Impact Description: Noise will emanate from the reclamation activities, water storage and pump stations during the operational phase.			
Prior to mitigation/ management			
Duration	Project Life (5)	Noise will be produced for the duration of life of mine	Negligible (negative) – 27
Extent	Local (3)	It is expected that during operation noise will be limited to site.	
Intensity x type of impact	Minor - negative (-1)	It is expected that during operational phase noise will have a minor social impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding communities as the locations of pumpstations and pipe routes are largely remote..	
Nature	Negative		
Mitigation/ Management action			
▪ If complaints are received about the noise from the pump stations then noise barriers should be installed between the pump station and the specific complainant, as close to the pump stations as possible; ▪ Regular service maintenance on the pumps and pipelines to mitigate water hammer noise as well as maintaining a constant flow rate during pumping of water and slurry,include design prevention appurtenances like rupture discs where warranted; ▪ Mining 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; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Project Life (5)	Noise will be produced for the duration of life of mine	Negligible (negative) – 18
Extent	Local (3)	It is expected that the disturbing noise will be limited to the site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during operational phase noise will have a minor impact	

Dimension	Rating	Motivation	Significance
Probability	Unlikely (2)	It is unlikely that noise will impact on the surrounding receptors as the locations of pumpstations and pipe routes are largely remote..	
Nature	Negative		

9.6.1.3 Decommissioning Phase

9.6.1.3.1 Project activities assessed

The Decommissioning Phase noise was assessed in terms of the activities in Table 9-20.

Table 9-20: Interactions and Impacts of the decommissioning activities

Interaction	Impact
Dismantling and removal of the pump stations and pipelines	Noise disturbance from the decommissioning activities
Rehabilitation of Cooke 4 TSF and C4S TSF footprints	Noise disturbance from the rehabilitation activities

9.6.1.3.2 Impact description

The decommissioning activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, with the decommissioning activities using similar machinery and vehicles than the construction phase, it is expected that the significance of the noise impact during this phase will be similar.

9.6.1.3.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the decommissioning activities and subsequently comply with the Gauteng Noise Control Regulations.

9.6.1.3.4 Management Actions and Targets

Decommissioning activities should be restricted to daylight hours (this will keep the night time noise levels to a minimum) as well as not on weekends and public holidays. Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound. Mining 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. Switching off equipment when not in use.

9.6.1.3.5 Impact Ratings

The table below summarises the rating of the impact significance for the operational phase.

Table 9-21: Pre-mitigation and post-mitigation significance ratings for impacts on noise during the decommissioning phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Dismantling and removal of the pump stations and pipeline infrastructure)			
Impact Description: Noise will emanate from the machinery and vehicles operating during the decommissioning activities.			
Prior to mitigation/ management			
Duration	immediate (1)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) – 15
Extent	Local (3)	It is expected that during decommissioning noise will extend as far as development site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors as the locations of pumpstations and pipe routes are largely remote..	
Nature	Negative		
Mitigation/ Management action			
▪ Restricting decommissioning activities to daylight hours; ▪ Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound ▪ Mining related machines and vehicles to be serviced according to service plan to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) – 12
Extent	Local (3)	It is expected that during decommissioning noise will be limited to site if mitigation measures are implemented.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal social impact	

Dimension	Rating	Motivation	Significance
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptor as the locations of pumpstations and pipe routes are largely remote.s.	
Nature	Negative		

9.6.1.4 Post-closure Phase

The construction, operational and decommissioning activities will have ceased and the subsequent noise levels from the activities will have ceased, rehabilitation activities reduced to maintenance, therefore no post closure impacts expected and also no post closure monitoring programme is recommended.

9.7 Ezulwini Mining Right Area

9.7.1.1 Construction Phase

The Construction Phase noise was assessed in terms of the activities in Table 9-22.

Table 9-22: Interactions and Impacts of the construction activities

Interaction	Impact
Construction of pipelines	Noise disturbance from the construction vehicles and machinery

9.7.1.1.1 Impact description

The construction activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, the noise dispersion model run for the construction of the pump stations and pipeline (refer to Plan 11 in Appendix C) indicate that the expected noise will not measure above the SANS 10103:2008 daytime rating level at the surrounding suburban receptors and therefore not impact on the surrounding receptors. Based on the definition of disturbing noise in the Gauteng Noise Control Regulations there will be no disturbance although certain noise sources may still be audible and therefore rated as a negligible impact on the surrounding receptors.

9.7.1.1.2 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the construction activities and subsequently comply with the Gauteng Noise Control Regulations.

9.7.1.1.3 Management Actions and Targets

Construction activities should be restricted to daylight hours (this will keep the night time noise levels to a minimum) as well as not on weekends and public holidays. Mining related machinery and vehicles should be switched off when not in use.

9.7.1.1.4 Impact Ratings

The table below summarises the rating of the impact significance for the construction phase

Table 9-23: 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 for the pipeline and pump stations)			
Impact Description: Noise will emanate from the machinery and vehicles operating during the construction activities.			
Prior to mitigation/ management			
Duration	immediate (1)	Noise will be produced for the duration of the construction phase.	Negligible (negative) – 18
Extent	Local (3)	It is expected that during construction noise will extend as far as development site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors as they are remote.	
Nature	Negative		
Mitigation/ Management action			
▪ Restricting construction activities to daylight hours; ▪ Mining 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; ▪ Switching off equipment when not in use; and ▪ Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the construction phase	Negligible (negative) – 12
Extent	Local (3)	It is expected that during construction noise will be limited to site if mitigation measures are implemented.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during construction noise will have a minimal social impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors.	

Dimension	Rating	Motivation	Significance
Nature	Negative		

9.7.1.2 Operational Phase

9.7.1.2.1 Project activities assessed

The Operational Phase noise was assessed in terms of the activities in Table 9-24.

Table 9-24: Interactions and Impacts of the operational activities

Interaction	Impact
Uranium extraction at Ezulwini (tailings to Ezulwini North Dump).	Noise disturbance from the pump stations
Abstraction of water from Cooke shaft.	Noise disturbance from the pump stations
Pumping water from the Cooke 4 shaft to C4S TSF	Noise disturbance from the pump stations
Pumping slurry from the CPP to the Ezulwini plant	Noise disturbance from the pump stations
Pumping slurry from Ezulwini plant to Ezulwini North Dump	Noise disturbance from the pump stations

9.7.1.2.2 Impact description

The operational activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, the operational scenarios were run for the day and night time (refer to Plan 12 Plan 13 in Appendix C). The noise modelling results indicate that the expected noise will not measure above the SANS 10103:2008 daytime rating levels (50 dBA) as well as night time rating levels (40 dBA) at the surrounding suburban receptors and therefore not impact on the surrounding receptors. Based on the definition of disturbing noise in the Gauteng Noise Control Regulations there will be no disturbance although certain noise sources may still be audible and therefore rated as a negligible impact on the surrounding receptors.

9.7.1.2.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the operational activities and subsequently comply with the Gauteng Noise Control Regulations.

9.7.1.2.4 Management Actions and Targets

If complaints are received about the noise from the pump stations then noise barriers should be installed between the pump station and the specific complainant, as close to the pump stations as possible. Regular service maintenance on the pumps and pipelines to mitigate water hammer noise as well as maintaining a constant flow rate during pumping of water and slurry, include design prevention appurtenances like rupture discs where warranted. Mining 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. Switching off equipment when not in use.

9.7.1.2.5 Impact Ratings

The table below summarises the rating of the impact significance for the operational phase.

Table 9-25: Pre-Mitigation and Post-Mitigation Significance Ratings for Impacts on Noise during the Operational Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (operation of the pump stations at Cooke 4 South TSF)			
Impact Description: Noise will emanate from the pump stations and pipelines during the operational phase.			
Prior to mitigation/ management			
Duration	Project Life (5)	Noise will be produced for the duration of life of mine	Negligible (negative) – 27
Extent	Local (3)	It is expected that during operation noise will be limited to site.	
Intensity x type of impact	Minor - negative (-1)	It is expected that during operational phase noise will have a minor social impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding communities as they are remote.	
Nature	Negative		
Mitigation/ Management action			
▪ Regular service maintenance on the pipelines to mitigate water hammer noise as well as maintaining a constant flow rate during pumping of water and slurry; ▪ Mining 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; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Project Life (5)	Noise will be produced for the duration of life of mine	Negligible (negative) – 18

Dimension	Rating	Motivation	Significance
Extent	Local (3)	It is expected that the disturbing noise will be limited to the site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during operational phase noise will have a minor impact	
Probability	Unlikely (2)	It is unlikely that noise will impact on the surrounding receptors as they are remote.	
Nature	Negative		

9.7.1.3 Decommissioning Phase

9.7.1.3.1 Project activities assessed

The Decommissioning Phase noise was assessed in terms of the activities in Table 9-26.

Table 9-26: Interactions and Impacts of the decommissioning activities

Interaction	Impact
Dismantling and removal of the pump stations and pipelines	Noise disturbance from the decommissioning activities

9.7.1.3.2 Impact description

The decommissioning activities may impact on the ambient sound levels at surrounding receptors by causing noise disturbance. However, with the decommissioning activities using similar machinery and vehicles than the construction phase, it is expected that the significance of the noise impact during this phase will be similar.

9.7.1.3.3 Management Objectives

To minimise/prevent the noise impact of causing a noise disturbance at the surrounding receptors as a result of the decommissioning activities and subsequently comply with the Gauteng Noise Control Regulations.

9.7.1.3.4 Management Actions and Targets

Decommissioning activities should be restricted to daylight hours (this will keep the night time noise levels to a minimum) as well as not on weekends and public holidays. Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound. Mining 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. Switching off equipment when not in use.

9.7.1.3.5 Impact Ratings

The table below summarises the rating of the impact significance for the operational phase.

Table 9-27: Pre-Mitigation and Post-Mitigation Significance Ratings for Impacts on Noise during the Decommissioning Phase

Dimension	Rating	Motivation	Significance
Activity and Interaction (Dismantling and removal of the pump stations and pipeline infrastructure)			
Impact Description: Noise will emanate from the machinery and vehicles operating during the decommissioning activities.			
Prior to mitigation/ management			
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) – 18
Extent	Local (3)	It is expected that during decommissioning noise will extend as far as development site area.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal impact	
Probability	Unlikely (3)	It is unlikely that noise will impact on the surrounding receptors.	
Nature	Negative		
Mitigation/ Management action			
▪ Restricting decommissioning activities to daylight hours; ▪ Reversing alarms on mobile equipment should be broadband reversing alarms which emit directional, lower, less intrusive sound ▪ Mining related machines and vehicles to be serviced according to service plan to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.			
Post- mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the decommissioning phase	Negligible (negative) – 12
Extent	Local (3)	It is expected that during decommissioning noise will be limited to site if mitigation measures are implemented.	
Intensity x type of impact	Minimal - negative (-1)	It is expected that during decommissioning noise will have a minimal social impact	
Probability	Rare (2)	It is improbable that noise will impact on the surrounding receptors as they are remote.	
Nature	Negative		

9.7.1.4 Post-closure Phase

The construction, operational and decommissioning activities will have ceased ,rehabilitation activities reduced to maintenance and the subsequent noise levels from the activities will have ceased, therefore no post closure impacts expected and also no post closure monitoring programme is recommended.

10 Cumulative Impacts

Cumulative impacts should be considered for the overall improvement of ambient noise levels. The project is considered a causative source of noise pollution of negligible significance.

The existing noise sources in the immediate area of the project are typical noise sources such as vehicle activity on the main roads (N12, R28, R500 and R501) as well as on surrounding gravel roads.

The existing Driefontein, Kloof, Ezulwini and Cooke mines already impact on the noise levels of their immediate surroundings in their respective mining right areas but are too far apart from one another to cumulatively impact on the region.

The project is not expected to have cumulative impact or exacerbate current noise levels. This is primarily due to noise propagation not measuring above the rating levels of the surrounding suburban and rural receptors.

11 Unplanned Events and Low Risks

Low risks can be monitored to gauge if the baseline changes and mitigation is required. Unplanned events may occur on any project. This section advises on the potential impacts of those events and how to manage them, if they occur. Table 11-1 describes the unplanned event and how to manage it.

Table 11-1: Unplanned events, low risks and their management measures

Unplanned event	Potential impact	Mitigation/ Management/ Monitoring
Forced construction activities during night	Noise disturbance during night time	Night time monitoring at nearest receptor to establish whether the specific noise from the construction activities are measuring above the rating levels.
Slipping v-belts at booster pump stations	Noise disturbance from high pitched noise created by the slipping belts	Replacement of v-belts when incidence occurs

12 Environmental Management Plan

The objective of an Environmental Management Plan (EMP) is to present mitigation to (a) manage undue or reasonably avoidable adverse impacts associated with the development of a project and (b) to enhance potential positives.

12.1 Project Activities with the most Significant Noise Impacts

This section lists the aspects that are expected to produce the highest noise levels for each phase, even though it has been established in this noise assessment that there aren't any significant noise impacts expected from the proposed project's activities throughout the construction, operational and decommissioning phases.

Table 12-1: Most significant impacts

Aspects	Potential Significant impacts
Kloof Mining Right Area	
Vehicles and machinery involved in the construction and decommissioning of the CPP, RTSF, AWTF and pipeline	*Noise disturbance by the vehicles and machinery on the surrounding receptors*
Operation of the CPP which includes the air blowers of the acid plant, boiler, roaster and UF Mill as well as pump stations	*Noise disturbance by the CPP and pump stations on the surrounding receptors*
Driefontein Mining Right Area	
Vehicles and machinery involved in the construction and decommissioning of the pipeline and rehabilitation activities of the TSF footprints	*Noise disturbance by the vehicles and machinery on the surrounding receptors.*
Operation of the pump stations	*Noise disturbance by the pump stations on the surrounding receptors*
Cooke Mining Right Area	
Vehicles and machinery involved in the construction and decommissioning of the pipeline	*Noise disturbance by the vehicles and machinery on the surrounding receptors*
Operation of the pump stations	*Noise disturbance by the pump stations on the surrounding receptors*
Ezulwini Mining Right Area	
Vehicles and machinery involved in the construction and decommissioning of the pipeline	*Noise disturbance by the vehicles and machinery on the surrounding receptors*

Aspects	Potential Significant impacts
Operation of the pump stations	*Noise disturbance by the pump stations on the surrounding receptors*

12.2 Summary of Mitigation and Management

Table 12-2 to Table 12-4 provide 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 EMP.

Table 12-2: Impacts

Activities	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Construction of the pipelines; Site clearing for surface infrastructure; and Construction of surface infrastructure	Construction	Only extending as far as development site area and pipe route which are largly remote	Limit construction activities to daylight hours; Switch of vehicles and machinery not in use; and machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers;	Mitigation measures will assist in keeping noise levels as low as possible to comply with the Gauteng Noise Control Regulations	During construction phase
Reclamation activities; Processing activities; and Pumping activities	Operational	Only extending as far as development site area and pipe line routes which are largly remote	Regular service maintenance on pipelines as well as maintaining a constant flow rate during pumping of water and slurry to mitigate water hammer noise	Mitigation measures will assist in keeping noise levels as low as possible to comply with the Gauteng Noise Control Regulations	During operational phase
Dismantling and removal of surface infrastructure including pipelines; and Rehabilitation of TSF footprints	Decommissioning	Only extending as far as development site area	Limit decommissioning activities to daylight hours; Switch of vehicles and machinery not in use; and machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers;	Mitigation measures will assist in keeping noise levels as low as possible to comply with the Gauteng Noise Control Regulations	During decommissioning phase

Table 12-3: Objectives and Outcomes of the EMP

Activities	Potential impacts	Aspects affected	Phase	Mitigation	Standard to be achieved/objective
Site clearance and construction of CPP, RTSF, AWTF and pipelines	Noise	Impact on ambient noise at surrounding noise sensitive receptors	Construction	Limit construction activities to daylight hours; Switch of vehicles and machinery not in use; and machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers;	To comply with Gauteng Noise Control Regulations
Reclamation activities; Operation of the pump stations and booster pump stations; and Operation of the CPP	Noise	Impact on ambient noise at surrounding noise sensitive receptors	Operational	Regular service maintenance on pipelines as well as maintaining a constant flow rate during pumping of water and slurry to mitigate water hammer noise	To comply with Gauteng Noise Control Regulations
Dismantling and removal of surface infrastructure including pipelines; and Rehabilitation of TSF footprints	Noise	Impact on ambient noise at surrounding noise sensitive receptors	Decommissioning	Limit decommissioning activities to daylight hours; Switch of vehicles and machinery not in use; and machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers;	To comply with Gauteng Noise Control Regulations

Table 12-4: Mitigation

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
Site clearance and construction of CPP, RTSF, AWTF and pipelines	Impact on ambient noise at surrounding noise sensitive receptors	Impact on ambient noise at surrounding noise sensitive receptors	Limit construction activities to daylight hours; Switch of vehicles and machinery not in use; and machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers;	During construction phase	To comply with Gauteng Noise Control Regulations
Reclamation activities; Operation of the pump stations and booster pump stations; and Operation of the CPP	Impact on ambient noise at surrounding noise sensitive receptors	Impact on ambient noise at surrounding noise sensitive receptors	s; Regular service maintenance on pipelines as well as maintaining a constant flow rate during pumping of water and slurry to mitigate water hammer noise	During operational phase	To comply with Gauteng Noise Control Regulations
Dismantling and removal of surface infrastructure including pipelines; and Rehabilitation of TSF footprints	Impact on ambient noise at surrounding noise sensitive receptors	Impact on ambient noise at surrounding noise sensitive receptors	Limit decommissioning activities to daylight hours; Switch of vehicles and machinery not in use; and machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers;	During decommissioning phase	To comply with Gauteng Noise Control Regulations

Table 12-5: Prescribed environmental management standards, practice, guideline, policy or law

Specialist field	Applicable standard, practice, guideline, policy or law
Noise	Gauteng Noise Control Regulations

12.3 Monitoring Plan

Due to the negligible nature of the potential noise impact, it is not recommended that a noise monitoring programme be implemented from the onset. 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 in Table 12-6 below:

Table 12-6: Monitoring plan if required

Method	Monitoring locations	Frequency	Target	Reporting
Sampled in accordance with the Gauteng Noise Control Regulations in conjunction with the SANS 10103:2008 guidelines; Noise measurement should be taken for a period not less than 10 min at each location	The noise measurements should be taken at the location of the complainant	To be conducted on an ad hoc basis if complaints of noise disturbance is received	Noise levels from the project should not measure above the SANS 10103:2008 rating levels for the specific district the receptor falls within.	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.

13 Consultation Undertaken

Discussions were held with the relevant landowners and occupiers on whose property the noise measurements were taken. This was to obtain the required permission to enter the property and explain the purpose of the study. No concerns were raised at the time.

14 Comments and Responses

at the time of compiling this report, no noise related comments or concerns were raised through the EIA's public participation process.

15 Conclusion and Recommendations

SGL proposes to undertake the WRTRP on the west rand of the Gauteng Province. The aim of the environmental noise impact assessment is to assess whether the proposed project will impact on the surrounding receptors by causing disturbing noise, as defined by the Gauteng Noise Control Regulations. The objectives of the assessment are to firstly measure the current ambient baseline noise levels to establish the current soundscape and secondly to quantify the expected noise from the project by use of dispersion modelling.

The baseline noise measurements indicate that the noise levels at the surrounding receptors are typical of suburban and rural districts with frequent road traffic. The daytime levels measured between 44dBA and 52 dBA, while the night time levels measured between 40dBA and 52dBA.

The results of the dispersion models indicate that the expected noise from the project will not measure above the SANS rating levels referred to by the Gauteng Noise Control Regulations, any surrounding receptors as the infrastructure is largely remote from sensitive receptors.

It is concluded that the proposed activities from the project will not cause disturbing noise at the surrounding receptors. The main reason for the negligible impact is that the expected noise levels from the project will measure below the existing day and night time baseline noise levels and subsequently measure below the SANS 10103:2008 rating levels.

The overall conclusion of the ultimate project, taking into account the above conclusion as well as the conclusion of the screening assessment, is that the noise impact is negligible. It is recommended that the project should go ahead without additional engineering noise control measures than what is stipulated in the EMP section of this report.

16 References

Cornelius, J. 2009. GijimaAST. *Environmental Noise impact survey at the proposed new Goldfields Driefonetin Recovery Plant and Proposed Tailings storage Facility site, near Cartonville*

Gauteng province, Department of Agriculture, Conservation and Environment, Notice 5479 of 1999. *Noise control regulations*, 1999, Provincial gazette extraordinary, 20 August 1999

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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.

Appendix A: Declaration of Independence

Digby Wells and Associates (South Africa) (Pty) Ltd

Contact person: Lukas Sadler

Turnberry Office Park
48 Grosvenor Road
Bryanston
2191
South Africa

Tel: 011 789 9495
Fax: 011 789 9498
E-mail: Lukas.sadler@digbywells.com

I, Lukas Sadler, as duly authorised representative of Digby Wells and Associates (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Sibanye Gold Limited, other than fair remuneration for work performed, specifically in connection with the Noise Assessment for the proposed Magnetite Project, Limpopo Province.

_____

Full name: Lukas Sadler

Title/ Position: Environmental Consultant

Qualification(s): BCom Environmental Management

Experience (years): 10 years

Registration: The National Association for Clean Air (NACA)

Appendix B: Specialists CV

Mr. Lukas Sadler
Environmental Consultant
Noise Unit
Digby Wells Environmental (Pty) Ltd

Education

2013:	Course in Environmental Noise Control
2010:	Short course in Air Quality Management
2009:	Short course in Occupational and Environmental Noise
2002 – 2004:	BCom Environmental Management (North West University)

Employment

November 2007 - Present:	Digby Wells Environmental
September 2005 – September 2007:	West View Rail (Pty) Ltd (London)

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 Railway.

I am currently working at Digby Wells Environmental in the Environmental Noise Unit, where I am responsible for the Noise Impact Assessments relating to EIA/EMP's, as well as assisting with the compilation of reports such as environmental impact assessments. This includes experience working with projects in accordance with the International Finance Corporation (IFC) and World Bank standards, in countries such as Namibia, Mali, Senegal, Ghana, Mozambique Liberia, DRC and Sierra Leone.

My core focus is working on Environmental Noise Impact Assessments, which includes the assessment, remediation and management of impacts related to noise nuisance for the construction, mining and petrochemical industry.

Further responsibilities and experience gained at Digby Wells Environmental currently include, but are not limited to:

- Assisting with the compilation of EIA's and EMP's; and
- Noise monitoring (baseline as well as continuous compliance monitoring).

Project experience

- Noise Impact Assessments
  - Boikarabelo Colliery – RSA
  - Putu Iron Ore Project – Liberia
  - New Liberty Gold Mine – Liberia
  - Thabametsi Colliery – RSA

- Temo Coal Project – RSA
- Cooke Uranium Project – RSA
- Kibali Gold Project - DRC
- Sadiola ESIA – Mali
- Mmamabula Optimisation Project - Botswana
- Koidu – Sierra Leone

- Dust Monitoring Experience
  - Mashala Resources – South Africa
  - Anglo Gold Ashanti Iduapriem Mine – Ghana
  - Eastplats – South Africa
  - Universal Coal – South Africa

Professional affiliations

The National Association for Clean Air (NACA)

Appendix C: Plans

Plan 1: Noise Measurement Locations

Plan 2: Kloof Construction Noise Propagation

Plan 3: Kloof Operational Noise Propagation Daytime

Plan 4: Kloof Operational Noise Propagation Night time

Plan 5: Driefontein Construction Noise Propagation

Plan 6: Driefontein Operational Noise Propagation Daytime

Plan 7: Driefontein Operational Noise Propagation Night time

Plan 8: Cooke Construction Noise Propagation

Plan 9: Cooke Operational Noise Propagation Daytime

Plan 10: Cooke Operational Noise Propagation Night time

Plan 11: Ezulwini Construction Noise Propagation

Plan 12: Ezulwini Operational Noise Propagation Daytime

Plan 13: Ezulwini Operational Noise Propagation Night time

Plan 1

Sibanye WRTRP EIA

Noise Monitoring Locations

Legend

- Current Noise Monitoring Point
- Historical Noise Monitoring Point
- Major Town
- Other Town
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Powerlines
- Pipelines: Kloof Mining Right
- Pipelines: Driefontein Mining Right
- Pipelines: Cooke Mining Right
- Pipelines: Ezulwini Mining Right
- CPP and Uranium Plant Footprint
- Regional Tailings Storage Facility
- TSF within Kloof Mining Right
- TSF within Driefontein Mining Right
- TSF within Cooke Mining Right
- Kloof Mining Right
- Driefontein Mining Right
- Cooke Mining Right
- Ezulwini Mining Right

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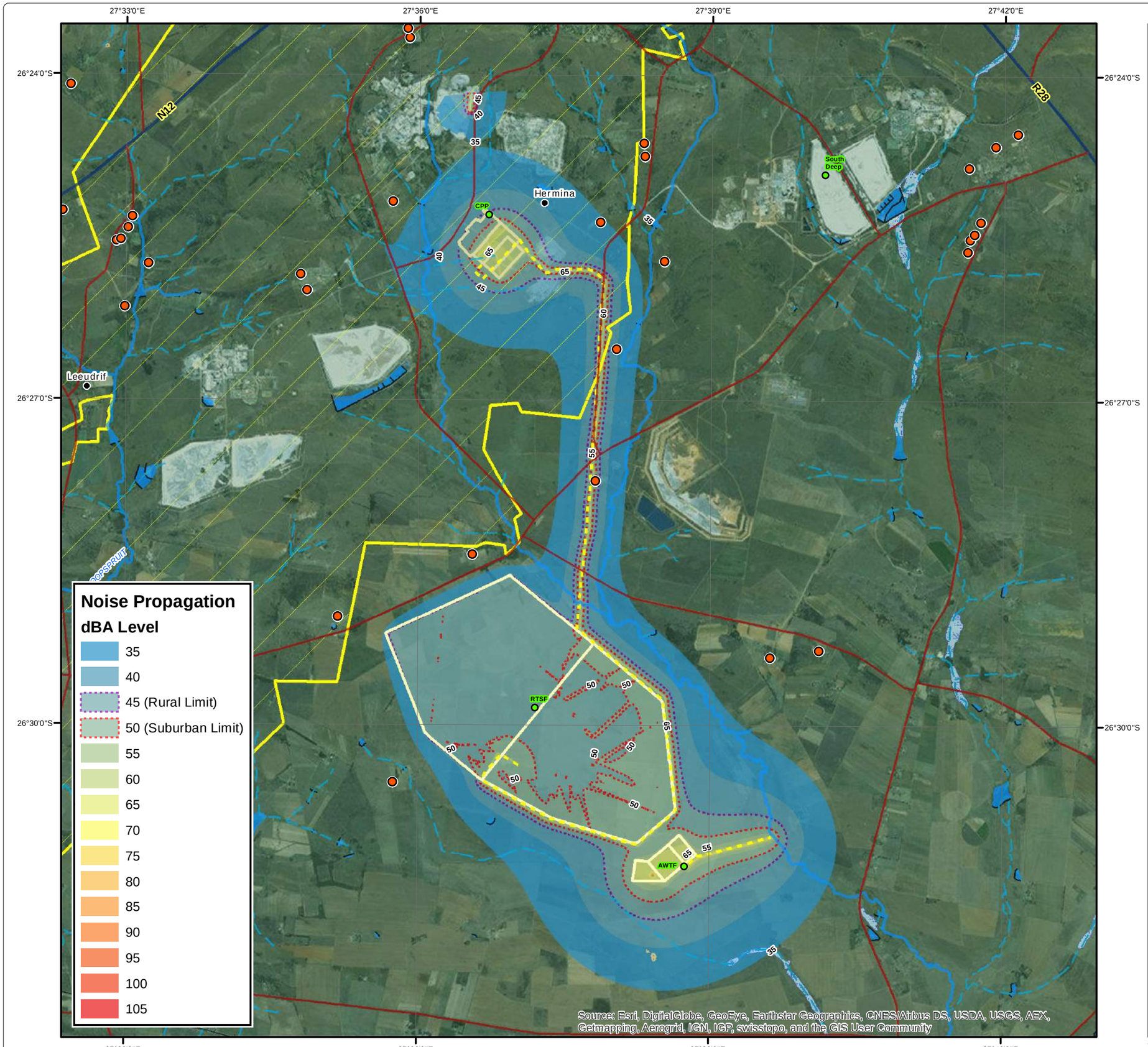
Plan 2

Sibanye WRTRP EIA

Kloof MRA Daytime Construction Noise Propagation



Noise Propagation
dBA Level

- 35
- 40
- 45 (Rural Limit)
- 50 (Suburban Limit)
- 55
- 60
- 65
- 70
- 75
- 80
- 85
- 90
- 95
- 100
- 105

Legend

- Noise Receptor
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Pipelines: Kloof Mining Right
- CPP and Uranium Plant Footprint
- Regional Tailings Storage Facility
- Kloof Mining Right

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Projection: Transverse Mercator	Ref #: sdp.GOL2376.201507.046
Datum: WGS 1984	Revision Number: 2
Central Meridian: 27°E	Date: 09/12/2015

N

0 0.5 1 2 3

Kilometres

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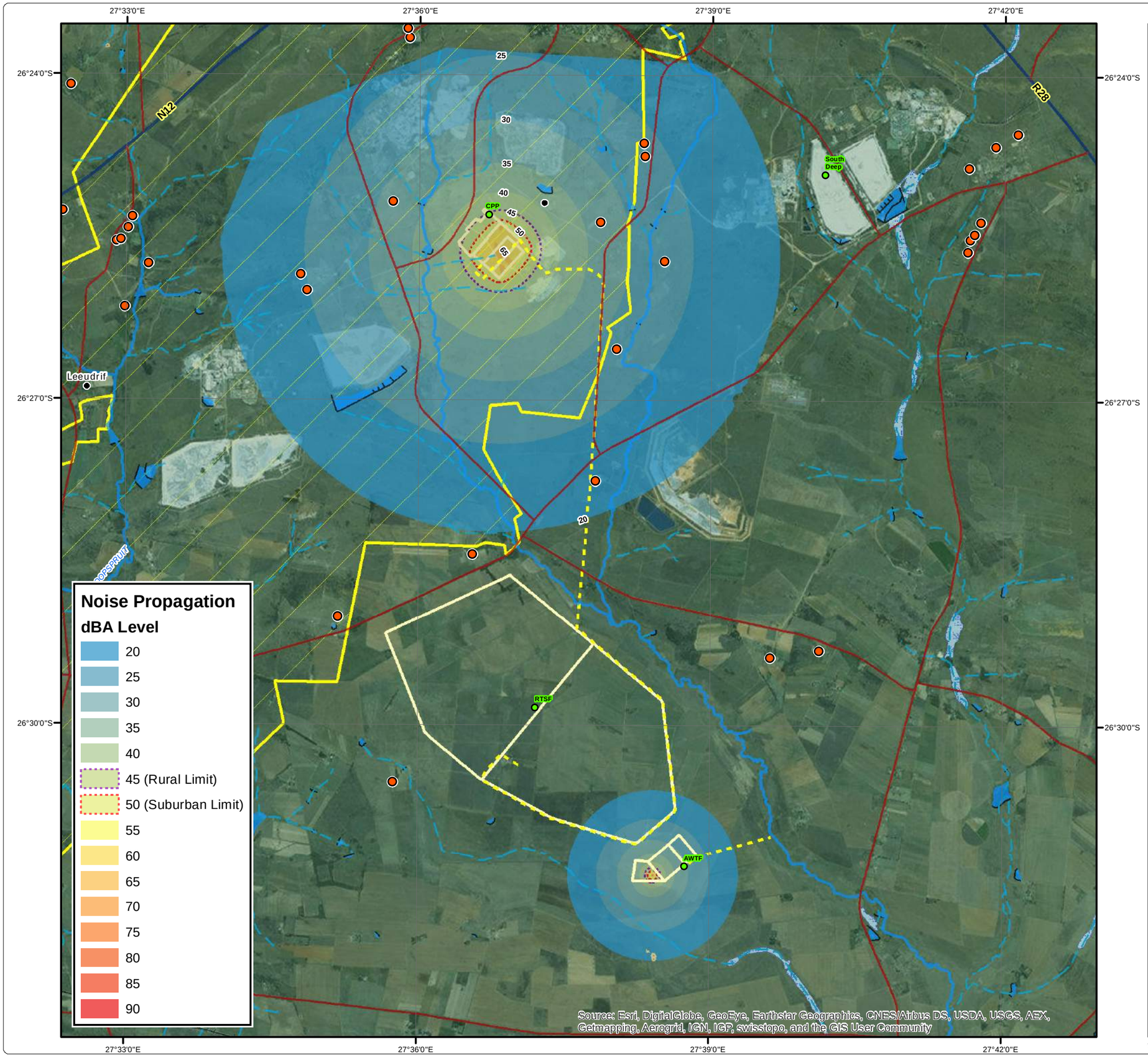
Plan 3

Sibanye WRTRP EIA

Kloof MRA Daytime Operational Noise Propagation



Legend

- Noise Receptor
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Pipelines: Kloof Mining Right
- CPP and Uranium Plant Footprint
- Regional Tailings Storage Facility
- Kloof Mining Right

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Projection: Transverse Mercator	Ref #: sdp.GOL2376.201507.047
Datum: WGS 1984	Revision Number: 2
Central Meridian: 27°E	Date: 09/12/2015

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0 0.5 1 2 3

Kilometres

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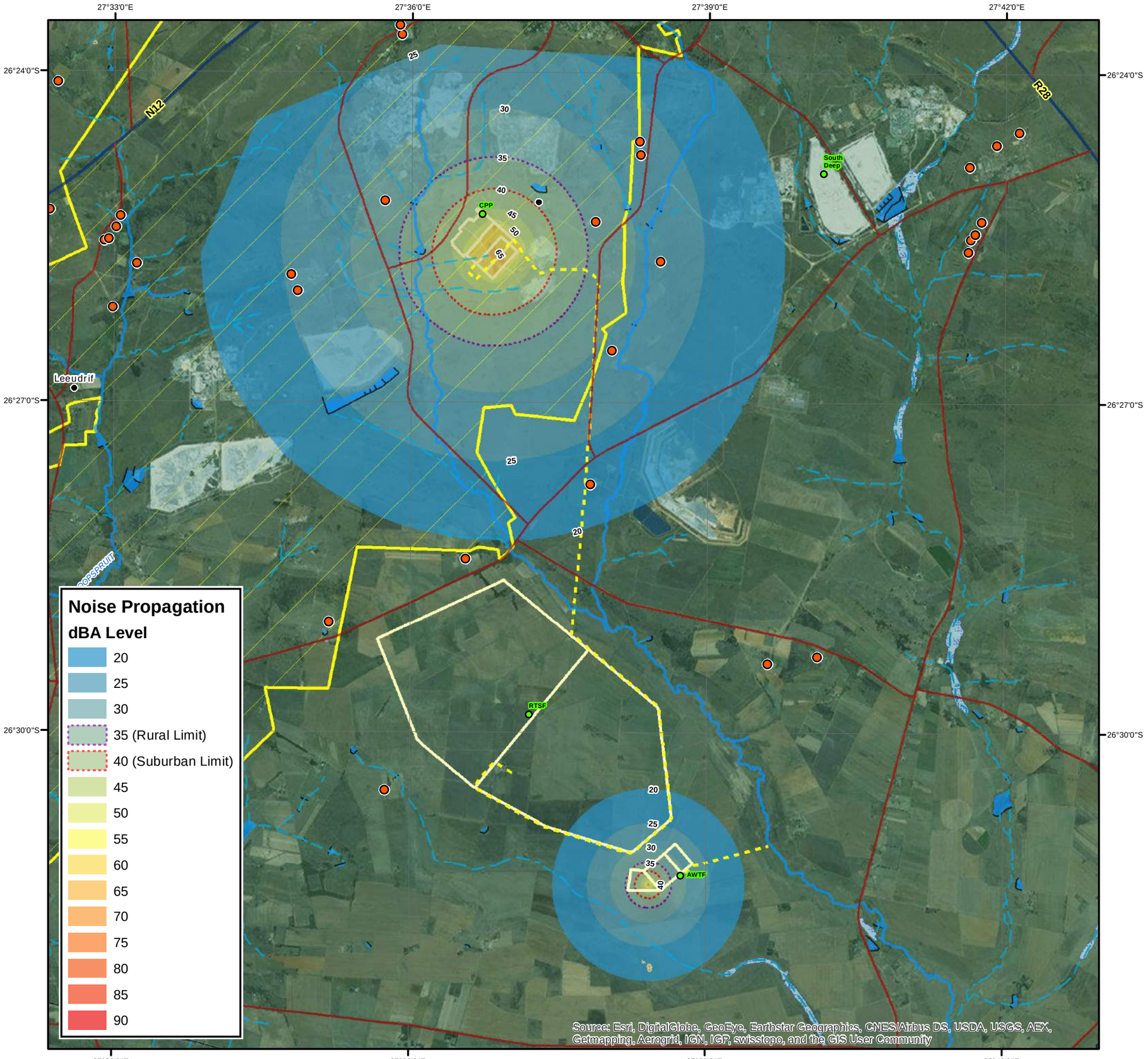
Plan 4

Sibanye WRTRP EIA

Kloof MRA Night Time Operational Noise Propagation



Legend

- Noise Receptor
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Pipelines: Kloof Mining Right
- CPP and Uranium Plant Footprint
- Regional Tailings Storage Facility
- Kloof Mining Right

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Projection: Transverse Mercator	Ref #: sdp.GOL2376.201507.048
Datum: WGS 1984	Revision Number: 2
Central Meridian: 27°E	Date: 09/12/2015

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Kilometres

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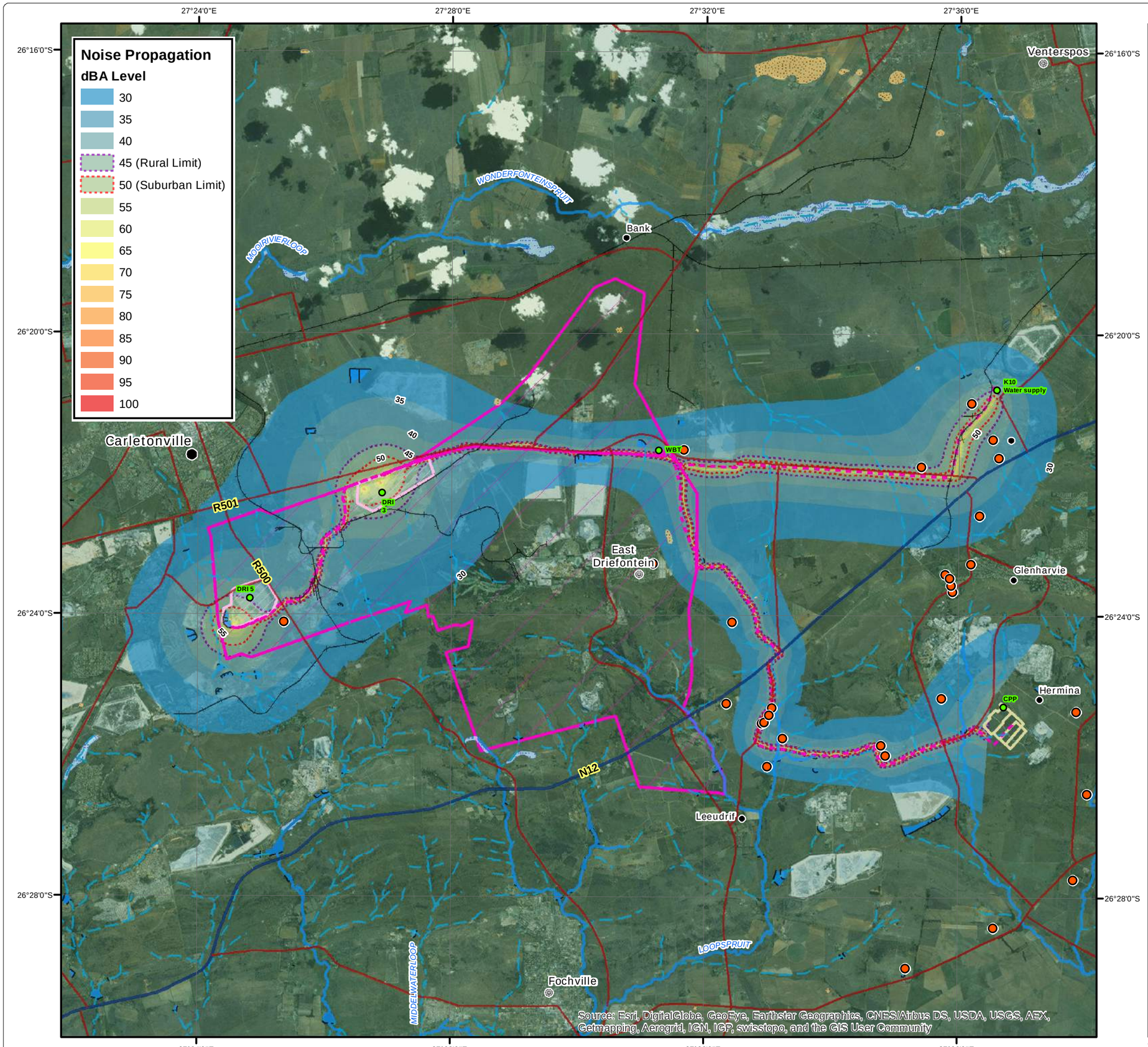
Plan 5

Sibanye WRTRP EIA

Driefontein MRA Daytime Construction Noise Propagation



Legend

- Noise Receptor
- Major Town
- Other Town
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Pipelines: Driefontein Mining Right
- CPP and Uranium Plant Footprint
- TSF within Driefontein Mining Right
- Driefontein Mining Right

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Projection: Transverse Mercator	Ref #: sdp.GOL2376.201507.049
Datum: WGS 1984	Revision Number: 2
Central Meridian: 27°E	Date: 09/12/2015

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Kilometres

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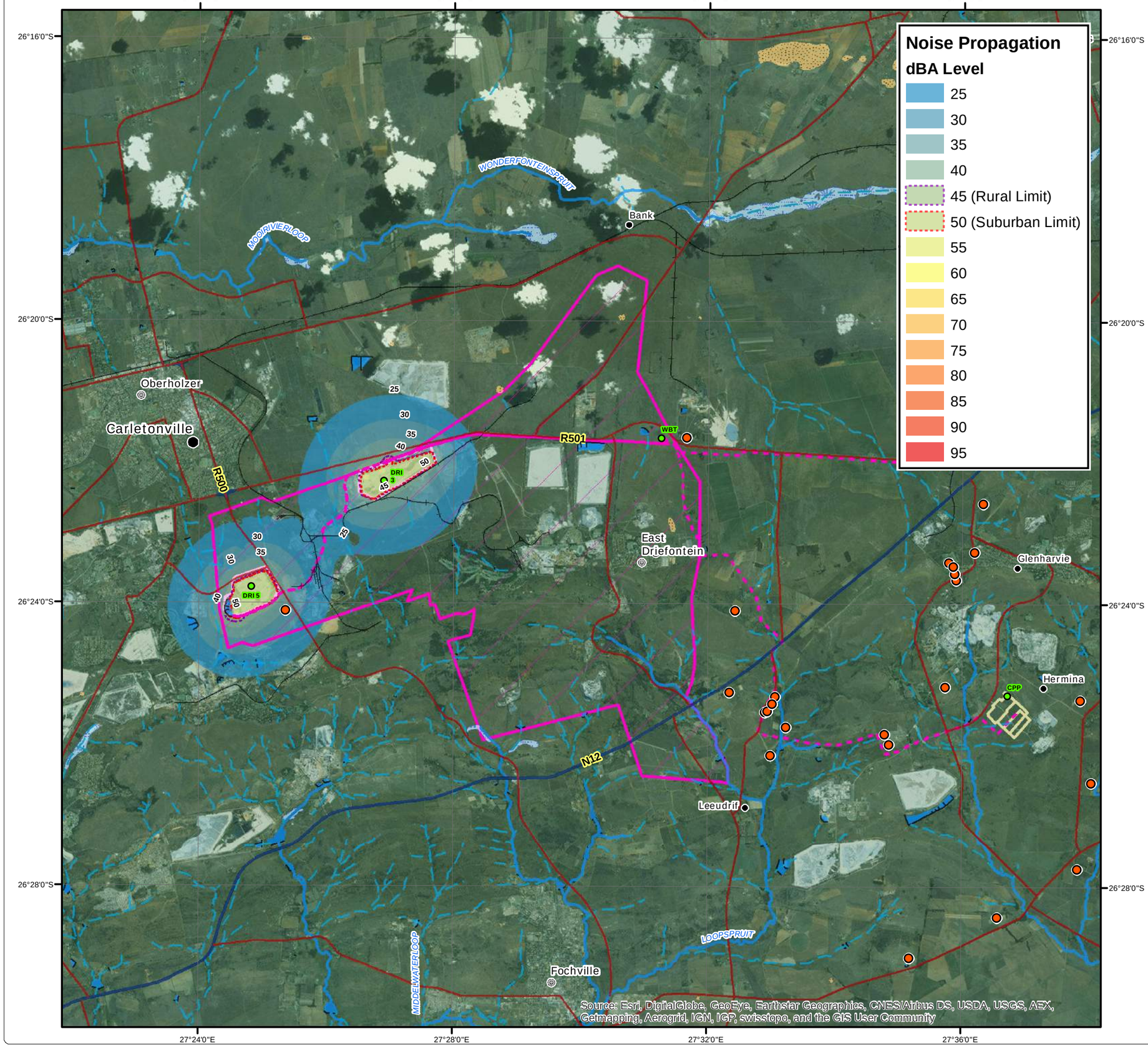
Plan 6

Sibanye WRTRP EIA

Driefontein MRA Daytime Operational Noise Propagation



Legend

- Noise Receptor
- Major Town
- Other Town
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Pipelines: Driefontein Mining Right
- CPP and Uranium Plant Footprint
- TSF within Driefontein Mining Right
- Driefontein Mining Right

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Projection: Transverse Mercator
Datum: WGS 1984
Central Meridian: 27°E

Ref #: sdp.GOL2376.201507.044
Revision Number: 2
Date: 09/12/2015

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Kilometres

1:100 000

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Plan 7

Sibanye WRTRP EIA

Driefontein MRA Night Time Operational Noise Propagation

27°24'0"E 27°28'0"E 27°32'0"E 27°36'0"E

26°16'0"S 26°20'0"S 26°24'0"S 26°28'0"S

Noise Propagation

dBA Level

- 25
- 30
- 35 (Rural Limit)
- 40 (Suburban Limit)
- 45
- 50
- 55
- 60
- 65
- 70
- 75
- 80
- 85
- 90
- 95

Bank
Oberholzer
Carletonville
East Driefontein
Glenharvie
Hermina
Leeudrif
Fochville
WONDERFONTEINSPRUIT
NOORDRIVIERLOOP
MIDDELWATERLOOP
LOOPSPRUIT
R500
R501
N12
WBT
DRI 3
DRI 5
CPP

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- Noise Receptor
- Major Town
- Other Town
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Pipelines: Driefontein Mining Right
- CPP and Uranium Plant Footprint
- TSF within Driefontein Mining Right
- Driefontein Mining Right

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Projection: Transverse Mercator
Datum: WGS 1984
Central Meridian: 27°E

Ref #: sdp.GOL2376.201507.045
Revision Number: 2
Date: 09/12/2015

N

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Kilometres

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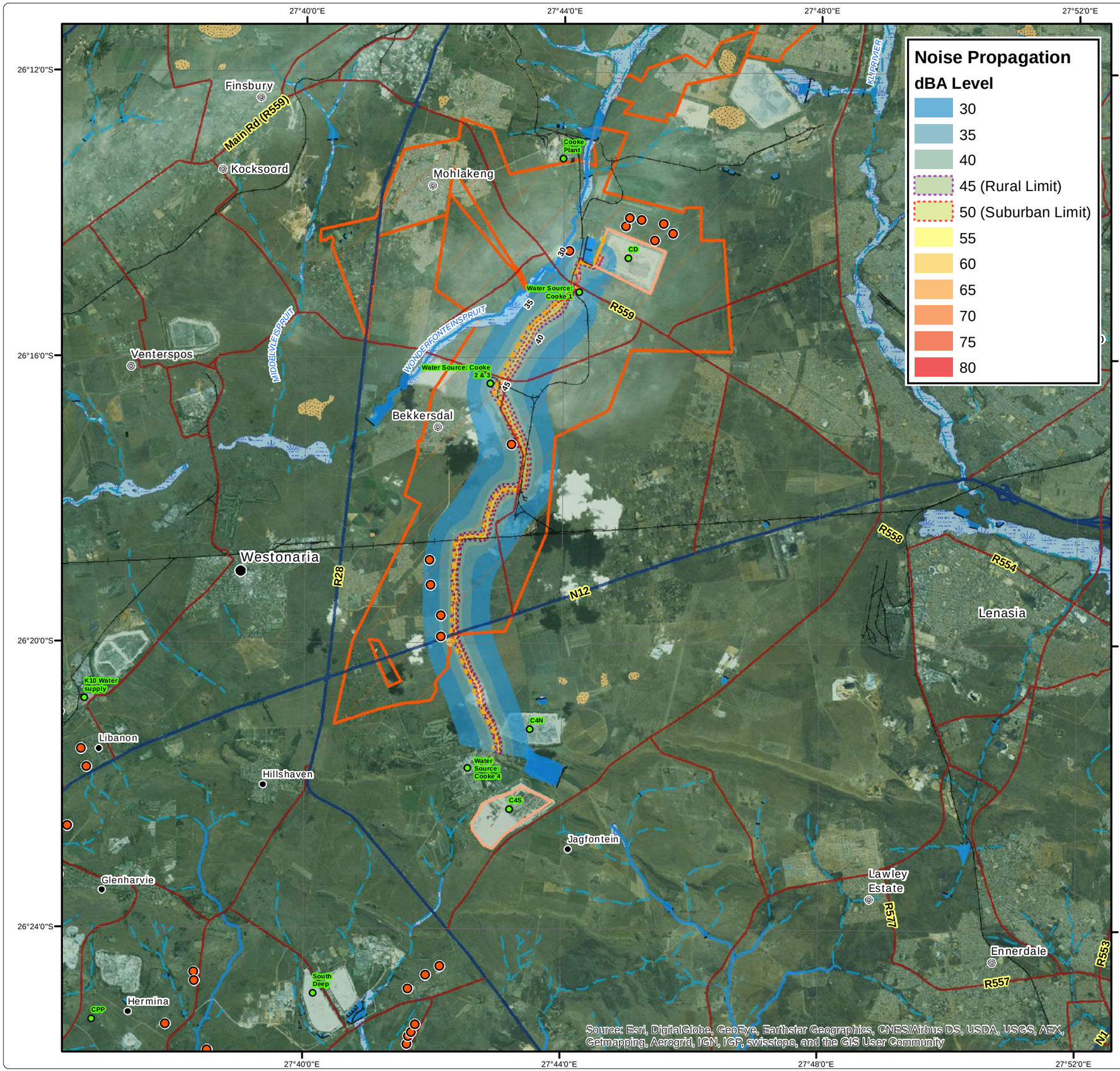
Plan 8

Sibanye WRTRP EIA

Cooke MRA Daytime Construction Noise Propagation



Legend

- Noise Receptor
- Major Town
- Other Town
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Pipelines: Cooke Mining Right
- TSF within Cooke Mining Right
- Cooke Mining Right

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Projection: Transverse Mercator	Ref #: sdp.GOL2376.201507.052
Datum: WGS 1984	Revision Number: 2
Central Meridian: 27°E	Date: 09/12/2015

N

0 1 2 4

Kilometres

1:100 000

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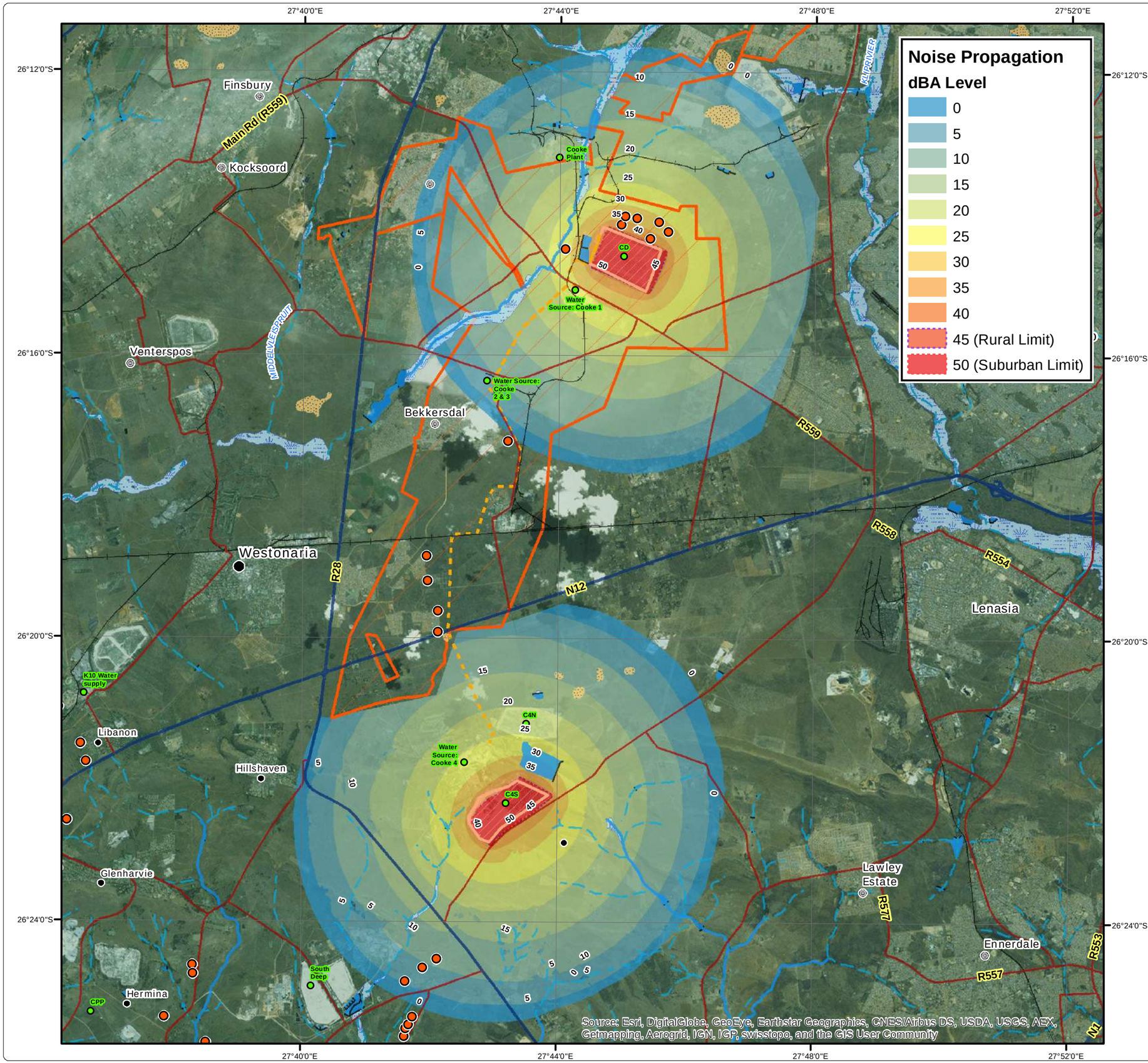
Plan 9

Sibanye WRTRP EIA

Cooke MRA Daytime Operational Noise Propagation



Legend

- Noise Receptor
- Major Town
- Other Town
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Pipelines: Cooke Mining Right
- TSF within Cooke Mining Right
- Cooke Mining Right

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Projection: Transverse Mercator	Ref #: sdp.GOL2376.201507.053
Datum: WGS 1984	Revision Number: 2
Central Meridian: 27°E	Date: 09/12/2015

N

0 1 2 4

Kilometres

1:100 000

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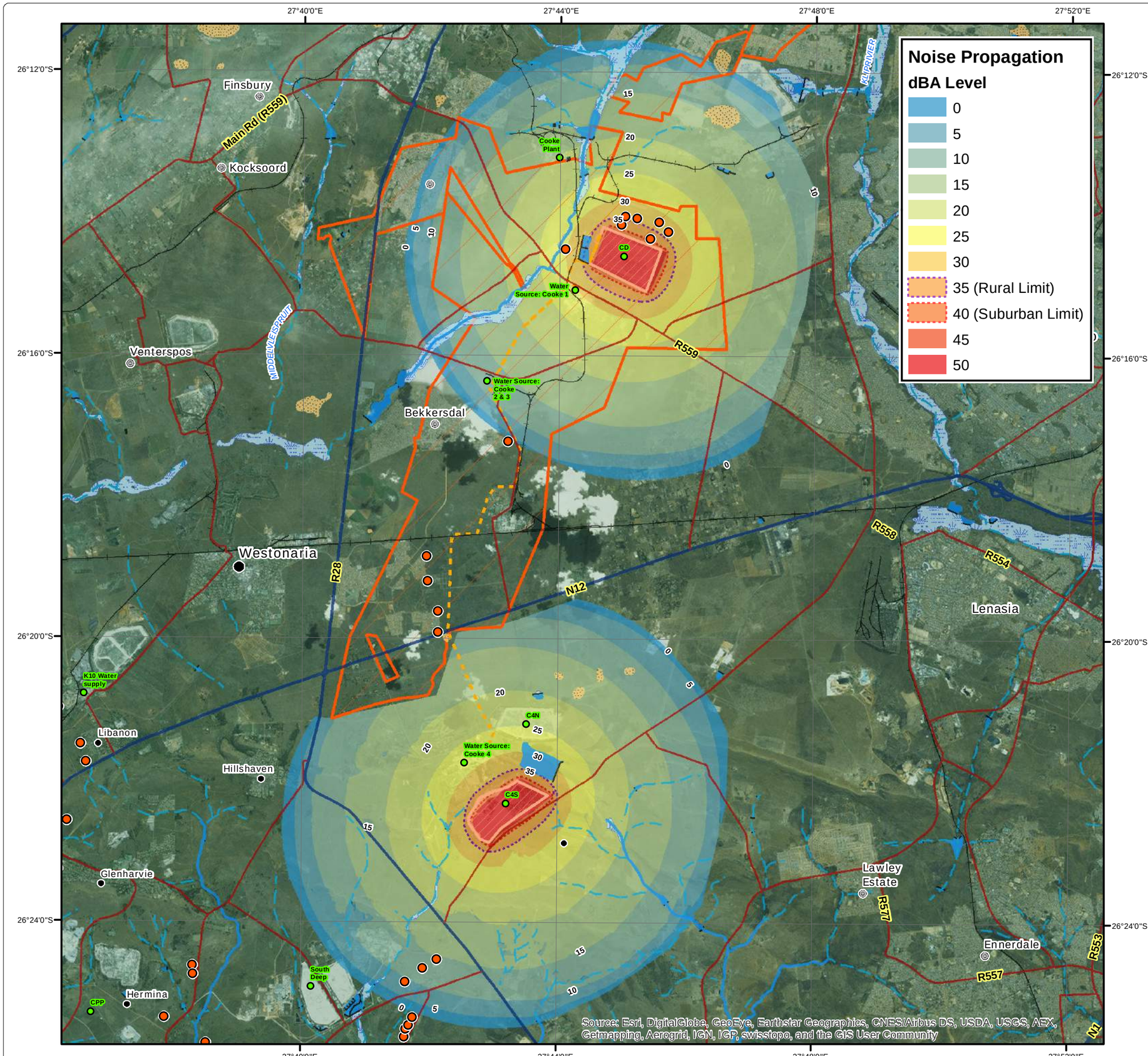
Plan 10

Sibanye WRTRP EIA

Cooke MRA Night Time Operational Noise Propagation



Legend

- Noise Receptor
- Major Town
- Other Town
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Pipelines: Cooke Mining Right
- TSF within Cooke Mining Right
- Cooke Mining Right

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Projection: Transverse Mercator	Ref #: sdp.GOL2376.201507.054
Datum: WGS 1984	Revision Number: 2
Central Meridian: 27°E	Date: 09/12/2015

N

0 1 2 4

Kilometres

1:100 000

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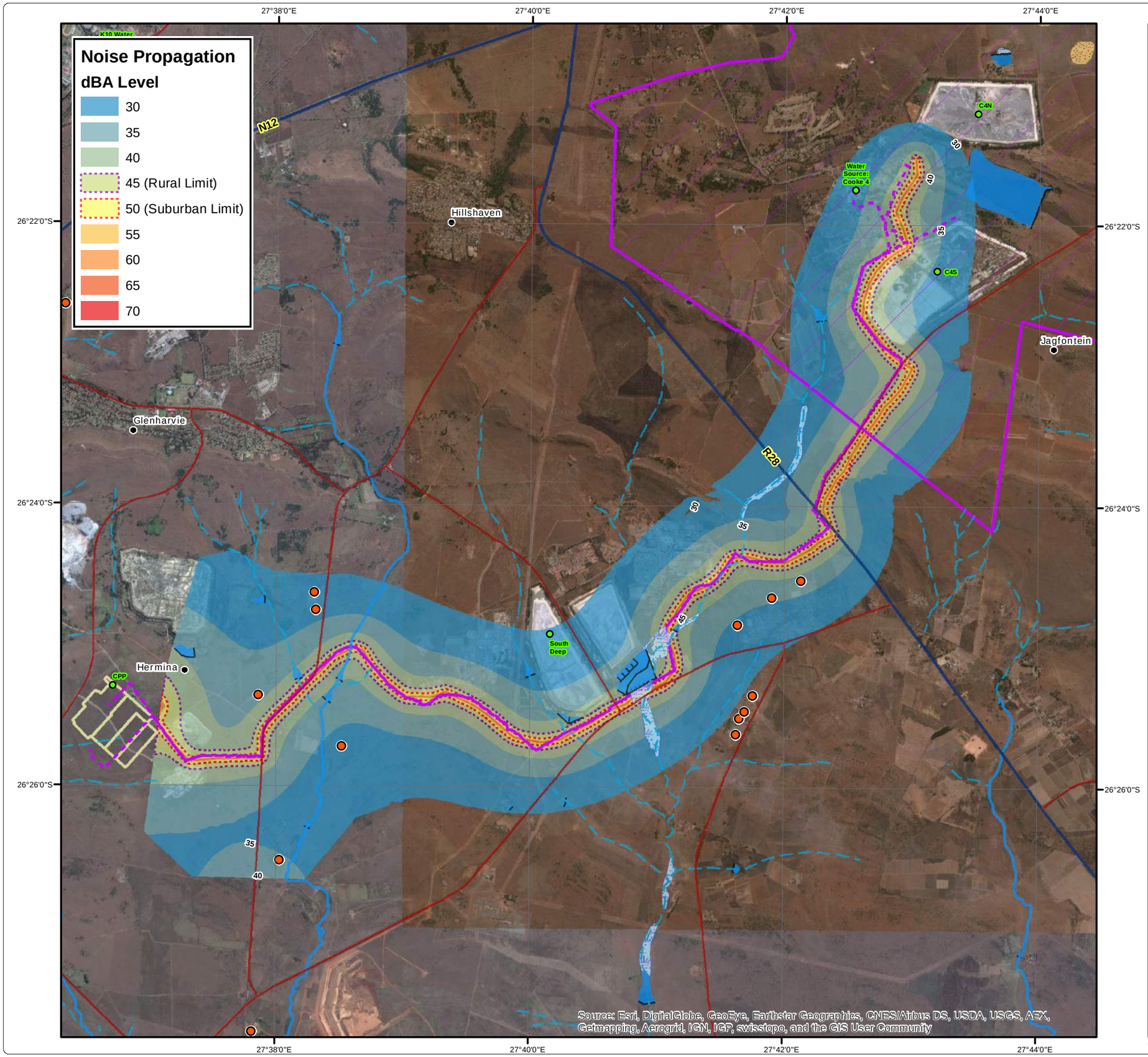
Plan 11

Sibanye WRTRP EIA

Ezulwini MRA Daytime Construction Noise Propagation



Legend

- Noise Receptor
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Pipelines: Ezulwini Mining Right
- CPP and Uranium Plant Footprint
- Ezulwini Mining Right

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Projection: Transverse Mercator	Ref #: sdp.GOL2376.201507.045
Datum: WGS 1984	Revision Number: 2
Central Meridian: 27°E	Date: 09/12/2015

N

0 0.5 1 2

Kilometres

1:50 000

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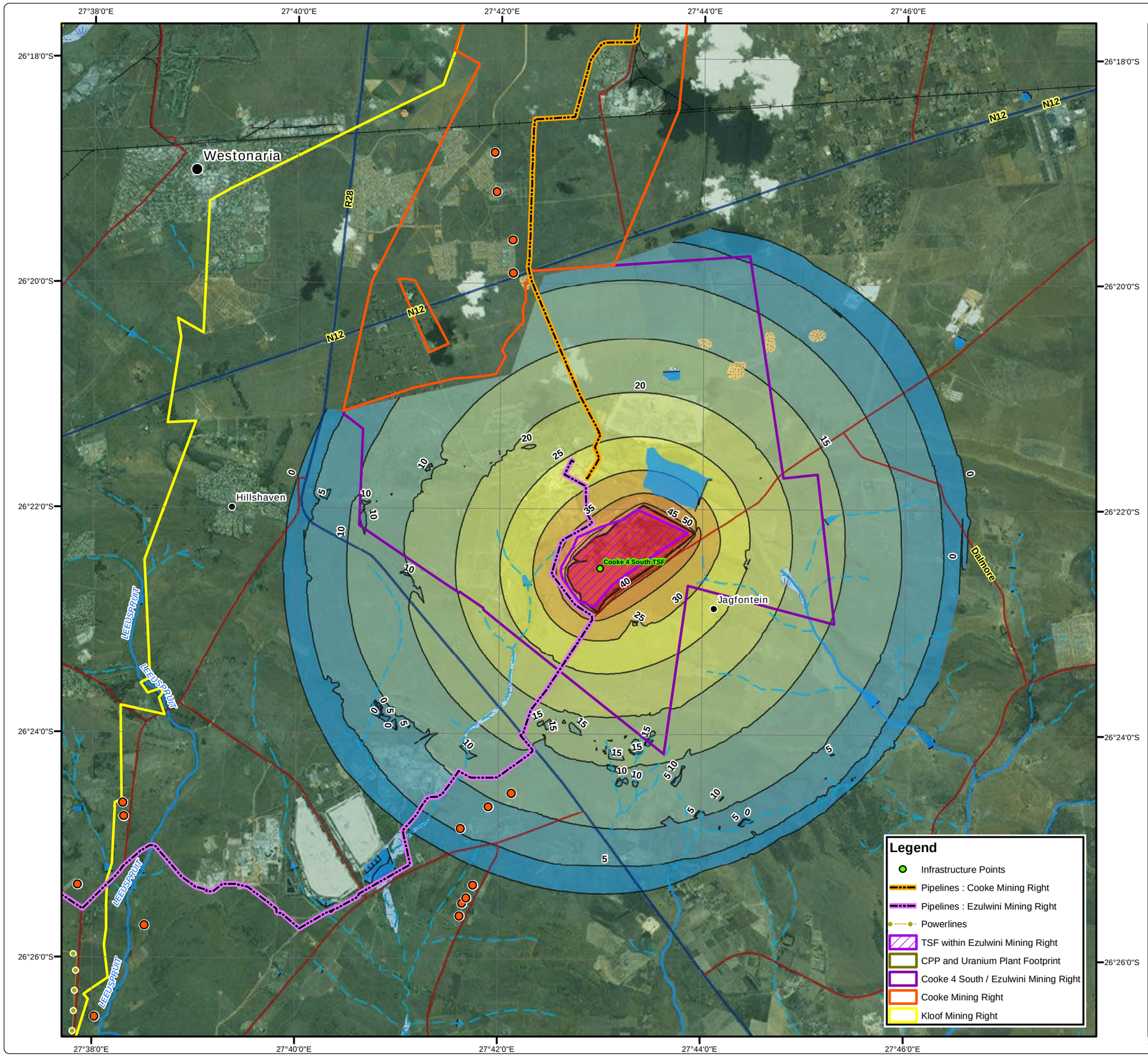
Plan 12

Sibanye WRTRP EIA

Ezulwini

Operational Noise Propagation Night Time



Legend

- Noise Receptors
- Major Town
- Other Town
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Ezulwini Operational Noise Propagation Daytime dBA Levels

- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40 Suburban Limit
- 45
- 50

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Projection: Transverse Mercator	Ref #: sdp.GOL2376.201507.050
Datum: WGS 1984	Revision Number: 1
Central Meridian: 27°E	Date: 13/07/2015

N

0 0.75 1.5 3

Kilometres

1:62 500

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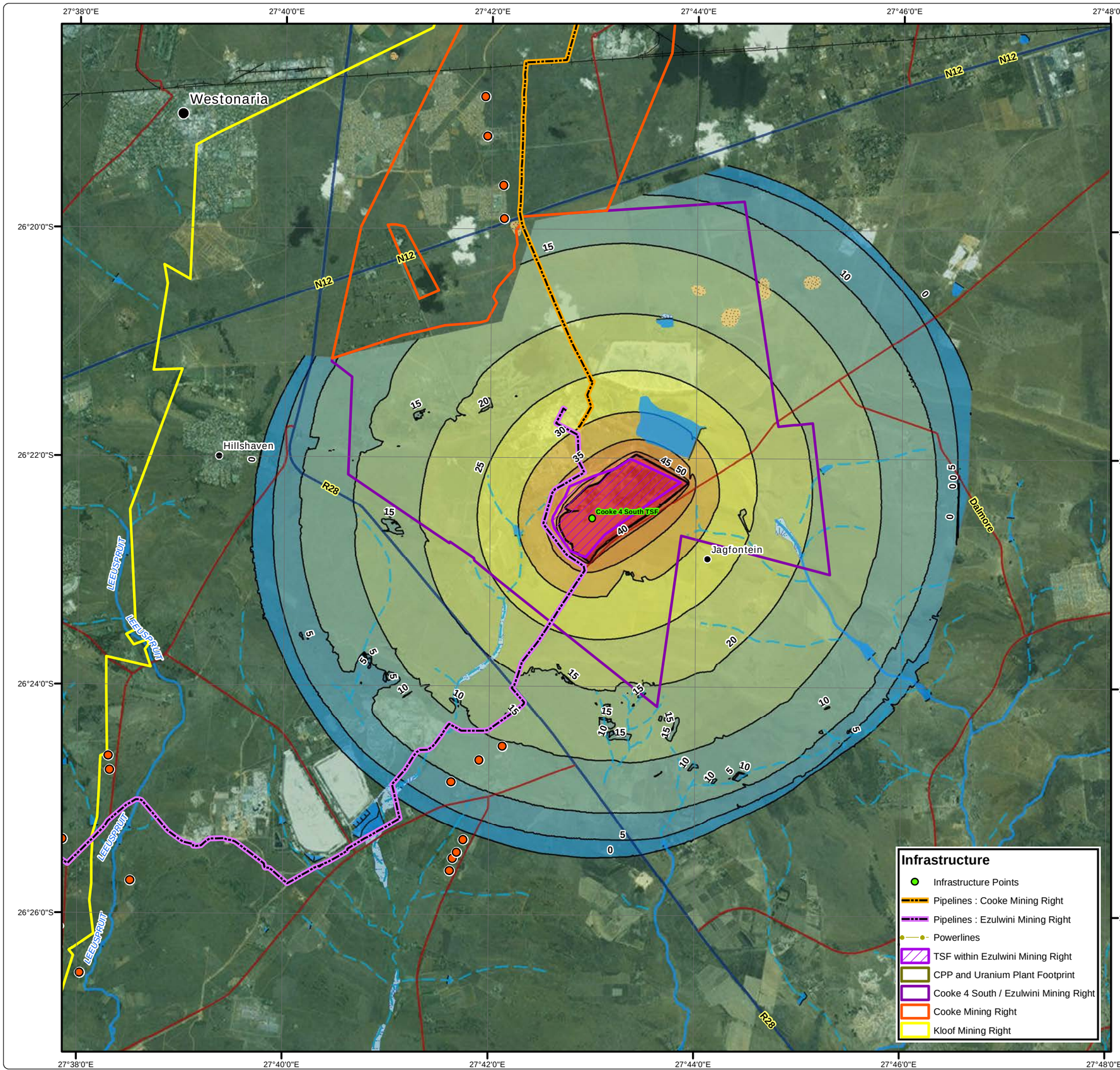
Plan 13

Sibanye WRTRP EIA

Ezulwini
Operational Noise Propagation Night Time



Legend

- Noise Receptors
- Major Town
- Other Town
- Settlement
- National / Arterial Route
- Main Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Ezulwini Operational Noise Propagation Night Time dBA Level

- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40 Suburban Limit
- 45
- 50

Infrastructure

- Infrastructure Points
- Pipelines : Cooke Mining Right
- Pipelines : Ezulwini Mining Right
- Powerlines
- TSF within Ezulwini Mining Right
- CPP and Uranium Plant Footprint
- Cooke 4 South / Ezulwini Mining Right
- Cooke Mining Right
- Kloof Mining Right

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Projection: Transverse Mercator	Ref #: sdp.GOL2376.201507.051
Datum: WGS 1984	Revision Number: 1
Central Meridian: 27°E	Date: 13/07/2015

N

0 0.75 1.5 3

Kilometres

1:62 500

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