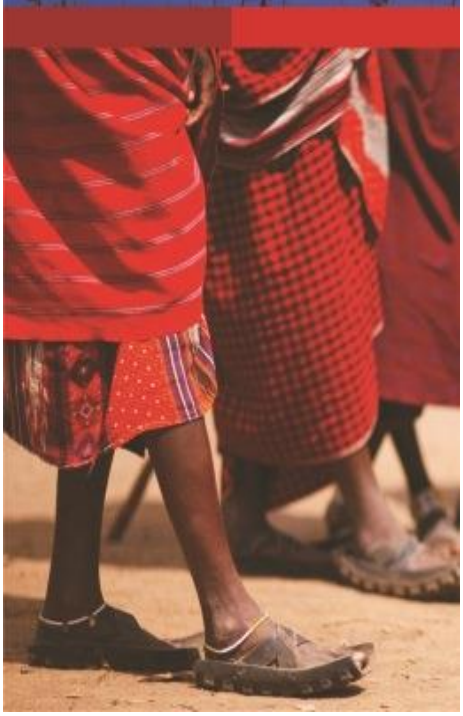

DIGBY WELLS
ENVIRONMENTAL

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

Air Quality Impact Assessment Report

Project Number:

NAM5335

Prepared for:

Temo Coal (Pty) Ltd

February 2019

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This document has been prepared by Digby Wells Environmental.

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

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

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EXECUTIVE SUMMARY

Digby Wells Environmental (hereafter Digby Wells) was appointed Temo Coal (Pty) Ltd to undertake a suite of specialist studies in support of its application for Environmental Authorisation (EA) as encapsulated in:

- The National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA);
- The NEMA Environmental Impact Assessment (EIA) Regulations (Government Notice Regulations [GN R] 982 as amended by GN R 326); and
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA).

Amongst the suite of specialist studies, an Air Quality Assessment (AQA) was conducted to determine potential air quality impacts on the surrounding environment from the construction of the rail loop and road diversion Project.

Historical dust deposition data (total suspended particulate (TSP) ≥ 30 µm)) and real-time measurements encompassing particulate matter with aerodynamic diameter leass than 10micron and 5 micron (PM_{10} and $PM_{2.5}$) and gaseous pollutants, such as SO_2, NO_2, CO and O_3 was used to assessed baseline air quality scenarios in the Project area.

Findings confirm that current levels of ambient pollutants are way below the recommended limits except for O_3, with some exceedances recorded. The fact that the construction of the rail loop and road diversion will take place in phases and will be medium-term in nature, impacts are likely to be minimal. Although emissions are associated with the construction of the rail loop and road diversion, airborne pollutants are not expected to exacerbate ambient conditions above regulatory limit values.

If the construction, operation and decommissioning of the rail loop and road is looked at in isolation, the ambient (current) levels of pollutants measured show that there is “room” to absorb airborne emissions during the different phases. The previous study “Air quality Assessment conducted for Namane Generation (Pty) Independent Power Producer Project in 2016” showed that for particulates, exceedances were not predicted. However, for NO_2 and SO_2 1-hour averaging period, exceedances predicted were confined within the mine boundary. The SO_2 24-hour and NO_2 1-year were below the South African standards with no exceedances observed. The operational phase of the rail loop and road will most likely represent minimal impacts on the ambient air quality of the area.

In conclusion, management should ensure that mitigation measures and dust management plan are in place during the different phases of the Project. Such a holistic approach will ensure that airborne emissions are contained, which will result in lower background concentration on-site and at off-site locations.

Based on the results presented in this report, the following recommendations should be applied:

- Administer mitigation measures in line with current best engineering practice, as described in the impact assessment section;
- Establish codes of practice for good housekeeping with respect to dust management and mitigation for open areas;
- Have a dust management plan in place, driven by a designated and dedicated mine policy and procedure;
- Monitor the air quality of the project area to ensure compliance with regulatory standards onsite and at offsite locations; and
- Establish a monthly and annual reporting structure to appraise performance and compliance.

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LIST OF ACRONYMS, ABBREVIATIONS AND TERMS

Abbreviation	Description
AQIA	Air Quality Impact Assessment
ASTM	American Society for Testing and Materials
DEA	Department of Environmental Affairs
Digby Wells	Digby Wells Environmental
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
km	Kilometre
m	Metre
m^2	Metre squared
mg	Milligram
NDCR	National Dust Control Regulation
NEM:AQA	National Environmental Management: Air Quality Act
NEMA	National Environmental Management Act
PM_{10}	Particulate Matter 10 micrometres in diameter
$PM_{2.5}$	Particulate Matter 2.5 micrometres in diameter
SANS	South African National Standards
TSP	Total Suspended Particulates
USEPA	United States Environmental Protection Agency
WHO	World Health Organisation

1 Introduction

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

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

This study augments the baseline air quality component of a previous study "Air quality Assessment conducted for Namane Generation (Pty) Independent Power Producer Project in 2016", which was completed and submitted. It encompasses the full project description; detailed discussion of the baseline meteorology and existing air quality scenario (based on available data at the time). This impact assessment should therefore be read in conjunction with the aforementioned report.

1.1 Project Background

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

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

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

This Air Quality Impact Assessment, considered;

- **Diversion of road D175:** The approved open pit area has a road, the D175, which transects the south-western corner of the future pit area and continues to exit the Mining Right boundary near the north-western corner. To facilitate continued mining and maximise the minable area at the Temo Mine, Temo proposes that the D175 be diverted around the mining area.
- **Proposed Rail Loop:** The purpose of the rail loop is to allow Temo to transport export-grade coal product to the Richards Bay Coal Terminal (RBCT) as well as for domestic use. The rail loop will include a loading loop which will be within the approved Mining Right boundary of the Temo Mine.
- **Proposed Bulk Water Pipeline:** Construction of a bulk water pipeline (for which three different pipeline routes are proposed) connecting the Temo mine to the Lephalale Waste Water Treatment Works (WWTW) to provide water to the mine.

1.2 Terms of Reference

The Air Quality Impact Assessment (AQIA) scope includes the following:

- Collection of site specific baseline air quality data (i.e. PM_{10} and $PM_{2.5}$ (particulate matter with aerodynamic diameter less than 10 µm and 2.5 µm) and gases (SO_2, NO_2, CO and O_3), not covered in the previous study;
- Update existing air quality baseline;
- Assessment of potential impacts associated with the construction of the Rail Loop, Road Diversion and pipelines; and
- Recommendation of air quality management measures, including mitigation and monitoring, which will serve as input to Temo Coal's Environmental Management Plan (EMP).

1.3 Assumptions and Exclusions

Assumptions and exclusions pertaining to the Project include:

- The construction of the road diversion, rail loop and pipelines will occur in phases with minimal impacts anticipated, hence no dispersion model required. Aspect was covered extensively in previous study; and
- The South African ambient air quality standards for particulates and gases published in the regulatory requirements of the National Environmental Management: Air Quality Act of 2004 (Act No. 39 of 2004), in gazette number 919 in government gazette 37078 of 29 November 2013; gazette number 486 in government gazette 35463 of 29 June 2012; and gazette number 1210 in government gazette 32816 of 29 December 2009, was used in this study.

2 Legal Requirement

This section summarises national legislation and regulations pertaining to air quality for sources and pollutants relevant to this study. As indicated above, pollutants measures encompasses PM_{10}, $PM_{2.5}$ and total suspended particulate (TSP) adapted from historical measurements and gases, such as SO_2, NO_2, CO and O_3.

2.1 Applicable Standard

Guidelines provide a basis for protecting public health from adverse effects of air pollution and for eliminating, or reducing to minimum ambient levels of pollutants that are known or likely to be hazardous to human health and wellbeing World Health Organization (WHO, 2000). Once the guidelines are adopted as standards, they become legally enforceable. These standards prescribe the allowable ambient concentrations of pollutants which are not to be exceeded during a specified time period in a defined area. If the air quality guidelines/standards are exceeded, the ambient air quality is poor and the potential for health effects is greatest.

The prevailing legislation in the Republic of South Africa with regards to the Air Quality field is the National Environment Management: Air Quality Act (Act No. 39 of 2004) (NEM: AQA). In line with the aforementioned, the Department of Environmental Affairs (DEA) published the acceptable dust fallout limits for residential and non-residential areas 01 November 2013. The dust fallout standard is given in the Table 2-1 below.

Table 2-1: Dust Fall Standards (NEMAQA - NDCR, 2013)

Restriction Areas	Dust fall rate ($mg/m^2/day$, 30-days average)	Permitted Frequency of exceeding dust fall rate
Residential Area	< 600	Two within a year, not sequential months
Non-Residential Area	< 1200	Two within a year, not sequential months

DEA has established National Ambient Air Quality Standards for PM_{10} and gases in (Table 2-2) since December 2009 and $PM_{2.5}$, since June 2012 (GN 486: 2012)

Table 2-2: National Ambient Air Quality Standards for Particulate Matter (PM_{10}) (2009)

AVERAGING PERIOD	LIMIT VALUE ($\mu g/m^3$)	LIMIT VALUE (ppb)	FREQUENCY OF EXCEEDANCE	COMPLIANCE DATE
National Ambient Air Quality Standard for Sulphur Dioxide (SO_2)				
10 Minutes	500	191	526	Immediate
1 hour	350	134	88	Immediate
24 hours	125	48	4	Immediate
1 year	50	19	0	Immediate

AVERAGING PERIOD	LIMIT VALUE (µg/m^3)	LIMIT VALUE (ppb)	FREQUENCY OF EXCEEDANCE	COMPLIANCE DATE
The reference method for the analysis of SO_2 shall be ISO 6767.				
National Ambient Air Quality Standard for Nitrogen Dioxide (NO_2)				
1 hour	200	106	88	Immediate
1 year	40	21	0	Immediate
The reference method for the analysis of NO_2 shall be ISO 7996.				
National Ambient Air Quality Standard for Particulate Matter (PM_{10})				
24 hour	75		4	1 January 2015
1 year	40		0	1 January 2015
The reference method for the determination of the PM10 fraction of suspended particulate matter shall be EN 12341.				
National Ambient Air Quality Standard for Ozone (O_3)				
8 hours (running)	120 (61ppb)		11	Immediate
The reference method for the analysis of ozone shall be the UV photometric method as described in SANS 13964.				
National Ambient Air Quality Standard for Carbon Monoxide (CO) mg/m3				
1 hour	30	26	88	Immediate
8 hour (calculated on 1 hourly averages)	10	8.7	11	Immediate
The reference method for analysis of CO shall be ISO 4224.				

Table 2-3: National Ambient Air Quality Standards for Particulate Matter ($PM_{2.5}$) (2012)

National Ambient Air Quality Standards for Particulate Matter ($PM_{2.5}$)			
AVERAGING PERIOD	**LIMIT VALUE (µg/m^3)**	**FREQUENCY OF EXCEEDANCE**	**COMPLIANCE DATE**
24 hours	40	0	1 January 2016 – 31 December 2029
24 hours	25	0	01 January 2030
1 year	20	0	1 January 2016 – 31 December 2029
1 year	15	0	01 January 2030
The reference method for the determination of PM2.5 fraction of suspended particulate matter shall be EN 14907.			

3 Baseline Environment

The dominant land use in the Project area is agriculture. Common in the area are isolated farm houses that are partially occupied by the owners, but inhabited by one, two or few farm workers who are employed full-time on the farms. The main activities are game hunting and animal husbandry. These locations represented as DM1 – DM11 where people live and where exposure is likely to occur were selected as sensitive receptors and air quality monitoring points (Figure 3-1).

According to the USEPA (2016), a sensitive receptor encompasses but not limited to "*hospitals, schools, daycare facilities, elderly housing and convalescent facilities. These are areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides, and other pollutants"*. In addition to the aforementioned, the definition covers human settlements where involuntary exposures are likely to occur.

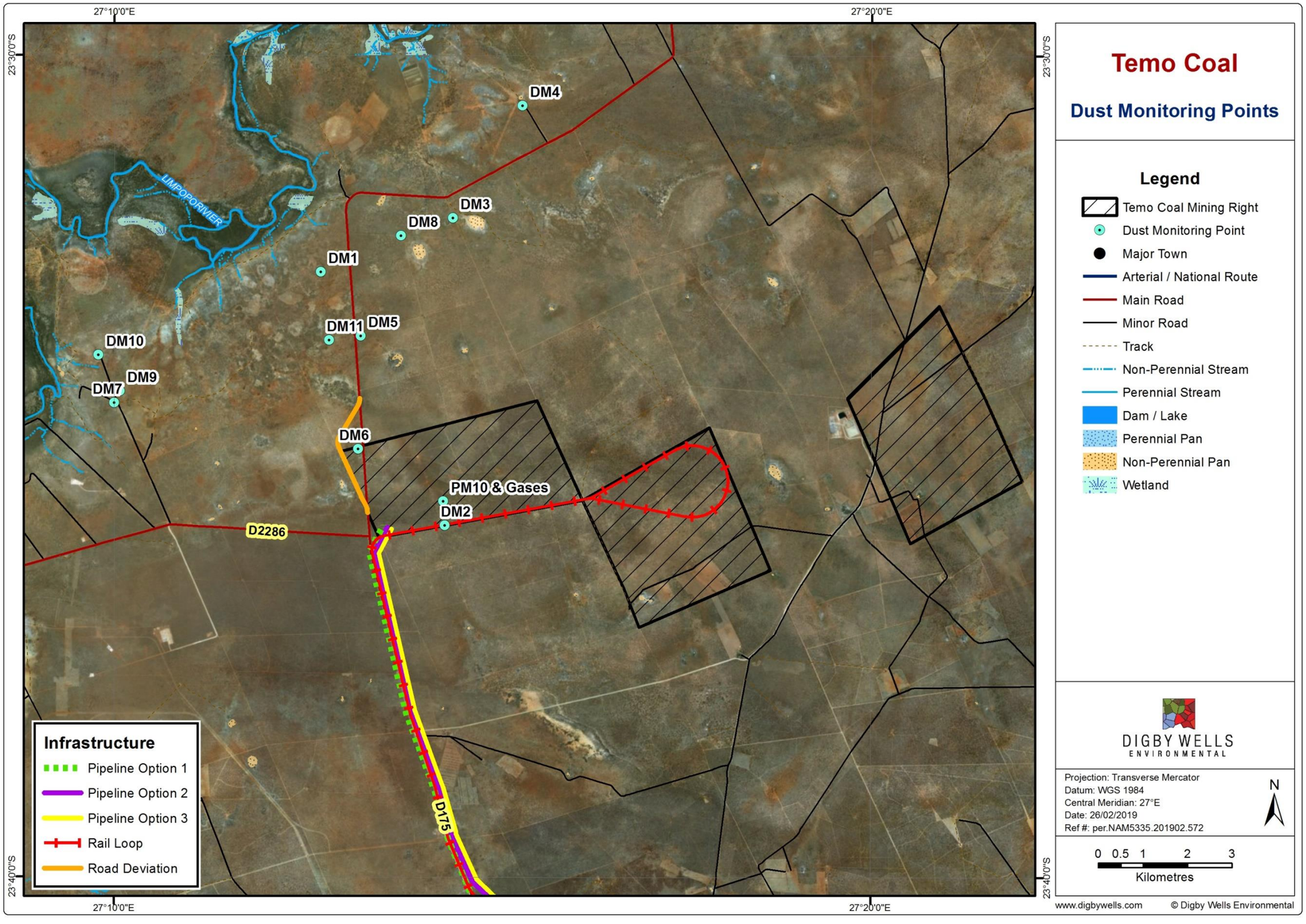


Figure 3-1: Project Layout in Relation to Monitoring Points & Sensitive Receptors

3.1 Climate

3.1.1 General Description of Climate

The Project area can be seen to be characterised by wet summers and cold dry winters. Modelled climate data from Lakes Environmental Software comprising rainfall, temperature, relative humidity, wind speed and wind direction was used to appraise background weather conditions. These meteorological parameters are discussed in detail below.

3.1.1.1 Rainfall

Rainfall plays a significant role in the removal of pollutants out of the atmosphere, especially PMs (Hsu, 2009); a phenomenon known as wet deposition during the wet season. In the absence of rains, dry and hot conditions prevail and airborne pollutants levels are slightly higher in the atmosphere. In this report, the total monthly rainfall records for the three year period are depicted in Figure 3-2 below. The wet/summer season (December – February), often receives much of the rainfall (>55%), followed by Spring (September – November), with about 40% of the rainfall. The dry/winter season (June - August) receives less than 5% of the total annual rainfall.

3.1.1.2 Temperature

Similar to the rainfall records, temperature and humidity data were sourced from Lakes Environmental. The average monthly temperatures are presented in Figure 3-3. The lakes Environmental data returned temperatures ranging from 12°C - 26°C for the area. For the relative humidity, the Lakes Environmental data shows a range of 55% - 75% on average monthly, with the values measures in Winter and Spring months (Figure 3-3).

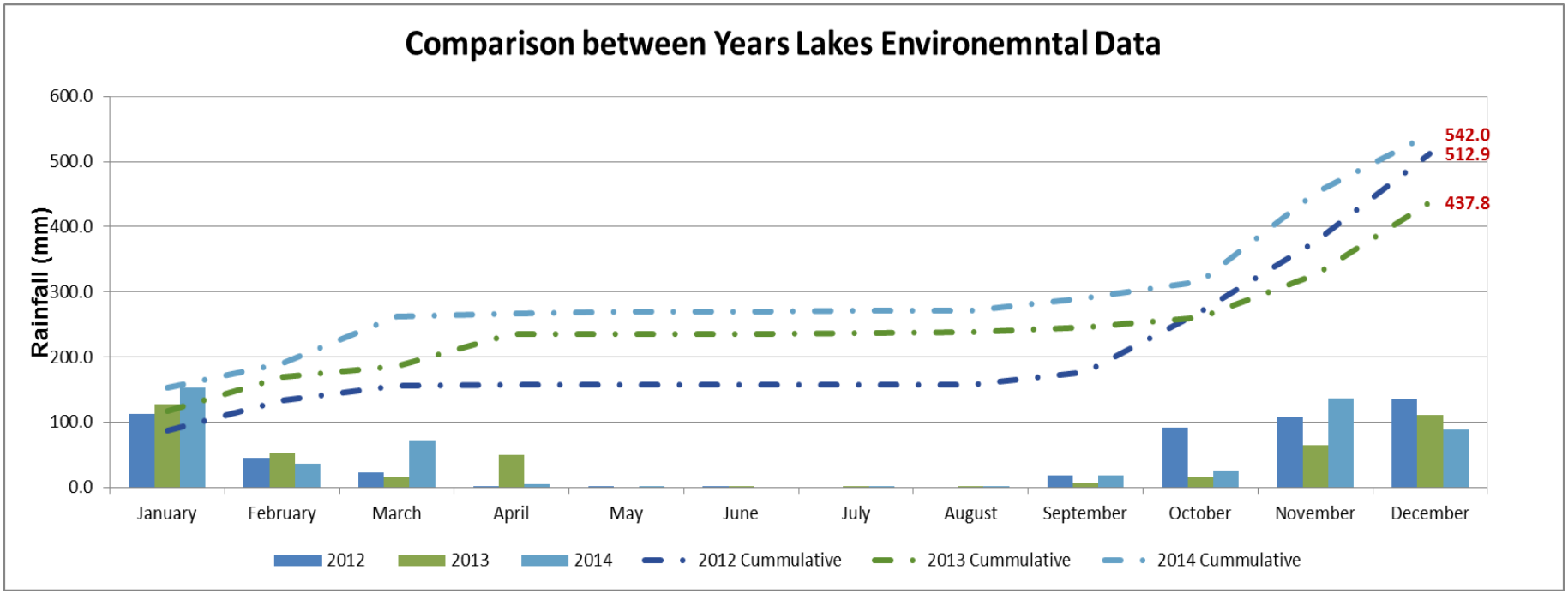


Figure 3-2: Comparison Years Lakes Environmental Data

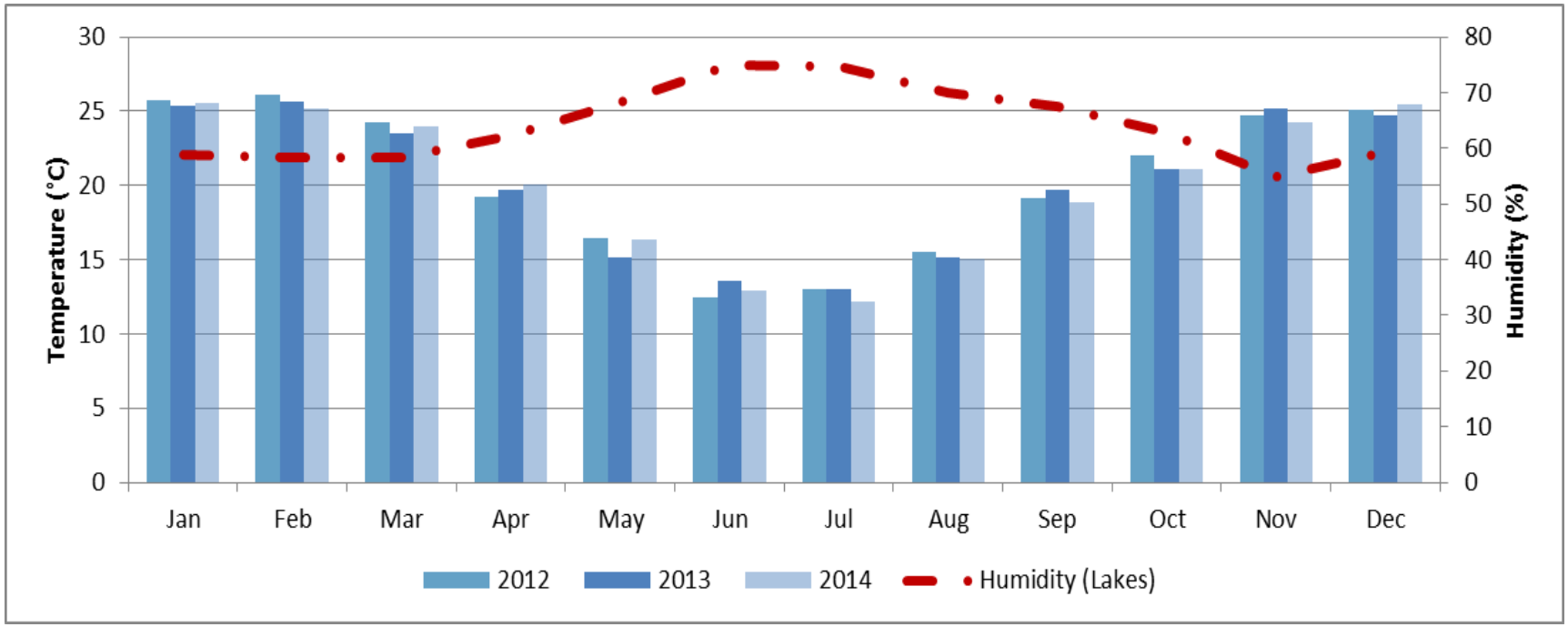


Figure 3-3: Average Monthly Temperature and Humidity (Lakes Environmental Data)

3.1.1.3 Wind Speed

Hourly meteorological data for the period January 2012 to December 2014 from Lakes Environmental was analysed and used to understand the prevailing wind patterns at the Project area in the absence of on-site data. The wind rose for the period as it applies to the Project area is depicted in (Figure 3-4). The prevailing winds are from the north-east (26%), east north-east (25%) respectively. Secondary contributions are seen from the east (10%) and north north-east (9.5%). The north-east sector dominated the wind speed regime for the Project area.

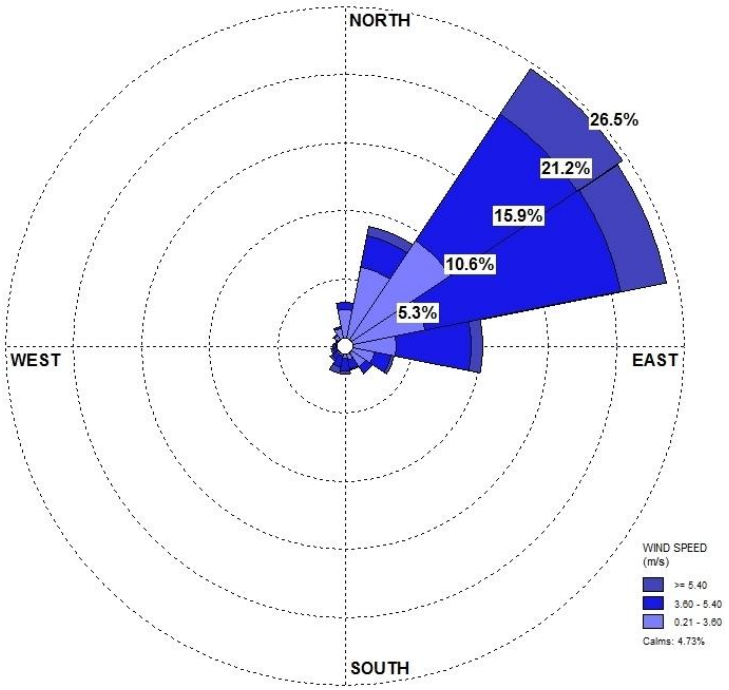


Figure 3-4: Surface Wind Rose.

The average wind speed at the Project site is 3.4 m/s and calm conditions (<0.5 m/s) occurred for some 4.7% of the time. Wind speed capable of causing wind erosion i.e. ≥5.4 m/s occurred for about 11% of the time (Figure 3-5). This equates to about 40 days in a year).

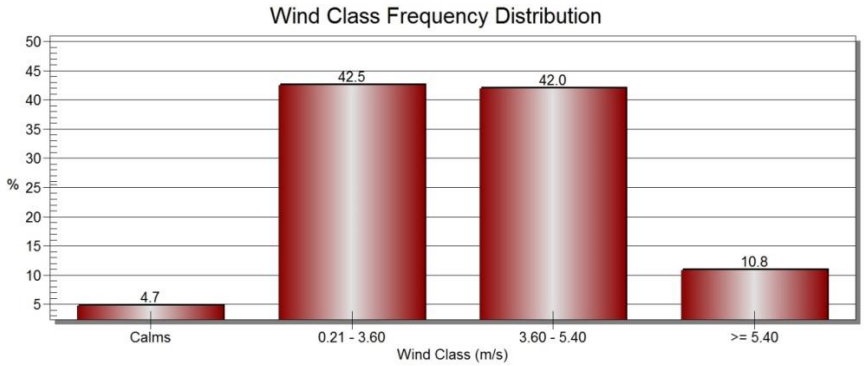


Figure 3-5: Wind Class Frequency.

3.2 Existing Air Quality

3.2.1 Particulate Matter

3.2.1.1 Total Suspended Particulate

The dust fallout sampling, analyses was conducted according to the American Society for Testing and Methods (ASTM) D1739 – 98 Standard Test Method for Collection and Measurement of Dustfall (Settleable Particulate Matter), adopted in by the South African National Standard (SANS 1137:2012).

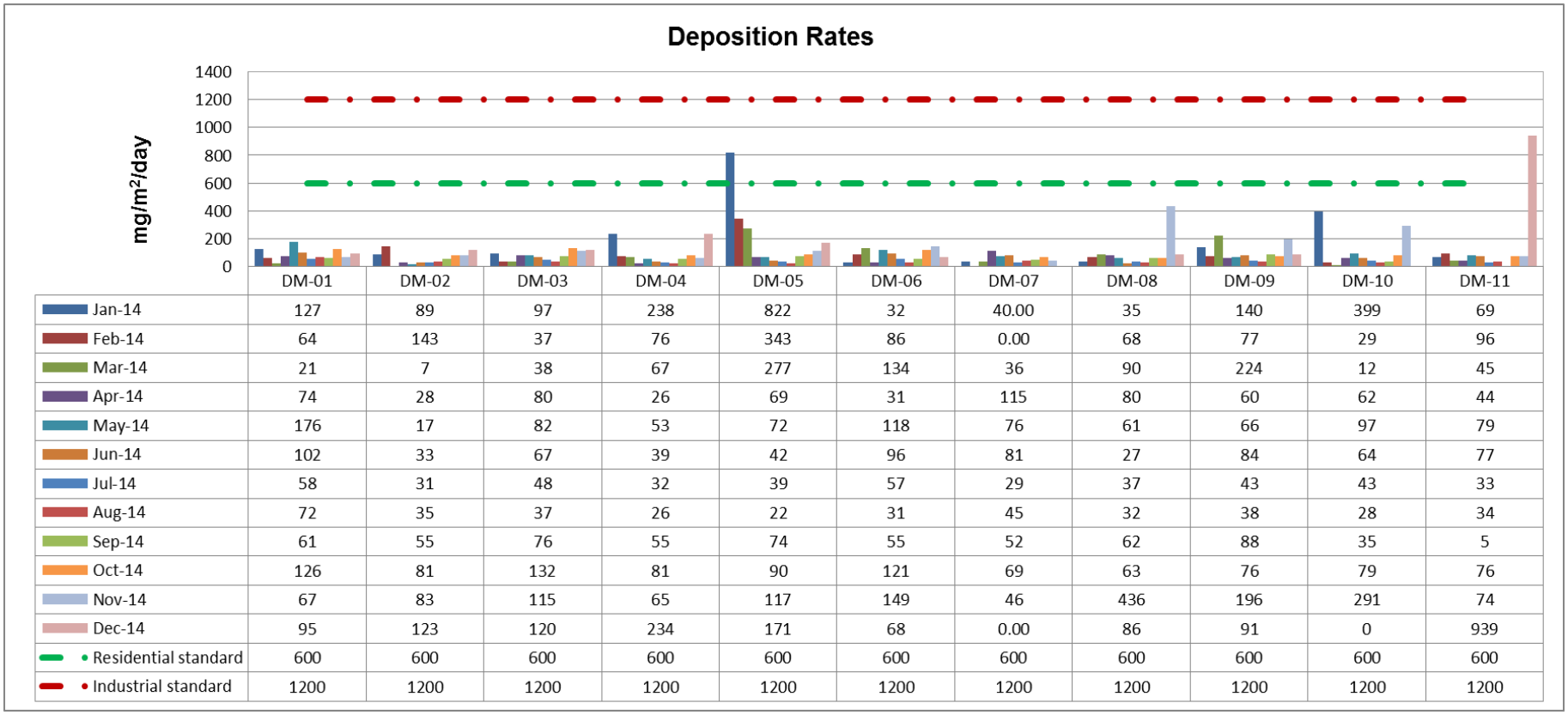
Dust deposition monitoring data collected by Ledjadja Coal (Pty) Ltd for the period – January 2014 – May 2015 was used to understand the background dust deposition rates in the Project area (Figure 3-6 and Figure 3-7). This data was considered sufficient to evaluate background dust levels. The dust network comprises a network of 11 sites (DM-01 to DM-11). Data recovery was 98%, with only three exceedances observed throughout the monitoring campaign (15 months). In the month of December 2014, at site DM10, a dust deposition rate of 7 440 mg/m^2/day was measured (result was discarded as this was considered a sabotage, since deposition rates of that magnitude is not common to the area). In general, the deposition rates measured in the Project area showed that the dust fallout were below the residential and industrial limit values as stipulated in the standards.

3.2.1.2 PM10 and PM2.5

The real-time sampler was set up on the 31st of January 2019. The plan is to measure real-time data on site for no less than three months. So, PM10 and PM2.5 records measured for the first two weeks of February 2019 are shown to be below the South African standard for 24-hour averaging period of 75 µg/m^3 and 40 µg/m^3 respectively (Figure 3-8 and Figure 3-9). As more data are collected, insight into the background PM_{10} and $PM_{2.5}$ scenario at the Project site and at surrounding receptors will be obtained.

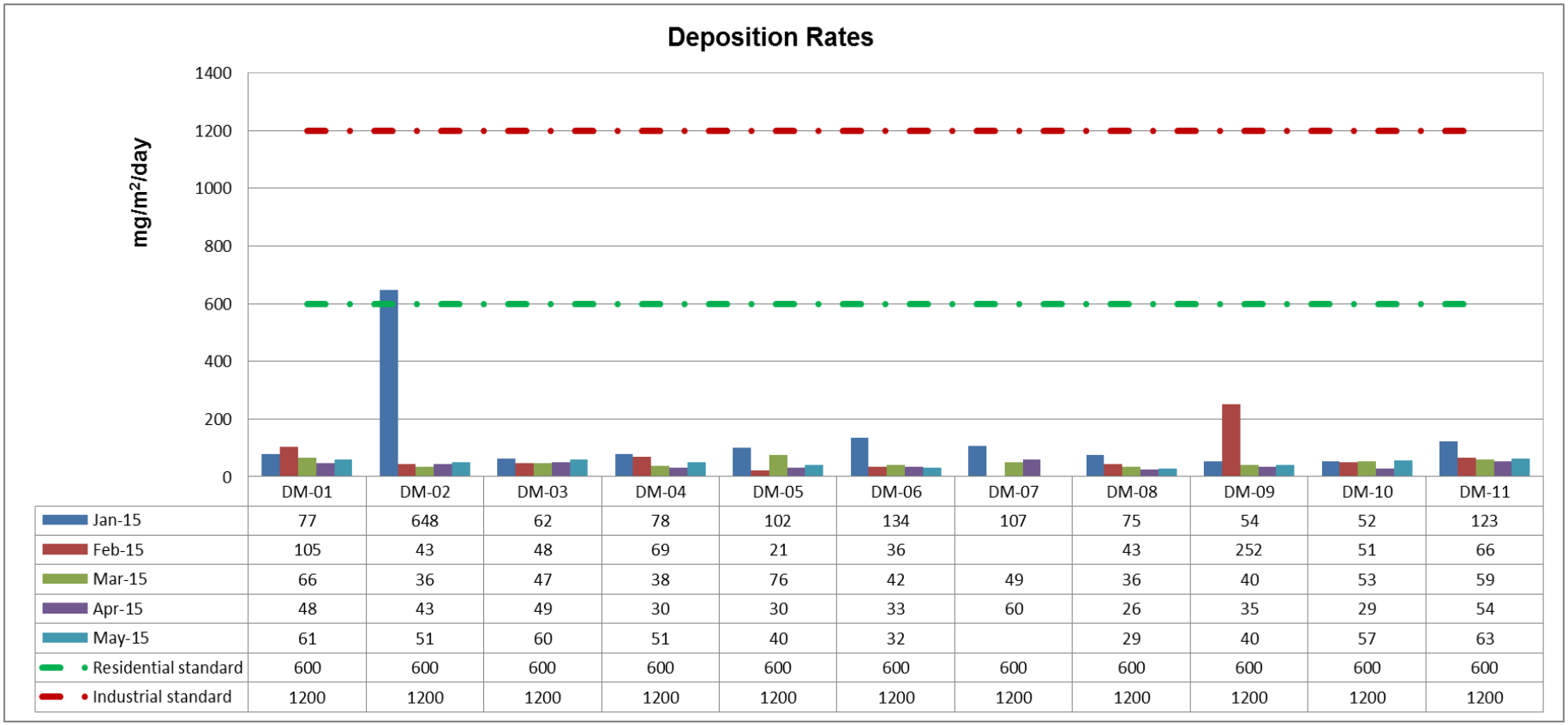
3.2.2 Gases

The ambient concentrations of SO_2, NO_2, and CO measured are way below the South African standards for the different averaging period. However, the background concentrations of O_3 are already exceeding the South African standard and additions from propose activities may exacerbate ambient levels.



	DM-01	DM-02	DM-03	DM-04	DM-05	DM-06	DM-07	DM-08	DM-09	DM-10	DM-11
Jan-14	127	89	97	238	822	32	40.00	35	140	399	69
Feb-14	64	143	37	76	343	86	0.00	68	77	29	96
Mar-14	21	7	38	67	277	134	36	90	224	12	45
Apr-14	74	28	80	26	69	31	115	80	60	62	44
May-14	176	17	82	53	72	118	76	61	66	97	79
Jun-14	102	33	67	39	42	96	81	27	84	64	77
Jul-14	58	31	48	32	39	57	29	37	43	43	33
Aug-14	72	35	37	26	22	31	45	32	38	28	34
Sep-14	61	55	76	55	74	55	52	62	88	35	5
Oct-14	126	81	132	81	90	121	69	63	76	79	76
Nov-14	67	83	115	65	117	149	46	436	196	291	74
Dec-14	95	123	120	234	171	68	0.00	86	91	0	939
Residential standard	600	600	600	600	600	600	600	600	600	600	600
Industrial standard	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200

Figure 3-6: Dust Deposition Data (2014)



	DM-01	DM-02	DM-03	DM-04	DM-05	DM-06	DM-07	DM-08	DM-09	DM-10	DM-11
Jan-15	77	648	62	78	102	134	107	75	54	52	123
Feb-15	105	43	48	69	21	36		43	252	51	66
Mar-15	66	36	47	38	76	42	49	36	40	53	59
Apr-15	48	43	49	30	30	33	60	26	35	29	54
May-15	61	51	60	51	40	32		29	40	57	63
Residential standard	600	600	600	600	600	600	600	600	600	600	600
Industrial standard	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200

Figure 3-7: Dust Deposition Data (2015)

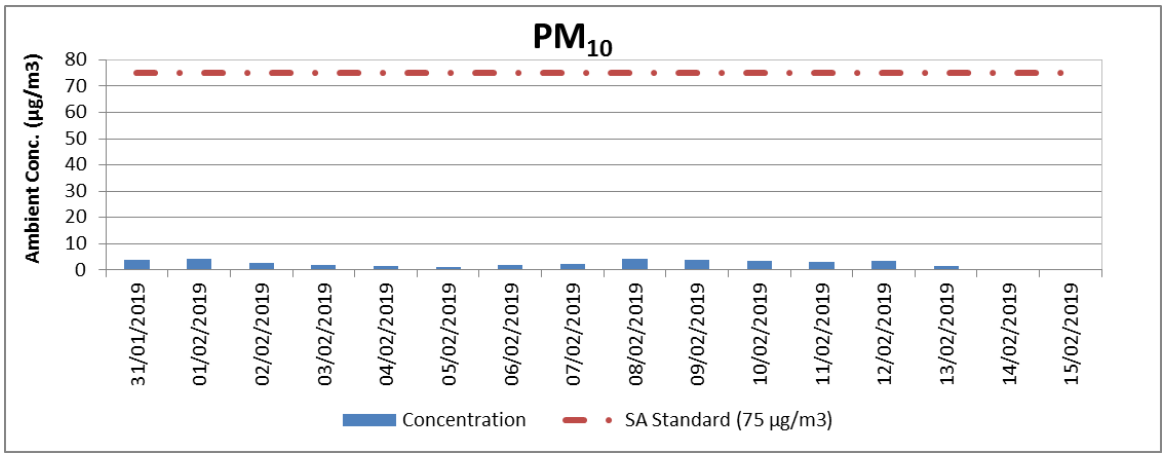


Figure 3-8: Site PM_{10} Data

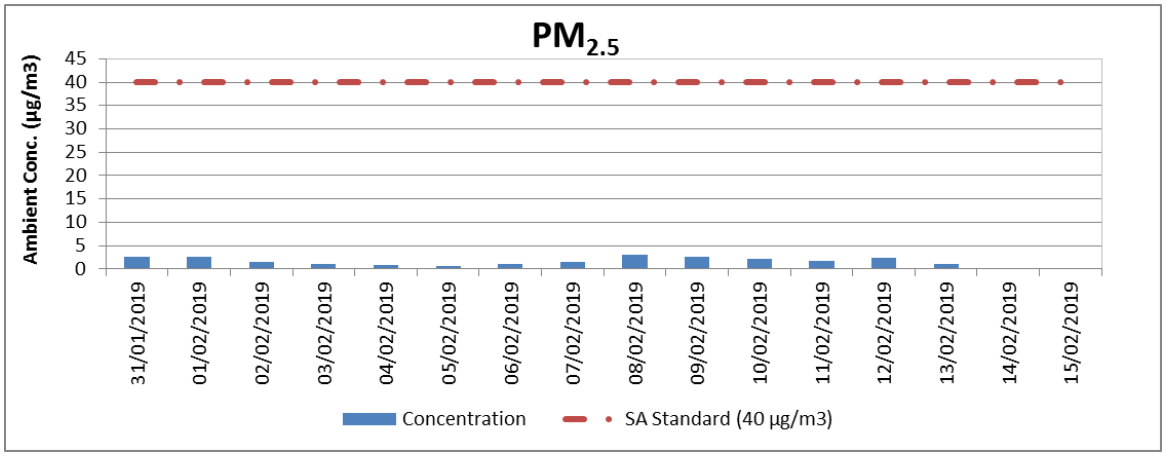


Figure 3-9: Site $PM_{2.5}$ Data

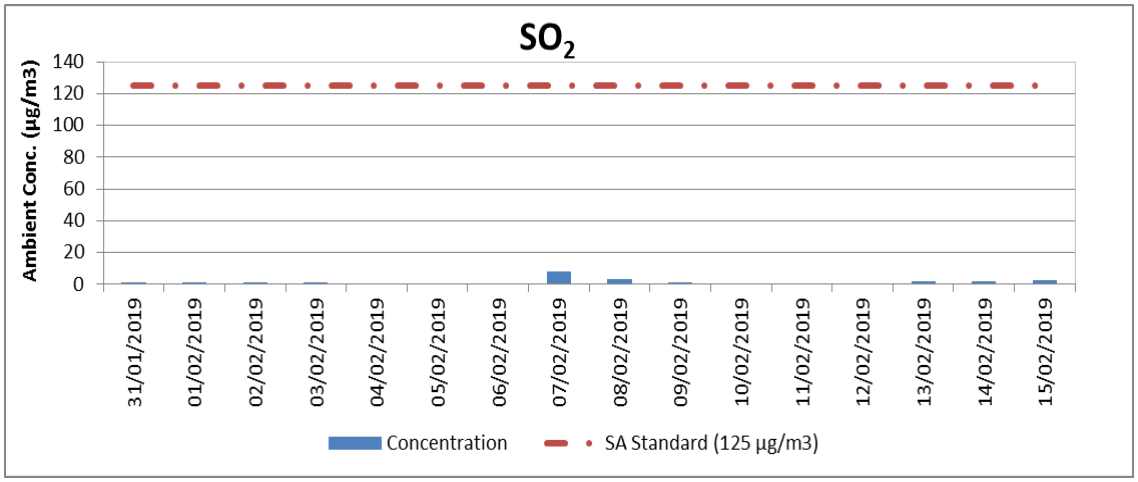


Figure 3-10: Site SO_2 Data

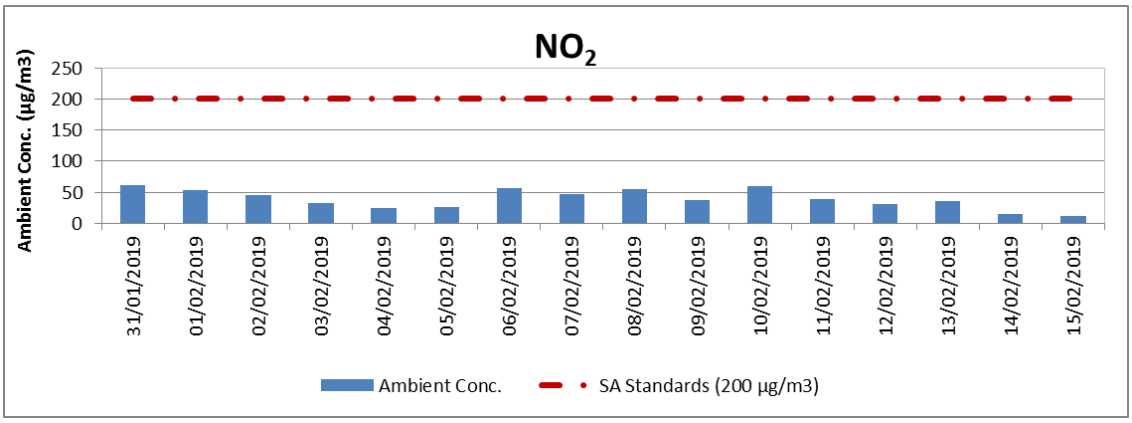


Figure 3-11: Site NO_2 Data

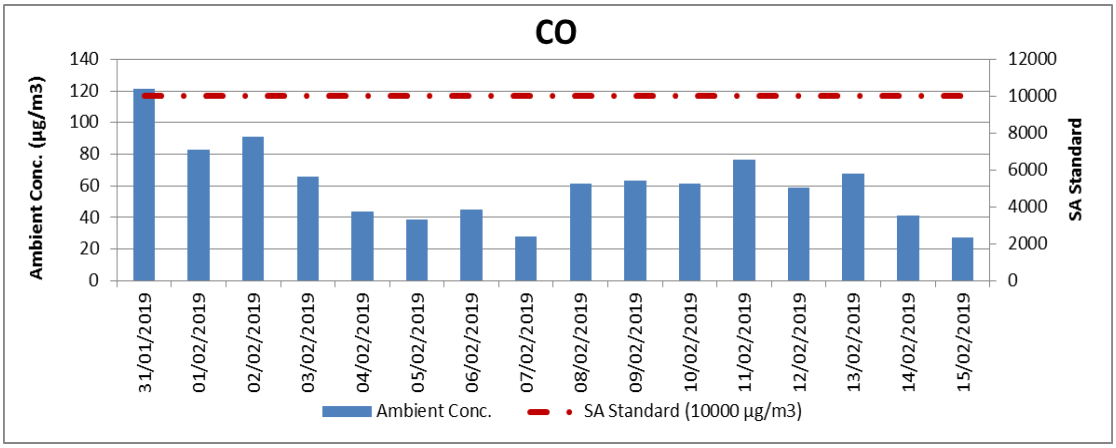


Figure 3-12: Site CO Data

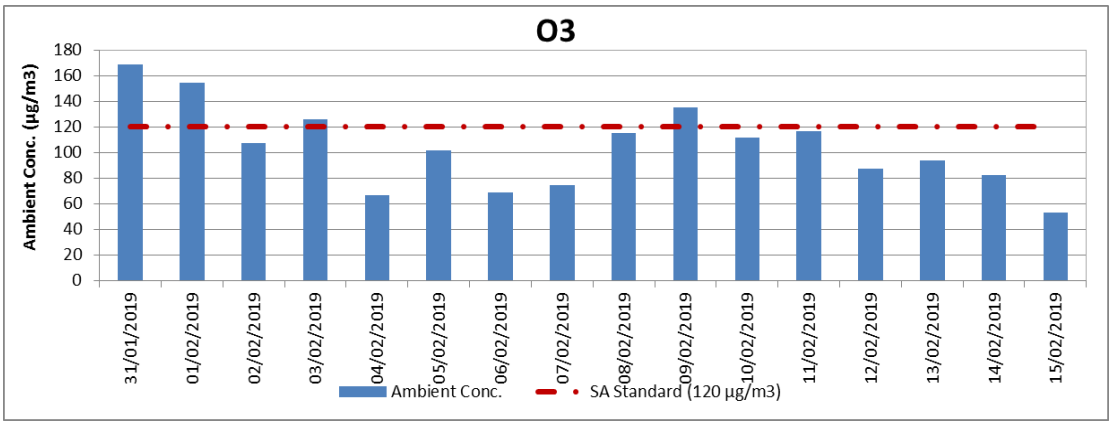


Figure 3-13: Site O_3 Data

4 Discussion

The ambient levels of both particulate and gases pollutants have been measured in the Project area and monitoring of these criteria pollutants is still on-going. Two weeks of measurement have shown that levels are way below the recommended standards for PM_{10}, $PM_{2.5}$, SO_2, NO_2 and CO, except O_3. Real-time monitoring of these pollutants is still in the early stages, hence, data collected should be re-evaluated at a later date in future to confirm actual scenarios on site.

4.1 Findings

The findings from this baseline assessment and potential impacts anticipated are summarized as follows:

- The dust deposition rates measured in the Project area are very low and below the recommended standards as discussed in Section 3.2. Hence, it is anticipated that the construction of the rail loop and road diversion which will take place in phase and medium-term in nature will have minimal impacts on this pollutants;
- The same applies to the ambient concentrations of PM_{10} and $PM_{2.5}$ measured at the proposed Project area. The concentrations are below the respective standards (Section 3.2). Impacts are anticipated to be minimal for reason mentioned above; and
- Impacts associated with the construction of the rail loop and road diversion are anticipated to be minimal for the same reasons as above on the ambient levels of SO_2, NO_2, and CO, except O_3. The ambient levels of O_3 will be assessed at a later as more data are received to confirm the actual scenario at the Project site.

5 Impact Assessment

The impacts are assessed based on the impact's magnitude as well as the receiver's sensitivity, culminating in an impact significance which identifies the most important impacts that require management.

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

- Nature of impacts (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
- Possibility to mitigate, avoid or offset significant adverse impacts.

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic 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 5-3. 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 measure proposed in this EIA/EMP Report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 5-2, which is extracted from Table 5-1. The description of the significance ratings is discussed in Table 5-3.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table 5-1: Impact Assessment Parameter Ratings

RATING	INTENSITY/REPLACABILITY		EXTENT	DURATION/REVERSIBILITY	PROBABILITY
	Negative impacts	**Positive impacts**			
7	Irreplaceable damage to highly valued items of great natural or social significance or complete breakdown of natural and / or social order.	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 damage to highly valued items of natural or social significance or breakdown of natural and / or social order.	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.
5	Very serious widespread natural and / or social baseline changes. 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.

RATING	INTENSITY/REPLACABILITY		EXTENT	DURATION/REVERSIBILITY	PROBABILITY
	Negative impacts	**Positive impacts**			
4	On-going serious natural and / or social issues. Significant changes to structures / items of natural or social 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.
3	On-going natural and / or social issues. Discernible changes to natural or social baseline.	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 natural and / or social impacts which are mostly replaceable. Very little change to the baseline.	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.
1	Minimal natural and / or social impacts, low-level replaceable damage with no change to the baseline.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited 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 5-2: Probability/Consequence Matrix

Significance

Probability 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
Consequence	-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

Table 5-3: Significance Rating Description[1]

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

[1] It is generally sufficient to only monitor impacts that are rated as negligible or minor

5.1 Impact Assessment Ratings

5.1.1 Construction Phase

5.1.1.1 Project activities assessed

As part of the Construction Phase, the following activities are identified that may result in air emission but with negligible impact on the background air quality of the project area:

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

5.1.1.1.1 Impact Description

This report should be read in conjunction with the "Air Quality Impact Assessment for Namane Generation Independent Power producer and Transmission Line Project" conducted 2016. Activities associated with the construction of the rail loop and road diversion will result in the release of fugitive dust comprising TSP, PM_{10} and $PM_{2.5}$. However, impacts are anticipated to be minimal because the construction phase will be medium-term and construction will occur in phases.

5.1.1.1.2 Management Objectives

The management objective is to ensure that emissions on-site and at off-site locations are not in exceedance of the regulatory limits for the protection of the environment, human health and wellbeing.

5.1.1.1.3 Management Actions and Targets

The mine management should have in place action plans and target to ensure that pollution levels are compliant with regulatory standards.

5.1.1.1.4 Construction Phase Impact Ratings

The impact rating took cognisance of the duration (how long the impact may be prevalent), the spatial scale (the physical area which could be affected by an impact), the severity (how severe the impact will be) and the probability of the impact occurring (which is related to the likelihood of such an impact happening). The ratings ascribed to each of the aforementioned are discussed in Table 5-4.

Table 5-4: Site Clearing, Topsoil Removal and Construction of the Rail Loop and Road Diversion

Activity and Interaction: Site Clearing, Topsoil Removal and Construction of the Rail Loop and Road Diversion			
Dimension	**Rating**	**Motivation**	**Significance**

Activity and Interaction: Site Clearing, Topsoil Removal and Construction of the Rail Loop and Road Diversion			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Particulate matter emissions			
Prior to mitigation/ management			
Duration	Medium term (3)	Medium term (1-5 years)	Negligible (negative) – 21
Extent	Limited (2)	Limited to site and immediate surrounding	
Intensity	Minor - negative (-2)	Minor impact during the construction phase activities	
Probability	Unlikely (3)	It is unlikely that impact on air quality will occur	
Nature	Negative		
Mitigation/ Management actions			
▪ The area of disturbance will be minimised to the maximum extent possible; ▪ Where necessary, wetting agents, dust suppressants or binders will be applied on the exposed areas (including excavated material and open areas); ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Construction should be conducted in phases; and ▪ The drop heights when tipping cover materials will be minimised as far as practicable.			
Post- mitigation			
Duration	Medium term (3)	Medium term (1-5 years)	Negligible (negative) – 15
Extent	Very limited (1)	Impact will be very limited to site and immediate surrounding after mitigation	
Intensity	Minimal - negative (-1)	Minimal dust impact anticipated after mitigation	
Probability	Unlikely (3)	It is unlikely that impact will occur	
Nature	Negative		

5.1.2 Operational Phase

5.1.2.1 Activities Assessed

As part of the Operational Phase of the Project, the following activities are identified that may impact on the ambient air quality of the area i.e. increasing the concentration of pollutants in the atmosphere:

- Wind erosion of open area within the rail loop; and

- Fugitive emissions from the use of the rail and road infrastructure.

5.1.2.1.1 Impact Description

The dust deposition network scattered across the Project area (with a network of existing dirt roads and open areas) have shown that deposition rates are very low. It is not anticipated that the operational phase of the rail loop and road will heighten impacts. Wind erosion of the open areas with the rail loop and dirt roads will lead to increased levels of particulate matter, such as TSP, PM_{10} and $PM_{2.5}$ in the surrounding atmosphere, with levels not exceeding regulatory standards. In addition, gaseous emissions from the train will be minimal as the frequency trip may be limited per week.

5.1.2.1.2 Management Objectives

The management objective is to ensure that emissions on-site and off-site from the operation are not in exceedance of the applicable South African standards for the protection of the environment, human health and wellbeing.

5.1.2.1.3 Management Actions and Targets

Management will implement mitigation measures (Table 5-5), to ensure emissions are within the South African standards and the mine operates within compliance.

Table 5-5: Significance Ratings for Wind Erosion and Emissions from the use of Rail and Road Infrastructure

Activity and Interaction: Wind Erosion and Emissions from the use of Rail and Road Infrastructure			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Nuisance and health effects from exposure to fine particulate matter			
Prior to Mitigation / Management			
Duration	Project Life (5)	Project life	Negligible (negative) – 27
Extent	Limited (2)	Limited to site and immediate surrounding	
Intensity	Minor - negative (-2)	Minor impact during the operational phase activities	
Probability	Unlikely (3)	It is unlikely that impact on air quality will occur	
Nature	Negative		
Mitigation / Management Actions			

Activity and Interaction: Wind Erosion and Emissions from the use of Rail and Road Infrastructure			
Dimension	**Rating**	**Motivation**	**Significance**
▪ Cover vehicles and wagons removing coal from site due to wind erosion; ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Implement routine maintenance of off-road vehicles and trains to optimise engine performance and minimise gaseous emissions.			
Post- Mitigation			
Duration	Project life (5)	Impact may occur for the project life	Negligible (negative) – 21
Extent	Very limited (1)	Impact will be very limited to site and immediate surrounding after mitigation	
Intensity	Minimal - negative (-1)	Minimal impact anticipated after mitigation	
Probability	Unlikely (3)	It is unlikely that impact will occur	
Nature	Negative		

5.1.3 Decommissioning Phase

5.1.3.1 Activities Assessed

As part of the Decommissioning Phase, activities conducted will be similar to those embarked on during the construction phase. The following activities have been identified that may impact on the ambient air quality of the Project area:

- Removal/rehabilitation of the rail tracks and road.

5.1.3.1.1 Impact description

Although activities associated with this phase will result in the release of fugitive dust comprising TSP, PM_{10} and $PM_{2.5}$ and release of gaseous emissions from machinery, impacts are anticipated to be minimal because this phase will be short-term and will be conducted in phases

5.1.3.1.2 Management Objectives

The management objective is to ensure that emissions on-site and those reaching off-site locations are not in exceedance of the applicable South African standards for the protection of the environment, human health and wellbeing.

5.1.3.1.3 Management Actions and Targets

Management will implement mitigation measures (Table 5-6) to ensure emissions are within the South African standards and the mine operates within compliance.

Table 5-6: Removal/Rehabilitation of Rail Tracks and Road

Activity and Interaction: Removal/Rehabilitation of Rail Tracks and Road			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in air quality			
Prior to mitigation/ management			
Duration	Short-term (2)	Short-term (Less than 1 years)	Negligible (negative) – 18
Extent	Limited (2)	Limited to site and immediate surrounding	
Intensity	Minor - negative (-2)	Minor impact during the construction phase activities	
Probability	Unlikely (3)	It is unlikely that impact on air quality will occur	
Mitigation/ Management actions			
▪ The area of disturbance will be minimised to the maximum extent possible; ▪ Where necessary, wetting agents, dust suppressants or binders will be applied on the exposed areas (including excavated material and open areas); ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Demolition should be conducted in phases; and ▪ The drop heights when tipping cover materials will be minimised as far as practicable.			
Post- mitigation			
Duration	Short-term (2)	Short-term (Less than 1 years)	Negligible (negative) – 12
Extent	Very limited (1)	Impact will be very limited to site and immediate surrounding after mitigation	
Intensity	Minimal - negative (-1)	Minimal dust impact anticipated after mitigation	
Probability	Unlikely (3)	It is unlikely that impact will occur	

6 Environmental Management Plan

6.1 Summary of Mitigation and Management

Table 6-2 provides a brief summary of the applicable standards. Table 6-1 provides a summary of the activity, 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 Environmental Management Plan (EMP).

Table 6-1: Proposed Mitigation and Management Measures

Activities	Potential Impacts	Phase	Aspects Affected	Mitigation Type	Time Period for Implementation	Compliance with Standards
Site clearing (removal of vegetation); Topsoil removal and stockpiling; and Construction of rail loop and road diversion	Reduction in the quality of air due to dust generation and the release of gaseous pollutants from off-road machinery	Construction	▪ Air Quality	▪ The area of disturbance will be minimised to the maximum extent possible; ▪ Where necessary, wetting agents, dust suppressants or binders will be applied on the exposed areas (including excavated material and open areas); ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Construction should be conducted in phases; and ▪ The drop heights when tipping cover materials will be minimised as far as practicable.	▪ Must be carried out concurrently with the construction phase	▪ National Environmental Management: Air Quality Act, Act.39 of 2004 - National Ambient Air Quality Standard for Gases and Particulate Matter PM_{10} and $PM_{2.5}$; ▪ National Dust Control Regulations (2013).

Activities	Potential Impacts	Phase	Aspects Affected	Mitigation Type	Time Period for Implementation	Compliance with Standards
Wind erosion of open area within the rail loop; and Fugitive emissions from the use of the use of rail and road infrastructure.	Reduction in the quality of air due to dust generation and the release of gaseous pollutants from off-road machinery and train	Operation	▪ Air Quality	▪ Cover vehicles and wagons removing coal from site due to wind erosion; ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Implement routine maintenance of off-road vehicles and trains to optimise engine performance and minimise gaseous emissions.	▪ Must be carried out concurrently with operational phase	▪ National Environmental Management: Air Quality Act, Act.39 of 2004 - National Ambient Air Quality Standard for Gases and Particulate Matter PM_{10} and $PM_{2.5}$; ▪ National Dust Control Regulations (2013).

Activities	Potential Impacts	Phase	Aspects Affected	Mitigation Type	Time Period for Implementation	Compliance with Standards
Removal/rehabilitation of the rail tracks and road	Reduction in air quality due to dust generation	Decommissioning	▪ Air Quality	▪ The area of disturbance will be minimised to the maximum extent possible; ▪ Where necessary, wetting agents, dust suppressants or binders will be applied on the exposed areas (including excavated material and open areas); ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Demolition should be conducted in phases; and ▪ The drop heights when tipping cover materials will be minimised as far as practicable.	▪ Must be carried out concurrently with decommissioning phase.	▪ National Environmental Management: Air Quality Act, Act.39 of 2004 - National Ambient Air Quality Standard for Gases and Particulate Matter PM_{10} and $PM_{2.5}$; ▪ National Dust Control Regulations (2013).

Table 6-2: Prescribed Environmental Management Standards, Practice, Guideline, Policy or Law

Specialist field	Applicable standard, practice, guideline, policy or law
Air quality	National Environmental Management: Air Quality Act, Act.39 of 2004, 2004
	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) - National Dust Control Regulations (2013)

7 Monitoring Plan

7.1 Dust Monitoring Programme

The monitoring of dust deposition rates in and around the Project area should be revived and maintained for the Project life. Despite the low levels of dust measured in the area, monitoring is required, perhaps at fewer monitoring locations representative of the areas to ensure a repository of data that be used to inform and revise management mitigation plans.

7.1.1 Particulate Matter and Gases Monitoring Programme

With the dust deposition measurement already in place, it is recommended that a real-time particulate monitor be set up on a quarterly basis to measure the ambient levels of fine particulate matter and gases in the Project area. The latter will provide valuable data and help ascertain the impacts associated with the operational phase.

8 Recommendations

Based on the results presented in this report, the following recommendations should be applied:

- Administer mitigation measures in line with current best engineering practice, as described in the impact assessment section (Section 5.1) above;
- Establish codes of practice for good housekeeping with respect to dust management and mitigation for open areas;
- Monitor the air quality of the project area to ensure compliance with regulatory standards onsite, and at offsite locations for the life of the project; and
- Establish a monthly and annual reporting structure to appraise performance and compliance.

9 Conclusion

The ambient levels of particulate matter encompassing TSP, PM_{10} and $PM_{2.5}$ and gaseous pollutants, such as SO_2, NO_2, CO and O_3 have been measured and assessed in the project area. The current levels are way below the recommended standards except for O_3, with some exceedances recorded.

Considering that current levels of ambient pollutants are way below the recommended limits, and the fact that the construction of the rail loop and road diversion will take place in phases and will be medium term in nature, impacts are likely to be minimal. Although emissions are associated with the construction of the rail loop and road diversion, airborne pollutants are not expected to exacerbate ambient conditions above regulatory limit values.

If the construction, operation and decommissioning of the rail loop and road is looked at in isolation, the ambient (current) levels of pollutants measured show that there is “room” to

absorb airborne emissions during the different phases. The previous study “Air quality Assessment conducted for Namane Generation (Pty) Independent Power Producer Project in 2016” showed that for particulates, exceedances were not predicted. However, for NO_2 and SO_2 1-hour averaging period, exceedances predicted were confined within the mine boundary. The SO_2 24-hour and NO_2 1-year were below the South African standards with no exceedances observed. The operational phase of the rail loop and road will most likely represent minimal impacts on the ambient air quality of the area.

In conclusion, management should ensure that mitigation measures and dust management plan are in place during the different phases of the Project. Such a holistic approach will ensure that airborne emissions are contained, which will result in lower background concentration on-site and at off-site locations.

10 References

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