Air Quality Impact Assessment for a Proposed 450 MW Emergency Risk Mitigation Power Plant near Richards Bay, KwaZulu-Natal – Scoping Report

Project for **Savannah Environmental (Pty) Ltd**
on behalf of **Phinda Power Producers (Pty) Ltd**

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REPORT DETAILS

Project Name	Air Quality Impact Assessment for a Proposed 450 MW Emergency Risk Mitigation Power Plant near Richards Bay, KwaZulu-Natal – Scoping Report
Project for	Savannah Environmental (Pty) Ltd
On behalf of	Phinda Power Producers (Pty) Ltd
Report Number	20SAV03a
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Date	September 2020
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Reviewed by	Gillian Petzer, Pr. Eng., BEng Chem (University of Pretoria)
Notice	Airshed Planning Professionals (Pty) Ltd is a consulting company located in Midrand, South Africa, specialising in all aspects of air quality, ranging from nearby neighbourhood concerns to regional air pollution impacts as well as noise impact assessments. The company originated in 1990 as Environmental Management Services, which amalgamated with its sister company, Matrix Environmental Consultants, in 2003.
Declaration	I, Theresa (Terri) Bird, as authorised representative of Airshed Planning Professionals (Pty) Ltd hereby confirm my independence as a specialist and declare that neither I nor Airshed Planning Professionals (Pty) Ltd have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Airshed Planning Professionals (Pty) Ltd was appointed as air quality specialists in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998); other than fair remuneration for worked performed, specifically in connection with the assessment summarised in this report. I also declare that I have expertise in undertaking the specialist work as required, possessing working knowledge of the acts, regulations and guidelines relating to the application. I further declare that I am able to perform the work relating to the application in an objective manner, even if this result in views and findings that is not favourable to the application; and that I am confident in the results of the studies undertaken and conclusions drawn as a result of it – as is described in this report.
Copyright Warning	
Acknowledgements	Mrs Sandy Caminga and the RBCAA is acknowledged for: • arranging access to the data from the RBCAA air quality monitoring stations; and, • facilitating access to the baseline dispersion modelling study conducted by WSP. Dr Lisa Ramsay and Mr Hasheel Tularam, from WSP, for providing the CALPUFF output for simulated annual average pollutant concentrations for PM_{10}, SO_2 and NO_2 from the Richards Bay baseline dispersion modelling assessment.

REVISION RECORD

Revision Number	Date	Reason for Revision
Draft Scoping Report	27 July 2020	Draft for Client Review
Revision 1	20 August 2020	Updated with minor typographical issues and naming conventions based on review by Savannah Environmental (Pty) Ltd.
Revision 2	27 August 2020	Updated with minor content changes in the conclusion based on review by Phinda Power Producers (Pty) Ltd.
Revision 3	30 September 2020	Updated with naphtha as an alternative fuel source, including amended storage footprint options.

ABBREVIATIONS

Airshed	Airshed Planning Professionals (Pty) Ltd
AQMP	Air Quality Management Plan
AQMS	Air Quality Monitoring Station
AQSR	Air Quality Sensitive Receptor
CBD	Central Business District
DEA	Department of Environmental Affairs (now DEFF)
DEAT	Department of Environmental Affairs and Tourism (Now DEFF)
DEFF	Department of Environment, Forestry and Fisheries (previously DEA and DEAT)
EIA	Environmental Impact Assessment
EF	Emission Factor
EMP	Environmental Management Plan
HAP	Hazardous Air Pollutant
ISO	International Organization for Standardization
LNG	Liquid Natural Gas
NAAQS	National Ambient Air Quality Standards
NEMAQA	National Environmental Management: Air Quality Act
NMES	National Minimum Emission Standards
PM	Particulate Matter
RBCAA	Richards Bay Clean Air Association
SABS	South African Bureau of Standards
SANS	South African National Standards
Savannah	Savannah Environmental (Pty) Ltd.
SAWS	South African Weather Service
US EPA	United Stated Environmental Protection Agency
WRF	Weather Research and Forecasting mesoscale model

GLOSSARY

Air pollution[(a)]	The presence of substances in the atmosphere, particularly those that do not occur naturally
Dispersion[(a)]	The spreading of atmospheric constituents, such as air pollutants
Dust[(a)]	Solid materials suspended in the atmosphere in the form of small irregular particles, many of which are microscopic in size
Frequency of exceedance	Permissible margin of tolerance of the Limit Concentration
Instability[(a)]	A property of the steady state of a system such that certain disturbances or perturbations introduced into the steady state will increase in magnitude, the maximum perturbation amplitude always remaining larger than the initial amplitude
Limit Concentration	Maximum allowable concentration of a pollutant applicable for an applicable averaging period
Mechanical mixing[(a)]	Any mixing process that utilizes the kinetic energy of relative fluid motion
Oxides of nitrogen (NO_x)	The sum of nitrogen oxide (NO) and nitrogen dioxide (NO_2) expressed as nitrogen dioxide (NO_2)
Particulate matter (PM)	Total particulate matter, that is solid matter contained in the gas stream in the solid state as well as insoluble and soluble solid matter contained in entrained droplets in the gas stream
$PM_{2.5}$	Particulate Matter with an aerodynamic diameter of less than 2.5 µm
PM_{10}	Particulate Matter with an aerodynamic diameter of less than 10 µm
Stability[(a)]	The characteristic of a system if sufficiently small disturbances have only small effects, either decreasing in amplitude or oscillating periodically; it is asymptotically stable if the effect of small disturbances vanishes for long time periods
Standard	A combination of the Limit Concentration and the allowable frequency of exceedance

Notes:

(a) Definition from American Meteorological Society's glossary of meteorology (AMS, 2014)

Symbols and Units

°C	Degree Celsius
CO	Carbon monoxide
g	Gram(s)
HC	Hydrocarbons
kg	Kilograms
1 kilogram	1 000 grams
km²	Square kilometre
m	Metres
mamsl	Metres above mean sea level (also metres above sea level – masl)
m/s	Metres per second
MW	Megawatt
µg	Microgram(s)
µg/m³	Micrograms per cubic metre
µm	Micrometre
mg	Milligram(s)
mg/m³	Milligrams per cubic metre
m²	Square metre
m³	Cubic metre
mm	Millimetres
N_2O	Nitrous oxide
NO	Nitrogen oxide
NO_2	Nitrogen dioxide
NO_x	Oxides of nitrogen
O_3	Ozone
PM	Particulate matter
$PM_{2.5}$	Inhalable particulate matter (aerodynamic diameter less than 2.5 µm)
PM_{10}	Thoracic particulate matter (aerodynamic diameter less than 10 µm)
SO_2	Sulfur dioxide (1)
SO_X	Oxides of sulfur
1 ton	1 000 000 grams
TVOCs	Total volatile organic compounds
VOCs	Volatile organic compounds

Notes:

(1) The spelling of "sulfur" has been standardised to the American spelling throughout the report. The International Union of Pure and Applied Chemistry, the international professional organisation of chemists that operates under the umbrella of UNESCO, published, in 1990, a list of standard names for all chemical elements. It was decided that element 16 should be spelled "sulfur". This compromise was to ensure that in future searchable data bases would not be complicated by spelling variants. (IUPAC. Compendium of Chemical Terminology, 2nd ed. (the "Gold Book"). Compiled by A. D. McNaught and A. Wilkinson. Blackwell Scientific Publications, Oxford (1997). XML on-line corrected version: http://goldbook.iupac.org (2006) created by M. Nic, J. Jirat, B. Kosata; updates compiled by A. Jenkins. ISBN 0-9678550-9-8.doi: 10.1351/goldbook)"

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1 INTRODUCTION

Phinda Power Producers (Pty) Ltd (hereafter 'Phinda') propose the development a power plant with generating capacity up to 450 MW near Richards Bay, KwaZulu-Natal. The project is to be submitted into the emergency power bidding process (managed by the Department of Mineral Resources and Energy) to provide energy to meet mid-merit electricity demand. Airshed Planning Professionals (Pty) Ltd (Airshed) was appointed by Savannah Environmental (Pty) Ltd to address potential impacts on the atmospheric environment by conducting a comprehensive air quality impact assessment for the Project. This report covers the Scoping study.

1.1 Background

The proposed project site is located on the remainder of Erf 1854 and Portion 2 of Erf 1854, Richards Bay (a total extent of 49.55 ha in extent), and the proposed fuel storage site is located on Remainder and Portion 1 of Erf 1795, approximately 4 km south west of the Richards Bay Central Business District (CBD) (Figure 1-1). The plant will require the construction of:

- a power plant, and associated infrastructure, of up to 450 MW and fuel storage (either liquid petroleum gas (LPG) up to 10 000m^3 ;or naphtha up to 90 000 m^3), and associated infrastructure ("Project 1A – Emergency Risk Mitigation Power Procurement Programme (RMPPP) Power Plant"); and
- electricity evacuation infrastructure ("Project 1B – RMPPP Transmission").

The RMPPP Power Plant and RMPPP Transmission projects have been initiated by Phinda in response to the procurement process expected to be initiated in August 2020 by the Independent Power Producer Office ("IPP Office") for the procurement of up to 2000MW of dispatchable generation capacity from a range of technologies in accordance with the new generation capacity required as specified in the Integrated Resource Plan 2019 and accompanying ministerial determination from the Minister for the Department of Resources and Energy to which the National Energy Regulator of South Africa has concurred.

The IPP Office has advised that it will initiate the 2 000 MW of new generation capacity procurement under a programme to be administered by it and titled the Risk Mitigation Power Procurement Programme ("RMPPP"), targeting first generation and transmission of energy to the grid by 31 December 2021. The IPP Office is attempting to fast track the implementation of the 2 000 MW of new generation capacity to be procured under the RMPPP in order to alleviate the frequent load shedding being experienced in South Africa at present and is specifically targeting new generation capacity that can be brought onto the grid as quickly as possible.

1.2 Scope of Work

In order to identify the potential impact of the project, the scope of the air quality specialist study includes the following tasks as part of the Environmental Impact Assessment (EIA):

- Phase 1 – Scoping Report:
  - A review of project information;
  - A review of legal requirements pertaining to air quality and specifically referring to;
    - The National Environmental Management Air Quality Act (NEMAQA) Act No. 39 of 2004:

            - National Ambient Air Quality Standards (NAAQS)
            - National Minimum Emission Standards (NMES)
            - National Guidelines for Dispersion Modelling
            - National Dust Control Regulations
        - International inhalation health criteria for non-criteria pollutants
    - A study of the receiving environment including:
        - An analysis of regional climate and site-specific atmospheric dispersion potential;
        - Analysis and assessment of existing (baseline) ambient air quality based on existing data collected within the Richards Bay;
        - The identification of air quality sensitive receptors.
    - A short report indicating the preferred site location from an air quality perspective.
- Phase 2 – Air Quality Impact Assessment:
    - The establishment of an emissions inventory by referring to NMES and emission factors for combustion processes, fuel storage and fugitive dust (construction);
    - Atmospheric dispersion simulations using the US EPA CALPro suite (CALMET and CALPUFF);
    - A human health risk and nuisance impact screening assessment based on dispersion simulation results;
    - A comprehensive air quality impact assessment report in the format prescribed by the Department of Environmental Affairs (DEA) in support of the Atmospheric Emission License (AEL) application.

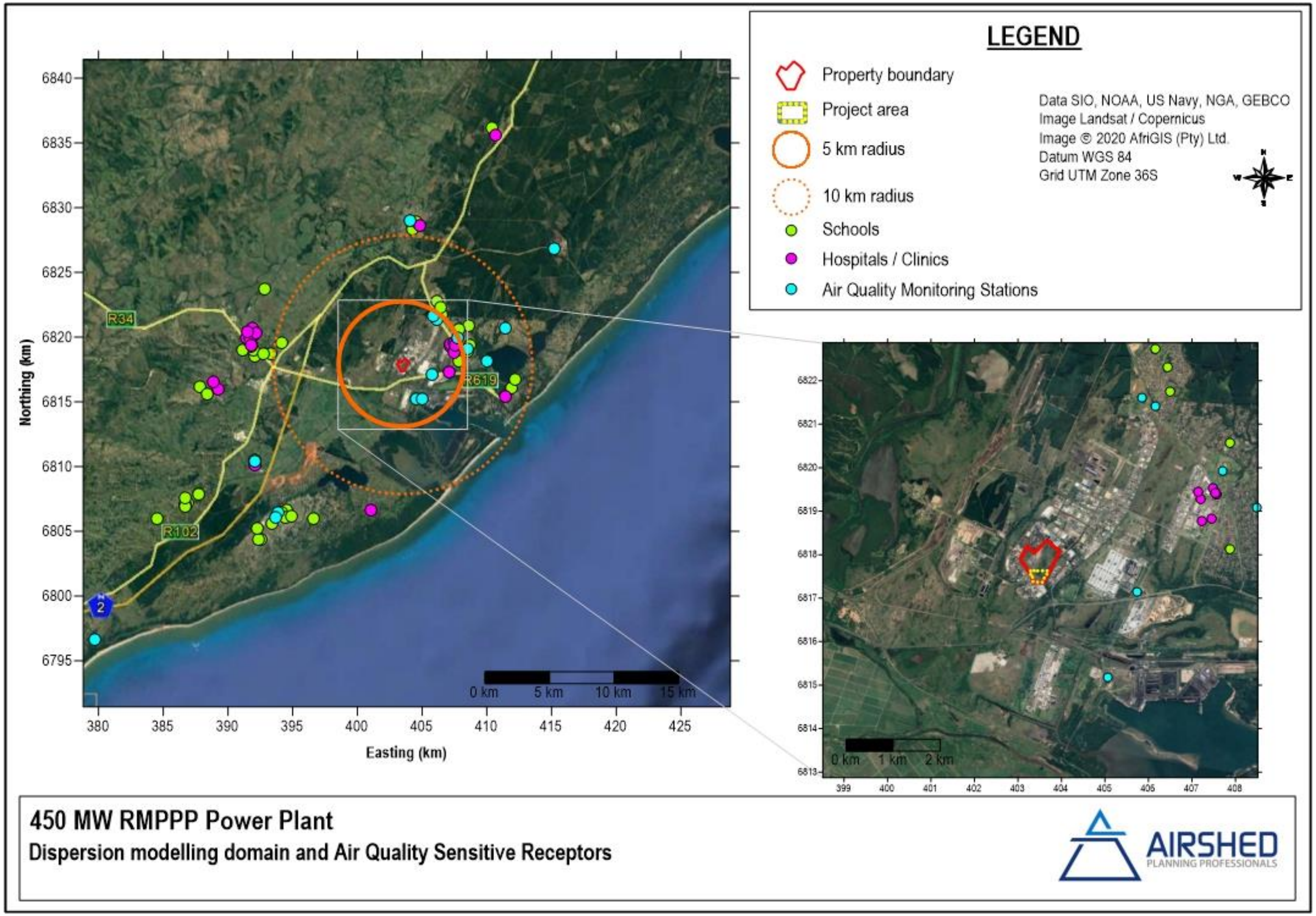


Figure 1-1: Location of the proposed 450 MW RMPPP Power Plant project, Richards Bay

1.3 Legislative Framework

Prior to discussing the impact of the project on the atmospheric environment, the regulations governing the impact of such operations should be referenced. These include:

- Listed Activities and National Minimum Emission Standards (NMES)
- Ambient air quality standards and guidelines:
    - National Ambient Air Quality Standards (NAAQS) for criteria pollutants,
    - International inhalation health criteria for non-criteria pollutants,
- The Air Quality Management Plan (AQMP) for Richards Bay.

NMES are provided for point sources and specify the amount of the pollutant acceptable in an emission stream and are often based on proven efficiencies of air pollution control equipment.

NAAQS and inhalation health criteria are fundamental to effective air quality management, providing the link between the source of atmospheric emissions and the user of that air at the downstream receptor site. NAAQS and inhalation health criteria generally indicate safe daily exposure levels for the majority of the population, including the very young and the elderly, throughout an individual's lifetime. Criteria are normally given for specific averaging or exposure periods.

The primary motivation of any AQMP is to achieve and maintain compliance with ambient air quality standards through progressive realisation of air quality improvements. AQMPs for the City of uMhlathuze Local Municipality and King Cetshwayo District Municipality are still under development (https://saaqis.environment.gov.za/, accessed 2020/07/22).

This section summarises legislation pertaining to air quality for sources and pollutants relevant to the study.

1.3.1 *National Minimum Emission Standards*

The minister has, in accordance with the National Environmental Management Air Quality Act (NEMAQA) (Act No. 39 of 2004), published a list of activities which result in atmospheric emissions and which are believed to have significant detrimental effects on the environment and human health; and, social welfare. The Listed Activities and NMES were published on the 31st of March 2010 (Government Gazette No. 33064) and the revised NMES on 22 November 2013 (Government Gazette No. 37054) (with later amendments in 2015, 2018, and 2020 for various subcategories). NMES applicable to the proposed project include:

- **Gas Combustion Installations** – Gas combustion used primarily for steam raising or electricity generation (more than 50 mega Watt (MW) heat input per unit). NMES subcategory 1.4 or 1.5 (depending on technology options) are applicable (Table 1-1 and Table 1-2) during normal operating conditions using LPG, natural gas or LNG.
- **Liquid Combustion Installations** – Liquid fuel combustion used primarily for steam raising or electricity generation (more than 50 MW heat input per unit) where NMES subcategory 1.2 would apply during normal operating conditions using naphtha.
- **LPG or Naphtha Storage** – The storage and handling of petroleum products within permanent immobile liquid tanks larger than 1000 m^3 in total triggers Subcategory 2.4 (Table 1-3).
    - Subcategory 2.4 NMES distinguishes between petroleum products with various vapour pressures. The vapour pressure of LPG is above 91 kPa (Table 1-3). However, LPG is in a liquid phase as a result of the application

of pressure or low temperatures for the purposes of storage and transport and would not be liquid at room temperature and pressure. The constituents of LPG (predominantly propane) are non-volatile[1].

- Naphtha, however, is liquid at room temperature and contains volatile constituents, requiring a Type 3 storage tank (Table 1-3).

Table 1-1: NMES for gas combustion installations

Subcategory 1.4: Gas Combustion Installations		
Description	Gas combustion (including gas turbines burning natural gas) used primarily for steam raising or electricity generation.	
Application	All installations with design capacity equal to or greater than 50 MW heat input per unit based on the lower calorific value of the fuel used.	
Substance or mixture of substances		**mg/Nm^3 under normal conditions of 3% O_2, 273 K and 101.3 kPa**
Common Name	**Chemical Symbol**	**New plant**
Particulate matter (PM)	Not applicable	10
Sulfur dioxide	SO_2	400
Oxides of nitrogen	NO_x expressed as NO_2	50
Notes: (a) The following special arrangement shall apply: i. Reference conditions for gas turbines shall be 15% O_2, 273 K and 101.3 kPa; and ii. Where co-feeding with waste materials with calorific value allowed in terms of the Waste Disposal Standards published in terms of the Waste Act, 2008 (Act No.59 of 2008) occurs, additional requirements under subcategory 1.6 shall apply.		

Table 1-2: NMES for Reciprocating Engines

Subcategory 1.5: Reciprocating Engines		
Description	Liquid and gas fuel stationary engines used for electricity generation.	
Application	All installations with design capacity equal to or greater than 10 MW heat input per unit based on the lower calorific value of the fuel used.	
Substance or mixture of substances		**mg/Nm^3 under normal conditions of 3% O_2, 273 K and 101.3 kPa**
Common Name	**Chemical Symbol**	**New plant**
Particulate matter (PM)	Not applicable	50
Sulfur dioxide	SO_2	2000* 400**
Oxides of nitrogen	NO_x expressed as NO_2	1170*
Notes: * applicable to liquid fuel sources ** applicable to gas fuel sources		

[1] US EPA Compendium Method TO-14A https://www3.epa.gov/ttn/amtic/files/ambient/airtox/to-14ar.pdf (accessed 24-07-2020)

Table 1-3: NMES for the storage and handling of petroleum products

Subcategory 2.4: Storage and Handling of Petroleum Products	
Description	Petroleum products storage tanks and product transfer facilities.
Application	All permanent immobile liquid storage tanks larger than 1 000 cubic metres cumulative tankage capacity at a site.

(a) The following transitional arrangement shall apply for the storage and handling of raw materials, intermediate and final products with a vapour pressure greater than 14 kPa at operating temperature:

– Leak detection and repair (LDAR) program must be instituted.

(b) The following special arrangements shall apply for control of TVOCs from storage of raw materials, intermediate and final products with a vapour pressure of up to 14 kPa at operating temperature, except during loading and offloading. (Alternative control measures that can achieve the same or better results may be used)

– Storage vessels for liquids shall be of the following type:

True vapour pressure of contents at storage temperature	**Type of tank or vessel**
Type 1: Up to 14 kPa	Fixed-roof tank vented to atmosphere, or as Type 2 and 3
Type 2: Above 14 kPa up to 91 kPa with a throughput of less than 50 000 m³ per annum	Fixed-roof tank with Pressure Vacuum Vents fitted s a minimum, to prevent "breathing" losses, or as per Type 3
Type 3: Above 14 kPa up to 91 kPa with a throughput greater than 50 000 m³ per annum	a) External floating roof tank with primary and secondary rim seals for tank diameter larger than 20 m, or b) fixed roof tank with internal floating deck / roof fitted with primary seal, or c) fixed roof tank with vapour recovery system
Type 4: Above 91 kPa	Pressure vessel

i. The roof legs, slotted pipes and/or dipping well on floating roof tanks (except for domed floating roof tanks or internal roof tanks) shall have sleeves fitted to minimise emissions.

ii. Relief valves on pressurised storage should undergo periodic checks for internal leaks. This can be carried out using portable acoustic monitors or if venting to atmosphere with an accessible open end, tested with a hydrocarbon analyser as part of an LDAR programme.

(c) The following special arrangements shall apply for control of TVOCs from storage, loading and unloading of raw materials, intermediate and final products with a vapour pressure of more than 14 kPa at operating temperatures, except during loading and unloading. Alternative control measures that can achieve the same or better results may be used:

iii. All installations with a throughput of 50 000 m³ per annum of products with a vapour pressure greater than 14 kPa, must be fitted with vapour recover / destruction units. Emission limits are set out in the table below –

Description	Vapour Recovery Units	
Application	All loading/ offloading facilities with a throughput greater than 50 000 m³ per annum	
Substance or mixture of substances	**mg/Nm³ under normal conditions of 273 K and 101.3 kPa**	
Common Name	**Chemical Symbol**	**New plant**
Total volatile organic compounds (TVOCs) from vapour recovery/destruction units (thermal treatment)	Not applicable	150
Total volatile organic compounds (TVOCs) from vapour recovery/destruction units (non-thermal treatment)	Not applicable	40 000

1.3.2 *National Ambient Air Quality Standards (NAAQS)*

Criteria pollutants are considered those pollutants most commonly found in the atmosphere, that have proven detrimental health effects when inhaled and are regulated by ambient air quality criteria. South African NAAQS for SO_2, NO_2, PM_{10}, carbon monoxide (CO), ozone (O_3), benzene (C_6H_6), and lead (Pb) were published on 13 March 2009. Standards for $PM_{2.5}$ were published on 24 June 2012. All standards are listed in Table 1-4 where pollutants of interest to the proposed project are shaded in blue.

Table 1-4: National Ambient Air Quality Standards for criteria pollutants

Pollutant	Averaging Period	Limit Value (µg/m³)	Limit Value (ppb)	Frequency of Exceedance	Compliance Date
SO_2	10-minute	500	191	526	Currently enforceable
	1-hour	350	134	88	Currently enforceable
	24-hour	125	48	4	Currently enforceable
	1-year	50	19	-	Currently enforceable
NO_2	1-hour	200	106	88	Currently enforceable
	1-year	40	21	-	Currently enforceable
PM_{10}	24-hour	75	-	4	Currently enforceable
	1-year	40	-	-	Currently enforceable
$PM_{2.5}$	24-hour	40	-	4	1 Jan 2016 – 31 Dec 2029
		25	-	4	1 Jan 2030
	1-year	20	-	-	1 Jan 2016 – 31 Dec 2029
		15	-	-	1 Jan 2030
CO	1-hour	30 000	26 000	88	Currently enforceable
	8-hour	10 000	8 700	11	Currently enforceable
Benzene (C_6H_6)	1-year	5	1.6	-	Currently enforceable
Ozone (O_3)	8 hours (running)	120	61	11	Currently enforceable
Lead (Pb)	1-year	0.5	-	-	Currently enforceable

1.3.2.1 Inhalation Health Criteria for Non-criteria Pollutants

Some VOCs are emitted from turbine units and during handling of LPG, however ambient VOC concentrations are not currently regulated in South Africa as a group. In the assessment of ambient VOC concentrations, Effect Screening Levels (ESLs) published by the Texas Commission of Environmental Quality (TCEQ) will be referenced. Short-term (1-hour) and long term (annual average) ESLs for diesel fumes are 1 000 µg/m³ and 100 µg/m³ respectively (TCEQ, 2013).

1.3.3 *National Dust Control Regulations (NDCR)*

NDCR were published on the 1st of November 2013 (Government Gazette No. 36974 R.827). Acceptable dustfall rates according to the Regulation are summarised in Table 1-5.

Table 1-5: Acceptable dustfall rates

Restriction areas	Dustfall rate (D) in mg/m²-day over a 30 day average	Permitted frequency of exceedance
Residential areas	D < 600	Two within a year, not sequential months.
Non-residential areas	600 < D < 1 200	Two within a year, not sequential months.

The regulation also specifies that the method to be used for measuring dustfall and the guideline for locating sampling points shall be ASTM D1739 (1970), or equivalent method approved by any internationally recognized body. Dustfall is assessed for nuisance impact and not inhalation health impact.

1.4 Study Approach and Methodology

The baseline description and ranking for the project used the following approach.

1.4.1 *Project and Information Review*

A review of the project from an air quality perspective in order to identify sources of emission and associated pollutants of concern was conducted. In the review the following documents were referenced:

- Project information supplied by Savannah Environmental (Pty) Ltd, as received from Phinda Power Producers (Pty) Ltd;
- Section 21 of the National Environmental Management: Air Quality Act (NEMAQA);
- Emission factor documentation published by the United States Environmental Protection Agency (US EPA) for:
  - Stationary gas turbines (US EPA, 2000)
- Review of the Cumulative Air Pollution Dispersion Modelling Assessment for Richards Bay (WSP Environmental, 2016).

1.4.2 *A Study of the Affected Atmospheric Environment*

The atmospheric environment was studied by taking into account:

- the local atmospheric dispersion potential;
- the position of air quality sensitive receptors (AQSRs) in relation to the project; and,
- measured ambient air quality in the study area.

An understanding of the atmospheric dispersion potential of the area is essential to an air quality impact assessment. Physical environmental parameters that influence the dispersion of pollutants in the atmosphere include terrain, land cover and meteorology.

The Richards Bay Clean Air Association (RBCAA) has the following air quality monitoring stations (AQMS): Arboretum, Brackenham, CBD, Harbour West, Felixton, eNseleni and eSikhaleni. The RBCAA also operates an automatic weather station (AWS) at the airport. The City of uMhlatuze has AQMS at Arboretum, Brackeham and eSikhaleni. Recent (2016 to 2019) data sets from the stations were provided for use in the study.

Potential AQSRs, residential areas, schools and medical facilities, were identified from recent maps of the area using Google Earth™ aerial imagery.

1.4.3 *Report*

The main deliverable of the air quality specialist study is a scoping level report including a scoping level impact rating.

1.4.4 *Terms of Reference for EIA Phase – Air Quality Impact Assessment*

The Terms of Reference, as a list of tasks, for the Air Quality Study portion of the EIA phase of the project will include:

- The establishment of an emissions inventory by referring to NMES and emission factors for combustion processes, fuel storage and fugitive dust (construction);
- Atmospheric dispersion simulations for the baseline, incremental, and cumulative scenarios using the CALPUFF atmospheric dispersion model;
- A human health risk and nuisance impact screening assessment based on dispersion simulation results;
- A comprehensive air quality impact assessment report in the format prescribed by the Department of Environmental Affairs (DEA) in support of the Atmospheric Emission License (AEL) application.
- Impact Significance rating according to the method provided by Savannah Environmental (Pty) Ltd.

1.5 Management of Uncertainty

The following important limitations apply to the study and should be noted:

- The ambient air quality data set assessed was for the period 2016 to 2019.
- The emissions from other sources of pollution, especially the industrial sources, have been identified from the WSP report and will be used to assess the cumulative impact.

2 PROJECT DESCRIPTION FROM AN AIR QUALITY PERSPECTIVE

2.1 Sources of Emission and Likely Pollutants

2.1.1 *Project 1A – 450 MW RMPPP Power Plant*

The 450MW Emergency Risk Mitigation Power Plant (RMPP) involves the construction of a gas-fired power station which will provide mid-merit power supply to the electricity grid. The 450 MW RMPP is planned to operate on a mid-merit basis at a minimum annual average dispatch rate of ~50% (i.e. operational between 5am and 9:30pm daily and being deployed on average for 50% over the year during this time period) and a maximum annual average dispatch rate of ~72%. The 450 MW RMPP has been designed and developed as a power balance system to manage electricity demand during day time peak periods to provide energy, capacity and ancillary services to promote the stability of the national grid and assist in levelling out the variability in renewables energy electricity supply and meet short term fluctuations in electricity demand. In addition, the 450 MW RMPP can provide back up support for daytime base load generation in the event of unscheduled maintenance on Eskom's base load electricity generation fleet. The power station will have an installed capacity of up to 450 MW, to be operated on either LPG or naphtha as the initial fuel source and later to be converted from utilising LPG/naphtha to natural gas. For the initial fuel source, either LPG would be supplied by road from the existing LPG import terminal in Richards Bay or naphtha would be supplied via pipeline from the import berths at Richards Bay. Once LNG import and regassification infrastructure is established in Richards Bay in accordance with the Department of Minerals and Energy, Transnet Limited and the IPP Office's planning, natural gas would be supplied to the 450 MW RMPP via a natural gas pipeline from this import terminal. The use of either Naphtha or LPG and the associated infrastructure required in respect of each of these alternative fuel sources, will be investigated further within the EIA phase and the preferred fuel source presented. The LNG terminal and regassification infrastructure and naphtha supply infrastructure at the port of Richards Bay and the relevant pipelines do not form part of the scope of this assessment, whereas LPG infrastructure does form part of this report.

The main infrastructure associated with the facility includes the following:

- Main Power Island consisting of either gas turbines comprising of air intake, air filter structures and exhaust stack for the generation of electricity through the use of natural gas, naphtha or LPG; or Gas engines comprising of reciprocating internal combustion engines and exhaust stack utilising LPG or natural gas.
- Generator and Auxiliary transformers.
- Balance of Plant systems.
- Dry Cooling systems.
- Auxiliaries.
- 132kv interconnecting substation and power lines connecting to the grid transmission infrastructure (under a separate environmental approval process).
- LPG fuel pipe routing between the LPG storage site and the power plant site or Naphtha import pipeline from the port of Richards Bay to the onsite storage of Naphtha (the Naphtha pipeline will be applied for under a separate environmental approval process).
- Stormwater management ponds.
- LPG storage comprising of up to 15 000 m^3 of storage in total, comprising of a number of either bullets or spheres storage tanks in design or;
- Naphtha storage on the power plant site of up to 90 000 m^3 in total, comprising a number of tanks;
- Once imported LNG is available in Richards Bay, the 450 MW RMPP will be converted from utilising LPG / Naphtha to the use of regassified LNG by means of a new dedicated natural gas pipeline which will replace or supplement

the LPG / Naphtha supply to the power plant (The approval for the pipeline will be conducted under a separate process).

- Effluent reticulation systems - i.e. 1) sanitary wastewater system; 2) oily water collection system and 3) storm water and rainwater collection system.
- Diesel generator to provide start-up power to the first gas engine / turbine.

Primary pollutants from gas turbine engines are NO_x, CO and to a lesser extent PM and VOCs. NO_x formation is strongly dependent on the high temperatures developed in the combustor. CO, VOC, hazardous air pollutants (HAP), and PM are primarily the result of incomplete combustion. Trace to low quantities of HAP and SO_2 are emitted from gas turbines. Ash and metallic additives in the fuel may also contribute to PM in the exhaust. Oxides of sulfur (SO_X) will only appear in a significant quantity if heavy oils are fired in the turbine. SO_2 emissions are directly related to the sulfur content of the fuel (US EPA, 2000). In addition to the above, VOC emissions will also be released in small quantities from the LPG storage tanks vents as well as the off-loading and handling of LPG.

2.1.2 *Project 1B – 450 MW RMPPP Transmission*

The establishment of the 450 MW RMPPP Power Plant will simultaneously require the implementation of the 450 MW RMPPP Transmission project to allow for the evacuation of the electricity produced by the Power Plant to the existing high voltage electricity transmission infrastructure in close proximity to the Power Plant.

The 450MW RMPPP Transmission is being undertaken as a separate application for environmental authorisation as:

- a basic assessment process is required for the transmission infrastructure; and
- Phinda wishes to secure a separate Environmental Authorisation for the 132 kV transmission line as ultimately it is expected that that Environmental Authorisation will need to be transferred to Eskom when Eskom takes over ownership and control of the transmission infrastructure.

Due to the large number of existing high voltage transmission lines between the 450 MW Power Plant site and the electricity evacuation connection point, electricity evacuation is proposed via underground transmission cables to connect to an existing unutilised 132 kV transmission line.

Construction phase emissions, for both the RMPPP power station and transmission project, will be generated by bulk earthworks, concrete works, welding etc. Pollutants will include fugitive PM and those emitted by construction vehicles in the form of PM and gases such as NO_x, SO_2 and VOCs.

2.2 Identified Air Quality Aspects

Identified air quality aspects associated with the proposed project is listed in Table 2-1.

Table 2-1: Identified air quality aspects

Aspect or Project Phase	Expected Atmospheric Sources of Emissions and Associated Pollutants						
	Source	CO	NO_x	PM[a]	SO_2	VOC	
The construction phase of the RMPPP	Fugitive dust from civil and building work such as excavations, piling, foundations and buildings	n/a	n/a	✓	n/a	n/a	The nature of emissions from construction activities is highly variable in terms of temporal and spatial distribution and is also transient. Detail regarding the extent of construction activities and equipment movements was also not available for inclusion in the study. Fugitive dust emissions are mostly generated by land-clearing and bulk earthworks.
	Exhaust gasses from diesel mobile construction equipment and trucks delivering materials.	✓	✓	✓	✓	✓	
The normal operation phase of the RMPPP	Exhaust gasses from the proposed turbine units	✓	✓	✓[c]	✓[c]	✓	The project is designed to operate on either LPG or naphtha (initial fuel source) or natural gas (NG) as a future fuel source. The assessment will include the operation of the proposed turbine or engine units based on the MES for the applicable subcategories. Vehicle entrainment and exhaust emissions are likely during LPG delivery, if delivered by tanker truck. Negligible fugitive losses of VOCs are expected during LPG tanker delivery, LPG or LNG delivery pipelines, from storage vessels, and from pipework and fittings. Naphtha will be transported to site via pipeline. Due to the volatility of the constituents of naphtha, standing and working losses from the naphtha storage terminal are likely to be higher than those from the LPG storage terminal.
	Fuel delivery trucks exhaust gases	✓	✓	✓	✓	✓	
	Petroleum product storage and handling	n/a	n/a	n/a	n/a	✓	
RMPPP upset conditions that may result in atmospheric impacts	Unstable combustion conditions within turbine units	✓	✓	✓[c]	✓[c]	✓	Incomplete combustion and unstable combustion temperatures may result in higher than normal PM, CO, NO_x and VOC emissions. SO_2 emissions should not be affected. Additional VOC emissions because of the LPG leaks may occur. Vehicle entrainment and exhaust emissions are also likely during LPG delivery.
	Fuel delivery trucks exhaust gases	✓	✓	✓	✓	✓	
	LPG leaks	n/a	n/a	n/a	n/a	✓	
Decommissioning phase of the Project	Fugitive dust from civil work such as rehabilitation and demolition.	n/a	n/a	✓	n/a	n/a	The nature of emissions from decommissioning activities is highly variable in terms of temporal and spatial distribution and is also transient. Detail regarding the extent of decommissioning activities and equipment movements was also not available for inclusion in the study. Fugitive dust emissions are however mostly generated by demolition and rehabilitation activities.
	Exhaust gasses from diesel mobile equipment and trucks removing materials.	✓	✓	✓	✓	✓	

3 DESCRIPTION OF THE RECEIVING ENVIRONMENT

3.1 Site Description

The City of uMhlathuze Local Municipality falls within the King Cetshwayo District Municipality (previously known as the uThungulu District Municipality) and includes the towns of Richards Bay and Empangeni and its surrounding rural and tribal areas. The topography of the area is flat comprising of hills, ridges and undulating plains. The relief ranges from sea level on the eastern side to 296 metres above mean sea level (mamsl) to the western side. The current land uses in the region include industrial and commercial processes, surface mining activities, agricultural activities (mainly sugar cane), forestry, and formal and small residential communities. The proposed location of the project is in the industrial area of Alton, adjacent to both the Mondi Richards Bay facility and Hillside Aluminium.

The proposed project site is located approximately 4 km south west of the Richards Bay Central Business District (CBD) (Figure 1-1). The nearest residential areas to the project site are Richards Bay CBD (3.3 km); Wild-en-Weide (4.7 km); Arboretum (5.1 km east); Nseleni A (11.0 km north); and Felixton (13.7 km south-west). There are several schools, hospitals and clinics located within 5 km of the proposed location (Figure 1-1; Table 3-1). The location of various AQMS in relation to the project are shown in Figure 3-1. Industrial areas (Alton and the Richards Bay Harbour) are located within 5 km of the proposed project.

3.2 Climate and atmospheric dispersion potential

Meteorological mechanisms govern the dispersion, transformation, and eventual removal of pollutants from the atmosphere. The analysis of hourly average meteorological data is necessary to facilitate a comprehensive understanding of the dispersion potential of the site. The horizontal dispersion of pollution is largely a function of the wind field. The wind speed determines both the distance of downward transport and the rate of dilution of pollutants.

This study accessed different sets of meteorological data: simulated meteorological data for the Richards Bay airshed, and, measured meteorological data at four locations in the Richards Bay domain. For the purposes of CALPUFF dispersion modelling, Weather Research and Forecasting model (WRF) data for the period 2017 to 2019 on a 4 km horizontal resolution for a 50 km by 50 km domain was used. Four RBCAA air quality monitoring stations (AQMS) (Airport, Brackenham, CBD and Harbour West) were included for comparison to assess how representative the WRF data set is for the proposed project site. The meteorological data availability for the RBCAA stations is shown in Table 3-2.

Table 3-1: Distance to nearby air quality sensitive receptors

Air Quality Monitoring Station Name	Distance from proposed site (km)	Direction from proposed site
Scorpio (RBCAA)	2.3	ESE
Bayside (RBCAA)	2.8	SSE
Harbour West (RBCAA)	3.1	SSE
Brackenham (RBCAA)	4.4	NE
Brackenham (uMhlathuze)	4.4	NNE
CBD (RBCAA)	4.7	ENE
Arboretum (RBCAA)	5.1	ENE
Arboretum (uMhlathuze)	6.5	E
Airport (RBCAA)	8.4	ENE
eNseleni (RBCAA)	11.1	N
Felixton (RBCAA)	13.7	WSW
RBM (RBCAA)	14.7	NE
Esikhawini (RBCAA)	15.0	SW
eSikhaleni (uMhlathuze)	15.4	SW
Mtunzini (RBCAA)	31.9	SW
St Lucia (RBCAA)	58.6	NE
Receptor name / details	**Distance from proposed site (km)**	**Direction from proposed site**
Richards Bay Municipal Clinic	3.8	SSW
Mens Clinic International - Richards Bay	4.0	WSW
Better2Know Private STD Health Centre Richards Bay	4.0	SW
Umhlathuze Dental	4.1	SW
Richardsbay Medical Institute	4.3	SW
Mandlazini Clinic	4.3	SW
The Bay Hospital	4.3	NNE
John Ross College	4.4	ESE
Richards Bay Secondary School	4.9	ESE
Veldenvlei Primary School	5.1	NNE
Arboretum Primary School	5.1	ESE
Brackenham Primary School	5.3	SE
Richardsbaai Hoerskool	5.4	ESE
Bay Primary School	5.5	ESE
Richards Bay Christian School	5.9	NE
Headache Clinic | Bay Chiropractic | Smile Dent	8.3	WSW
Richards Bay Primary School	8.6	NE
St Francis Pre-Primary School	8.7	E
Old Mill High School	9.5	SE
Empangeni Christian School	10.2	ESE

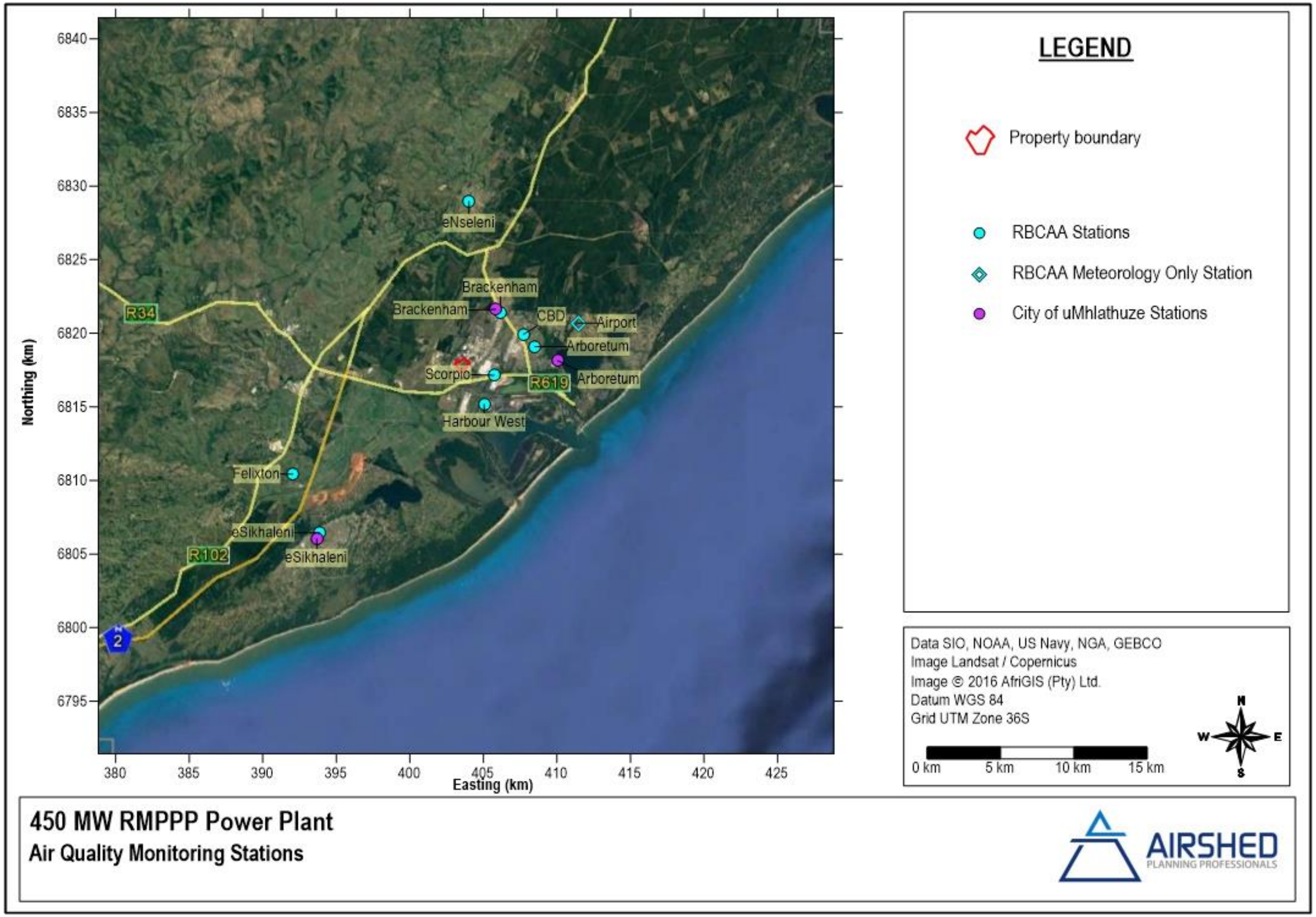


Figure 3-1: Location of the Proposed Project in relation to the AQMS

3.2.1 *Local Wind Field*

WRF data was used to construct wind roses for the surface wind field. Wind roses comprise 16 spokes, which represent the directions from which winds blew during a specific period. The colours used in the wind roses below, reflect the different categories of wind speeds; the dark red area, for example, representing winds >10 m/s. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. The frequency with which calms occurred, i.e. periods during which the wind speed was below 1 m/s are also indicated. For the comparison an extended data set was used for measured data (January 2016 to December 2019) to account for gaps in the data, while the simulated data set used for dispersion modelling was slightly shorter (January 2017 to December 2019).

The period, day-time and night-time wind roses for the WRF data is provided in Figure 3-2 to Figure 3-5. The data has a predominant south-south-westerly and north-easterly component over the period, and day-time. During night-time the wind is also predominantly from the south and south-south-west. The average period wind speed is 5.7 m/s. Night-time conditions reflect a decrease in wind speeds ranging mainly from 2-3 m/s in comparison to daily wind speeds of 3-4 m/s.

The seasonal variation in the wind field shows a slight northerly dominance in winter while north-northeasterlies are more dominant in summer and spring. Highest wind speeds are likely in spring.

Table 3-2: Parameters measured and data availability for the AQMS in Richards Bay (X indicates parameter not measured)

Owner	Monitoring Station	Easting (km)	Northing (km)	Year	Wind Speed	Wind Direction	Ambient Temperature	Relative Humidity	Pressure
RBCAA	Airport AWS	411.467	6820.689	2016	17.3%	17.3%	49.6%	X	X
				2017	99.7%	79.0%	no data	X	X
				2018	98.9%	98.9%	98.9%	X	X
				2019	98.2%	98.2%	98.5%	X	X
RBCAA	Arboretum AQMS	408.497	6819.088	2016	75.6%	75.4%	75.6%	X	X
				2017	93.7%	93.7%	93.7%	X	X
				2018	93.8%	93.8%	93.8%	X	X
				2019	97.3%	97.3%	97.3%	X	X
RBCAA	Brackenham AQMS	406.166	6821.399	2016	89.8%	89.8%	89.8%	X	X
				2017	82.7%	82.7%	84.8%	X	X
				2018	97.5%	97.5%	95.9%	X	X
				2019	96.4%	96.4%	96.4%	X	X
RBCAA	CBD AQMS	407.714	6819.921	2016	87.3%	87.3%	87.3%	87.4%	X
				2017	73.8%	73.8%	87.1%	87.1%	X
				2018	78.7%	78.7%	98.0%	no data	X
				2019	98.6%	98.6%	98.6%	no data	X
RBCAA	Harbour West AQMS	405.05	6815.191	2016	49.8%	49.8%	88.8%	X	X
				2017	83.6%	83.6%	83.6%	X	X
				2018	99.5%	99.5%	99.5%	X	X
				2019	99.9%	78.2%	no data	X	X
RBCAA	Felixton AQMS	392.06	6810.428	2016	X	X	no data	X	X
				2017	X	X	no data	X	X
				2018	X	X	99.3%	X	X
				2019	X	X	80.6%	X	X
RBCAA	eNseleni AQMS	404.02	6828.96	2016	X	X	X	X	X
				2017	X	X	X	X	X
				2018	X	X	X	X	X
				2019	97.1%	97.1%	97.1%	X	X

Owner	Monitoring Station	Easting (km)	Northing (km)	Year	Wind Speed	Wind Direction	Ambient Temperature	Relative Humidity	Pressure
RBCAA	eSikhaleni AQMS	393.857	6806.453	2016	87.5%	87.5%	87.5%	X	X
				2017	82.0%	82.0%	82.0%	X	X
				2018	95.5%	95.5%	95.5%	X	X
				2019	93.8%	93.8%	93.8%	X	X
City of uMhlathuze	Arboretum AQMS	410.05	6818.14	2016	X	X	X	X	X
				2017	X	X	X	X	X
				2018	X	X	X	X	X
				2019	84.5%	no data	84.5%	84.5%	84.5%
City of uMhlathuze	Brackenham AQMS	405.85	6821.62	2016	X	X	X	X	X
				2017	X	X	X	X	X
				2018	X	X	X	X	X
				2019	70.2%	70.2%	66.5%	70.2%	66.5%
City of uMhlathuze	eSikhaleni AQMS	393.67	6806.05	2016	X	X	X	X	X
				2017	X	X	X	X	X
				2018	X	X	X	X	X
				2019	83.6%	83.6%	83.6%	83.6%	83.9%

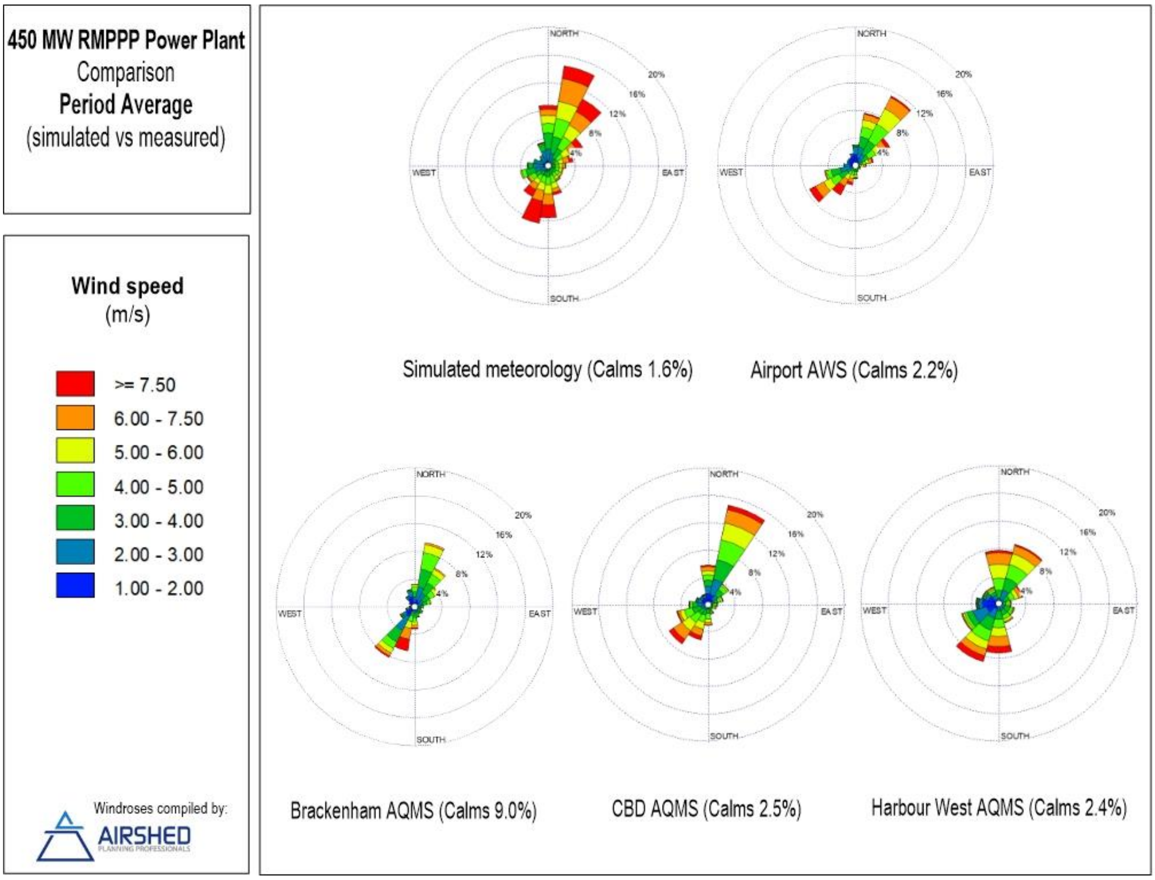


Figure 3-2: Period wind roses for the period January 2016 to December 2019

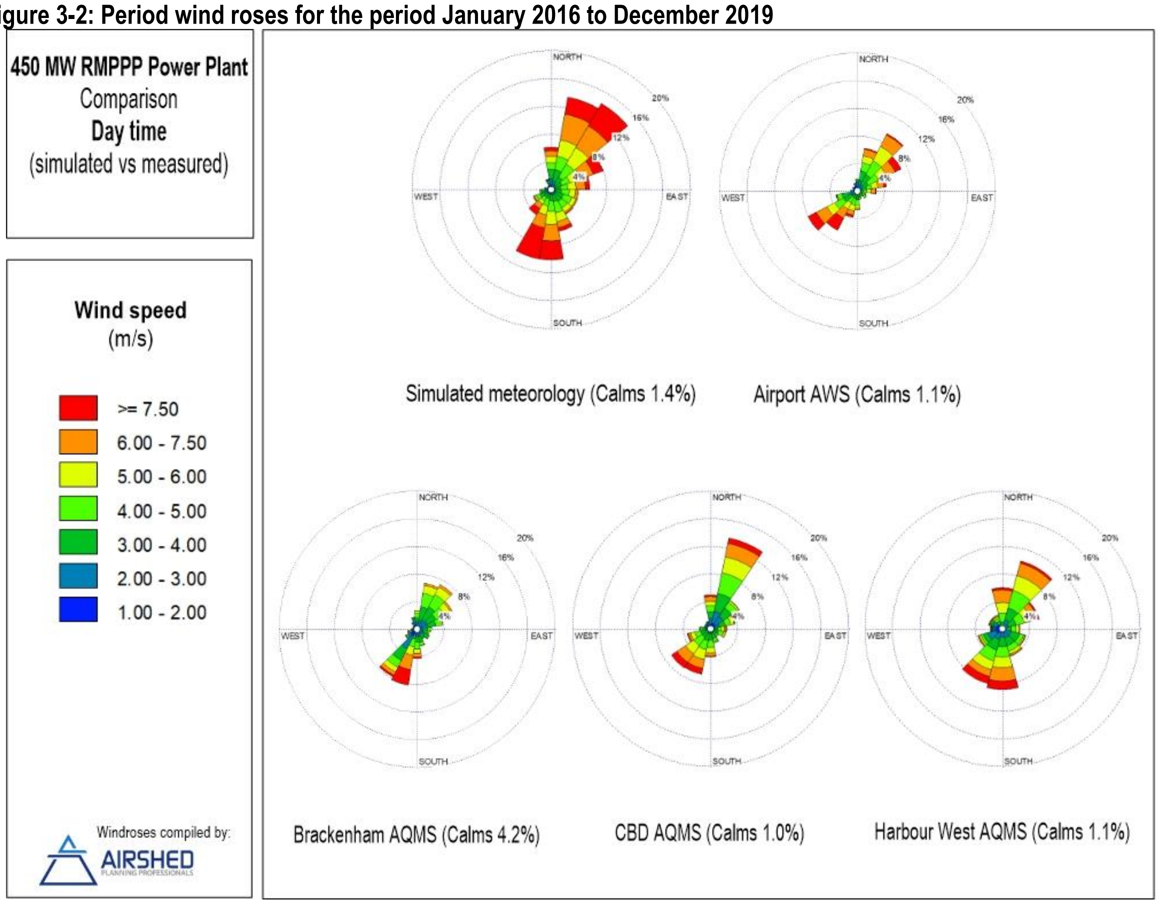


Figure 3-3: Day-time wind roses for the period January 2016 to December 2019

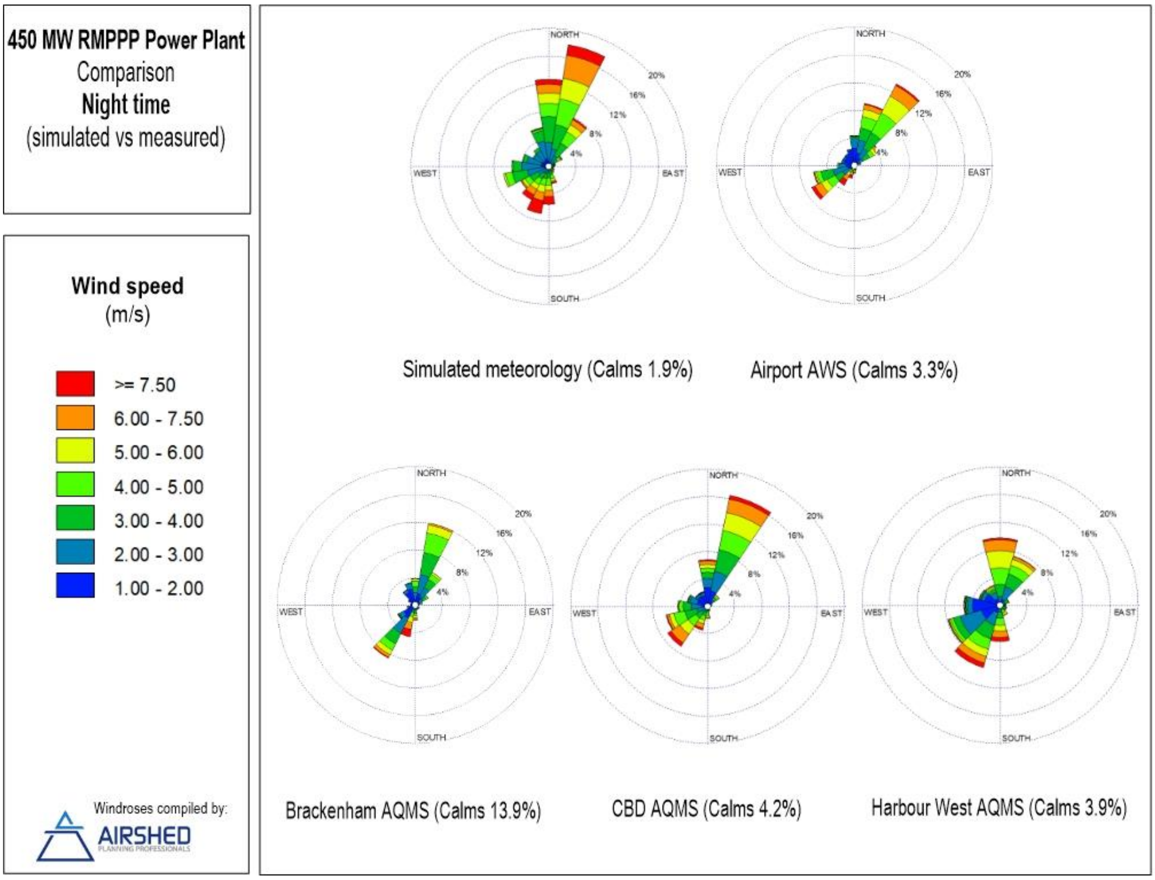


Figure 3-4: Night-time wind roses for the period January 2016 to December 2019

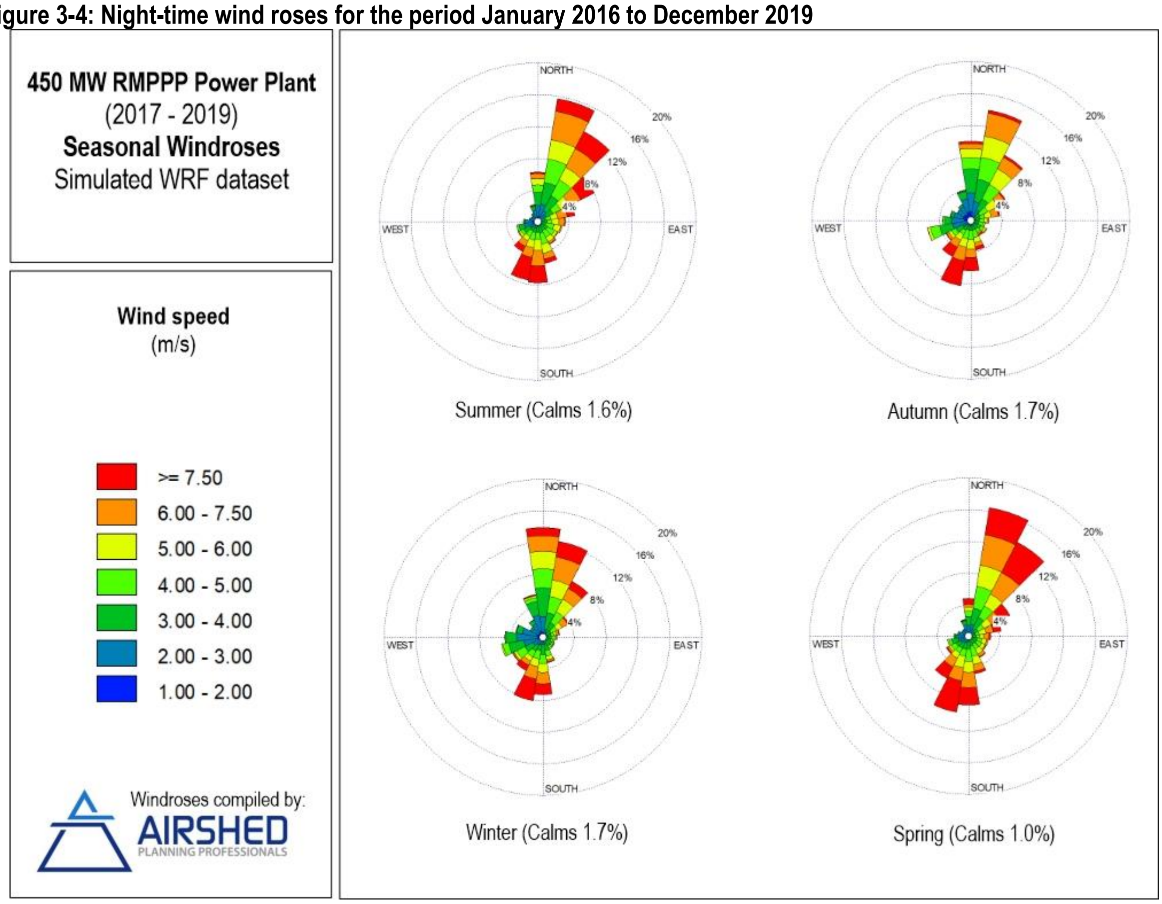
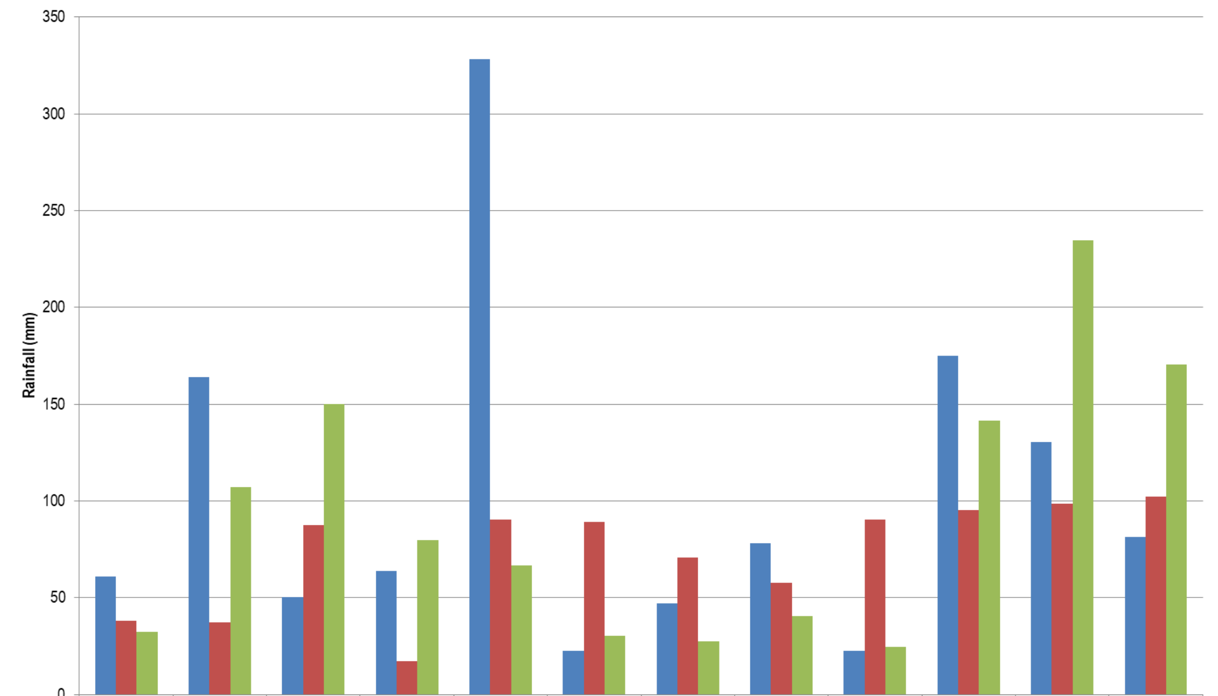


Figure 3-5: Seasonal wind roses for the period January 2017 to December 2019

3.2.2 *Precipitation*

Precipitation reduces erosion potential by increasing the moisture content of materials. This represents an effective mechanism for removal of atmospheric pollutants and is therefore considered during air pollution studies.

This WRF data rainfall pattern is observable in Figure 3-6. Rainfall peaks being between October and March, with approximately 1 070 mm of rainfall in a year. The lowest rainfall months are generally June and July.



	January	February	March	April	May	June	July	August	September	October	November	December
2017	61.1	164.1	50.4	63.9	328.1	22.7	47.1	78.3	22.8	175.2	130.6	81.6
2018	37.9	37.3	87.5	17.3	90.5	89.3	70.8	57.5	90.2	95.3	98.6	102.5
2019	32.3	107.0	150.0	79.9	66.9	30.5	27.7	40.6	24.8	141.5	234.5	170.7

Figure 3-6: Monthly rainfall based on WRF data for the period January 2017 to December 2019

3.2.3 *Temperature*

Air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the plume and the ambient air, the higher the plume is able to rise), and determining the development of the mixing and inversion layers.

Monthly mean, maximum and minimum temperatures from the WRF data are given in Table 3-3. Diurnal temperature variability is presented in Figure 3-7. Temperatures ranged between 10°C and 42°C. The highest temperatures occurred in September and the lowest in July. During the day, temperatures increase to reach maximum at around 14:00 in the afternoon. Ambient air temperature decreases to reach a minimum at around 06:00 i.e. just before sunrise.

Table 3-3: Monthly average, maximum and minimum temperatures based on WRF data for the period January 2016 to December 2018 (units: °C)

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Average	24	25	25	23	21	19	19	20	21	21	22	24	22
Maximum	36	37	34	34	31	30	34	33	42	36	36	39	42
Minimum	16	17	14	14	11	11	10	12	12	12	13	16	10

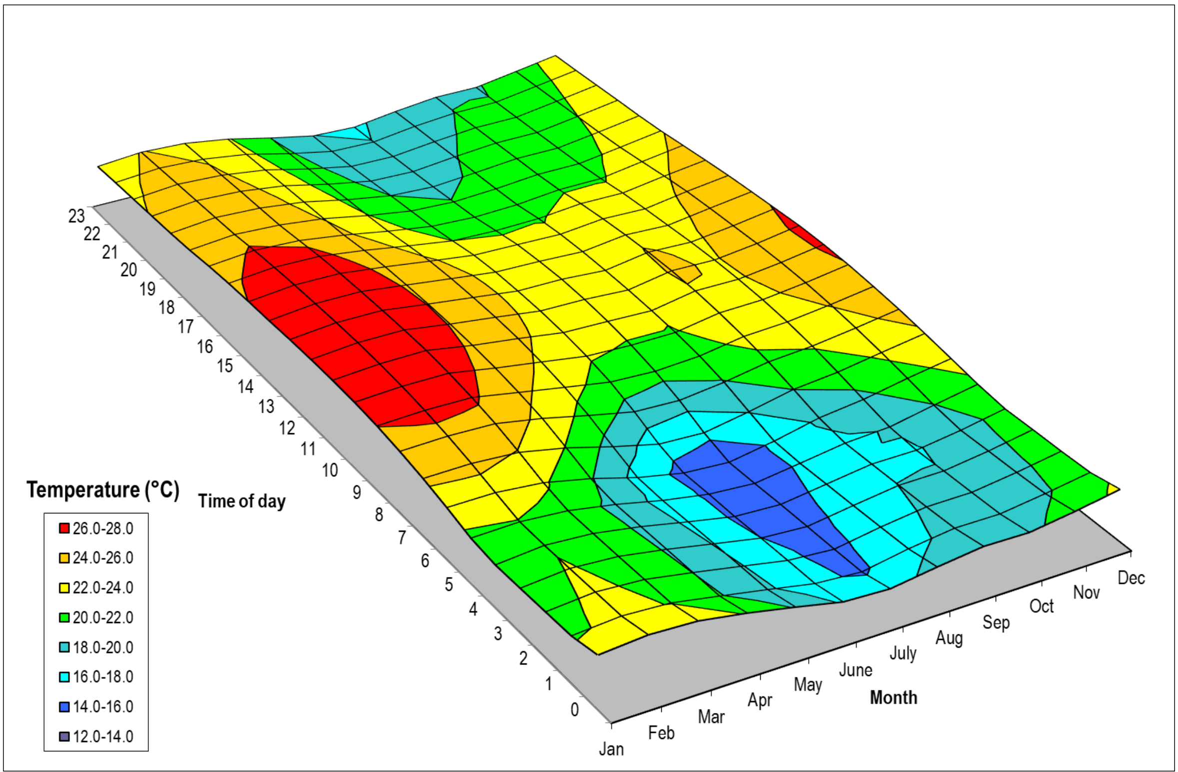


Figure 3-7: Diurnal temperature profile based on the WRF data for the period January 2017 to December 2019

3.2.4 *Mixing Depth*

The atmospheric boundary layer constitutes the first few hundred metres of the atmosphere. This layer is directly affected by the earth's surface, either through the retardation of flow due to the frictional drag of the earth's surface, or as result of the heat and moisture exchanges that take place at the surface. Typically, the temperature of the atmosphere decreases with height (termed the *environmental lapse rate*), and it decreases at a rate somewhere between 4°C per kilometre and 9.8°C per kilometre (the latter known as the *dry adiabatic rate*), i.e. the atmosphere is conditionally unstable much of the time. But this can change depending on how the temperature of the atmosphere changes at different levels.

During the daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth's surface. Since warmer air is less dense than cold air, it will become buoyant and rise. If warm air lies above cold air, you can see that rising motion will be inhibited (any rising parcel will be colder than the warm overlying air). This situation is referred to as a surface inversion. An inversion can also form above the mixing layer and this is termed an elevated inversion. The thickness of this mixing layer depends predominantly on the extent of solar radiation, growing gradually from sunrise to reach a maximum at about 5-6 hours after sunrise. This situation is more pronounced during the winter months due to strong night-time inversions and slower developing mixing layer.

During the night a stable layer, with limited vertical mixing, exists. Radiative flux divergence during the night usually results in the establishment of ground-based inversions and the erosion of the mixing layer. Low wind speeds are normally associated with these conditions and this result in less dilution potential. Stable conditions will cause pollutants to become trapped near ground level. Furthermore, the conditions associated with the nearby cold ocean could lead to overnight and morning fog.

Elevated inversions may occur for a variety of reasons, and on some occasions as many as five may occur in the first 1 000 m above the surface. The lowest-level elevated inversion is located at a mean height above ground of 1 550 m during winter months with a 78% frequency of occurrence. By contrast, the mean summer subsidence inversion occurs at 2 600 m with a 40% frequency.

3.2.5 *Atmospheric Stability*

The new generation air dispersion models differ from the models traditionally used in a number of aspects, the most important of which are the description of atmospheric stability as a continuum rather than discrete classes. The atmospheric boundary layer properties are therefore described by two parameters; the boundary layer depth and the Obukhov length (often referred to as the Monin-Obukhov length).

The Obukhov length (L_{Mo}) provides a measure of the importance of buoyancy generated by the heating of the ground and mechanical mixing generated by the frictional effect of the earth's surface. Physically, it can be thought of as representing the depth of the boundary layer within which mechanical mixing is the dominant form of turbulence generation (CERC, 2004). The atmospheric boundary layer constitutes the first few hundred metres of the atmosphere. During daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth's surface. Night-times are characterised by weak vertical mixing and the predominance of a stable layer. These conditions are normally associated with low wind speeds and lower dilution potential.

Diurnal variation in atmospheric stability, as calculated from measured data, and described by the inverse Obukhov length and the boundary layer depth is provided in Figure 3-8. The highest concentrations for ground level, or near-ground level releases from non-wind dependent sources would occur during weak wind speeds and stable (night-time) atmospheric conditions. For elevated releases, unstable conditions can result in very high concentrations of poorly diluted emissions close to the stack. This is called *looping* and occurs mostly during daytime hours. Neutral conditions disperse the plume fairly equally in both the vertical and horizontal planes and the plume shape is referred to as *coning*. Stable conditions prevent the plume from mixing vertically, although it can still spread horizontally and is called *fanning* (Tiwary & Colls, 2010). For ground level releases such as fugitive dust the highest ground level concentrations will occur during stable night-time conditions.

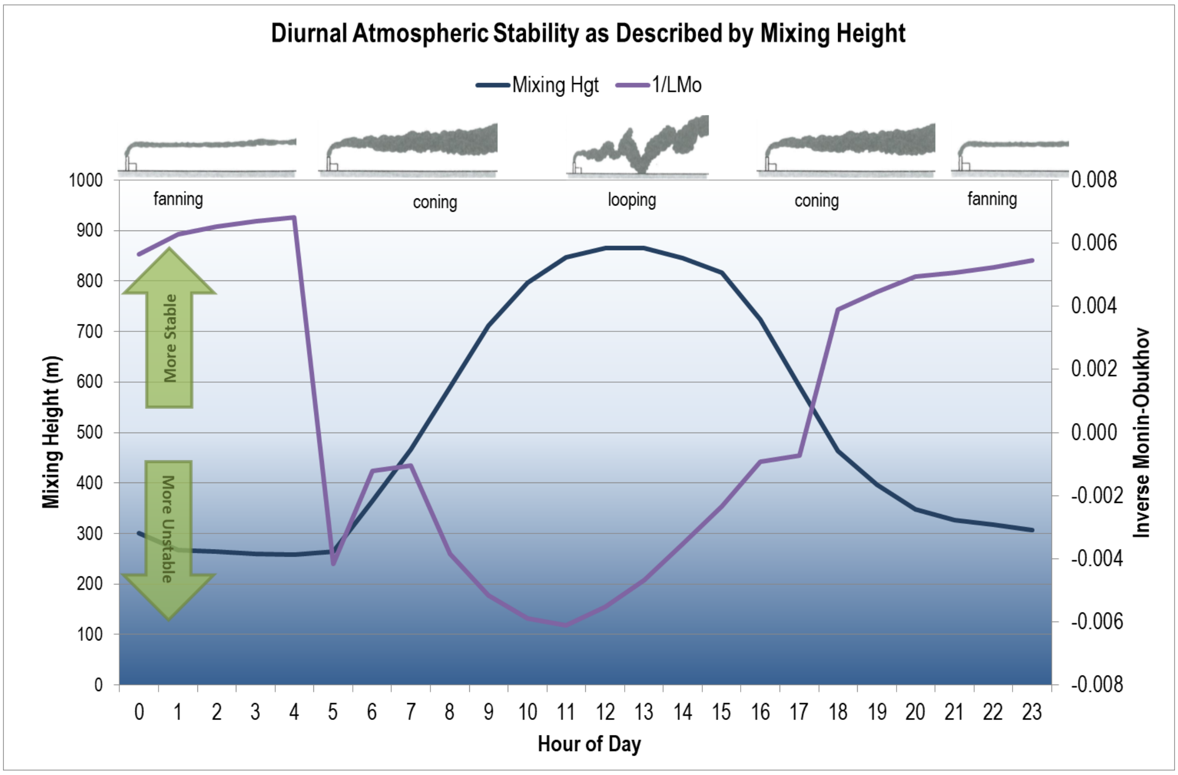


Figure 3-8: Diurnal atmospheric stability (CALMET processed WRF data, January 2017 to December 2019)

3.3 Ambient Air Quality Monitoring Data

The current air quality in the study area is mostly influenced by the industrial activities within the RB IDZ as well as farming activities, domestic fires, residential fuel burning, vehicle exhaust emissions and dust entrained by vehicles. These emission sources vary from activities that generate relatively course airborne particulates (such as farmland preparation dust from paved and unpaved roads) to fine PM such as that emitted by vehicle exhausts, power generators (at industrial operations). Other sources of PM include occasional fires in the residential areas and farming activities. Emissions from unpaved roads constitute a major source of emissions to the atmosphere in South Africa. When a vehicle travels on an unpaved road, the force of the wheels on the road surface causes pulverization of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong turbulent air shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. Dust emissions from unpaved roads are a function of vehicle traffic and the silt loading on the roads. Emission from paved roads are significantly less than those originating from unpaved roads, however they do contribute to the particulate load of the atmosphere. Particulate emissions occur whenever vehicles travel over a paved surface. The fugitive dust emissions are due to the re-suspension of loose material on the road surface. Emissions generated by wind erosion are dependent on the frequency of disturbance of the erodible surface. Every time that a surface is disturbed e.g. by mining, agriculture and/or grazing activities, its erosion potential is restored. Combustion gases (CO, SO_2, NO_2 and hydrocarbons) are typically released from industrial areas, power generators, vehicle exhausts, and burning activities. Although these sources are not meant to be exhaustive, it represents the main contributors.

The following RBCAA air quality monitoring stations (AQMS) were used to assess ambient air quality in the vicinity of the proposed project: Arboretum, Brackenham, CBD, Harbour West, Felixton, eNseleni and eSikhaleni. The City of uMhlatuze has AQMS at Arboretum, Brackeham and eSikhaleni. The location of various AQMS in relation to the project are shown in Figure 3-1. The AQMS do not all measure all pollutants (summarised in Table 3-15). The pollutants of concern are summarised in the sections below as measured at each of the AQMS listed.

Diurnal and seasonal variation plots – generated using openair (Carslaw & Ropkins, 2012); and (Carslaw, 2019) - of ambient pollutant concentrations measured at the AQMS near Richards Bay show the variation of ambient concentrations over daily, weekly and annual cycles (mean with 95% confidence interval). The data have been normalised by dividing by the respective mean values to allow comparison of the shape of diurnal trends for the variables on very different measurement scales (Carslaw, 2019).

3.3.1 *RBCAA Arboretum Station*

The data availability for the RBCAA Arboretum Station is shown in Table 3-4. There was average to good availability. 90% completeness of data is preferred especially for meteorological data. There were no exceedances of the short-term or long-term NAAQS for SO_2. Higher concentrations of SO_2 occurring in the early mornings (Figure 3-9).

Table 3-4: Ambient concentrations and data availability for the pollutants measured at the RBCAA Arboretum Monitoring Station

RBCAA Arboretum AQMS						
Period	**Data Availability**	**Hourly**	**Daily**	**Annual Average**	**No of recorded hourly exceedances**	**No of recorded daily exceedances**
		99th Percentile	**99th Percentile**			
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2016	75%	11.4	9.5	2.1	0	0
2017	94%	29.7	19.0	3.2	0	0
2018	94%	50.0	20.7	6.7	0	0
2019	97%	21.0	17.2	9.3	0	0

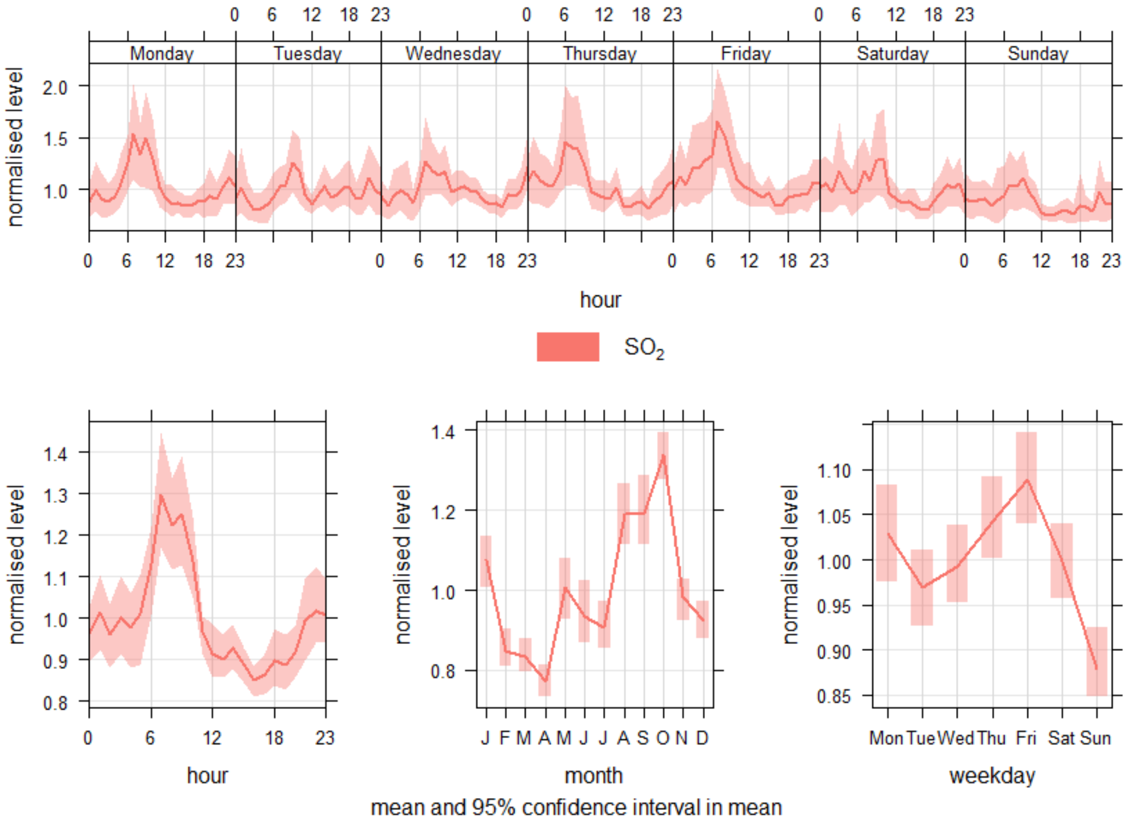


Figure 3-9: Time variation plot for the pollutants measured as RBCAA Arboretum Monitoring Station

3.3.2 *RBCAA Brackenham Station*

The ambient concentrations and data availability for the RBCAA Brackenham Station is shown in Table 3-5. The main surrounding influences on the air quality are residential activities and traffic. There were exceedances of the 24-hour NAAQS for PM_{10} in 2018. There were no exceedances of the 1-year NAAQS for PM_{10}. The SO_2 1-hour, 24-hour and 1-year NAAQS were not exceeded. The higher PM_{10} concentrations occurred during weekdays between 06H00 and 18H00 and especially during winter when the area has lower rainfall (Figure 3-10). The higher concentrations of SO_2 occurred during weekdays between 06H00 and 18H00 (Figure 3-10).

Table 3-5: Ambient concentrations and data availability for the pollutants measured at the RBCAA Brackenham Monitoring Station

RBCAA Brackenham AQMS						
Period	**Data Availability**	**Hourly**	**Daily**	**Annual Average**	**No of recorded hourly exceedances**	**No of recorded daily exceedances**
		99th Percentile	**99th Percentile**			
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2016	94%	17.5	13.1	2.8	0	0
2017	85%	11.1	9.2	2.3	0	0
2018	99%	18.3	14.1	3.4	0	0
2019	97%	7.3	12.2	1.4	0	0
PM_{10} (µg/m³)						
Criteria			*75 µg/m³*	*40 µg/m³*		*4 days per year*

RBCAA Brackenham AQMS						
Period	**Data Availability**	**Hourly**	**Daily**	**Annual Average**	**No of recorded hourly exceedances**	**No of recorded daily exceedances**
		99th Percentile	**99th Percentile**			
2016	90%		65.8	28.7		1
2017	85%		68.6	32.5		2
2018	89%		**92.5**	31.6		**6**
2019	96%		57.2	29.9		0

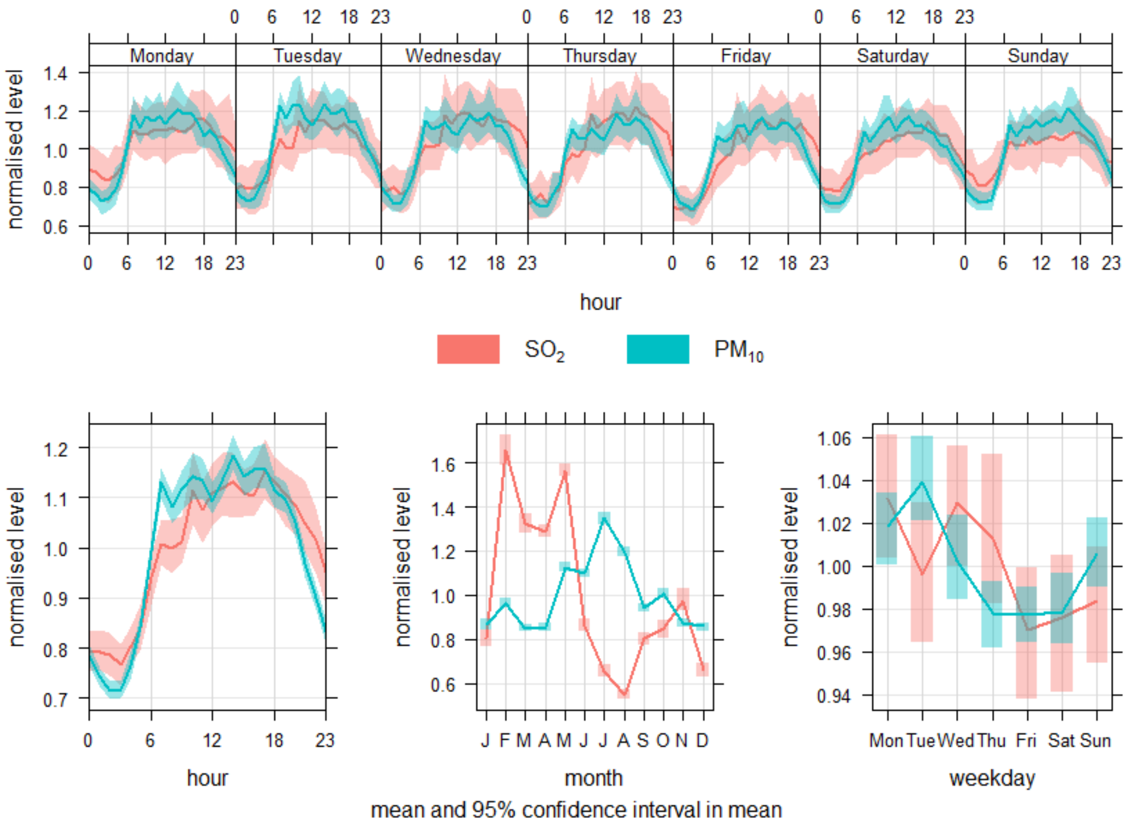


Figure 3-10: Time variation plot for the pollutants measured as RBCAA Brackenham Monitoring Station

3.3.3 *RBCAA Central Business District (CBD) Station*

The data availability for the RBCAA CBD Station is shown in Table 3-6. There was average to good availability. There were no exceedances of the 24-hour or 1-year NAAQS for PM_{10}. The SO_2 1-hour, 24-hour and 1-year NAAQS were not exceeded. Higher concentrations of PM_{10} occur in the afternoons and during winter and the beginning of spring (Figure 3-11). Higher concentrations of SO_2 occur in the early mornings (Figure 3-11).

Table 3-6: Ambient concentrations and data availability for the pollutants measured at the RBCAA CBD Monitoring Station

RBCAA CBD AQMS						
Period	Data Availability	Hourly	Daily	Annual Average	No of recorded hourly exceedances	No of recorded daily exceedances
		99th Percentile	99th Percentile			
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2016	86%	28.6	37.3	2.6	1	0
2017	87%	40.7	57.9	4.2	0	0
2018	99%	97.1	46.7	10.6	0	0
2019	98%	82.5	15.6	10.7	0	0
PM_{10} (µg/m³)						
Criteria			*75 µg/m³*	*40 µg/m³*		*4 days per year*
2016	85%		52.9	24.2		0
2017	87%		49.7	26.0		0
2018	97%		48.9	23.6		0
2019	97%		57.1	25.4		0

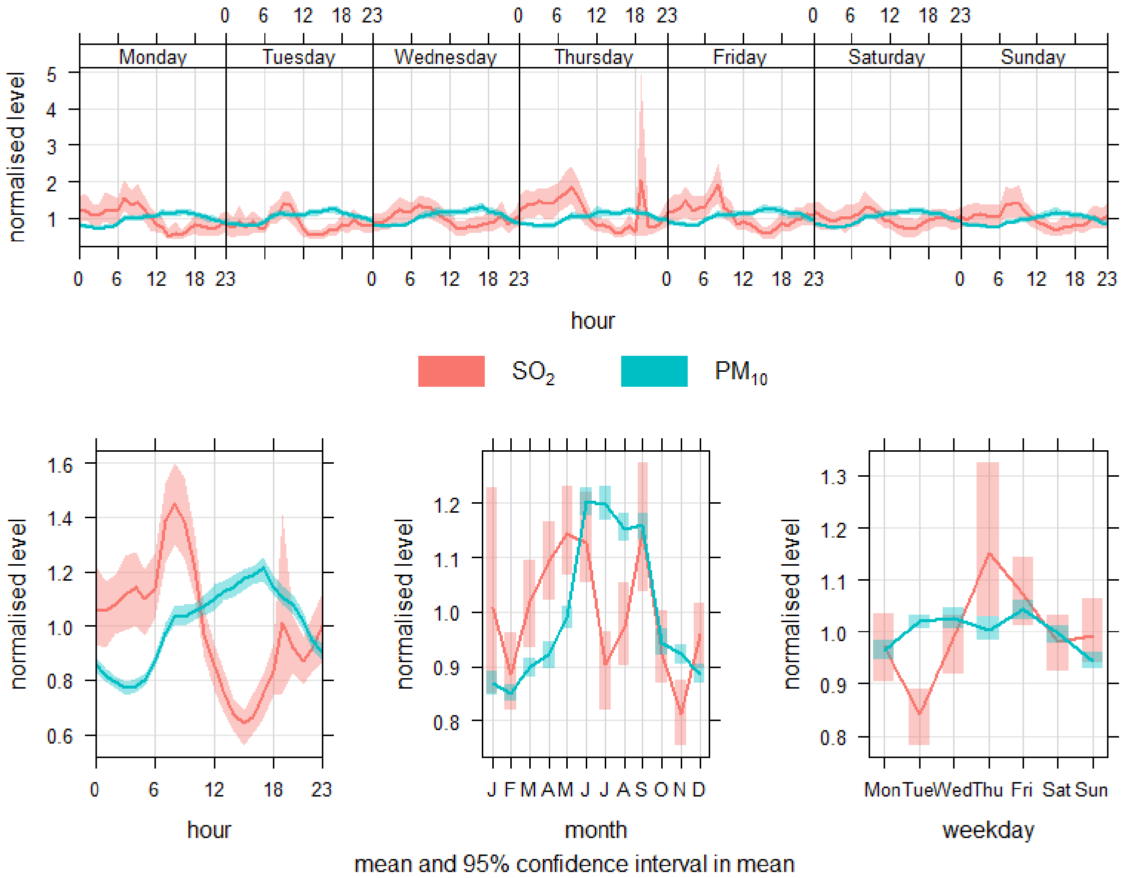


Figure 3-11: Time variation plot for the pollutants measured as RBCAA CBD Monitoring Station

3.3.4 *RBCAA eNseleni Station*

The data availability for the RBCAA eNseleni Station is shown in Table 3-7. There was good availability. There were no exceedances of the 24-hour or 1-year NAAQS for PM_{10}. The SO_2 1-hour, 24-hour and 1-year NAAQS were not exceeded. Higher concentrations of PM_{10} and SO_2 occur in the middle of the day ((Figure 3-12).

Table 3-7: Ambient concentrations and data availability for the pollutants measured at the RBCAA eNseleni Monitoring Station

RBCAA eNseleni AQMS						
Period	**Data Availability**	**Hourly**	**Daily**	**Annual Average**	**No of recorded hourly exceedances**	**No of recorded daily exceedances**
		99th Percentile	**99th Percentile**			
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2019	96%	19.1	14.4	3.4	0	0
PM_{10} (µg/m³)						
Criteria			*75 µg/m³*	*40 µg/m³*		*4 days per year*
2019	96%		58.1	29.1		1

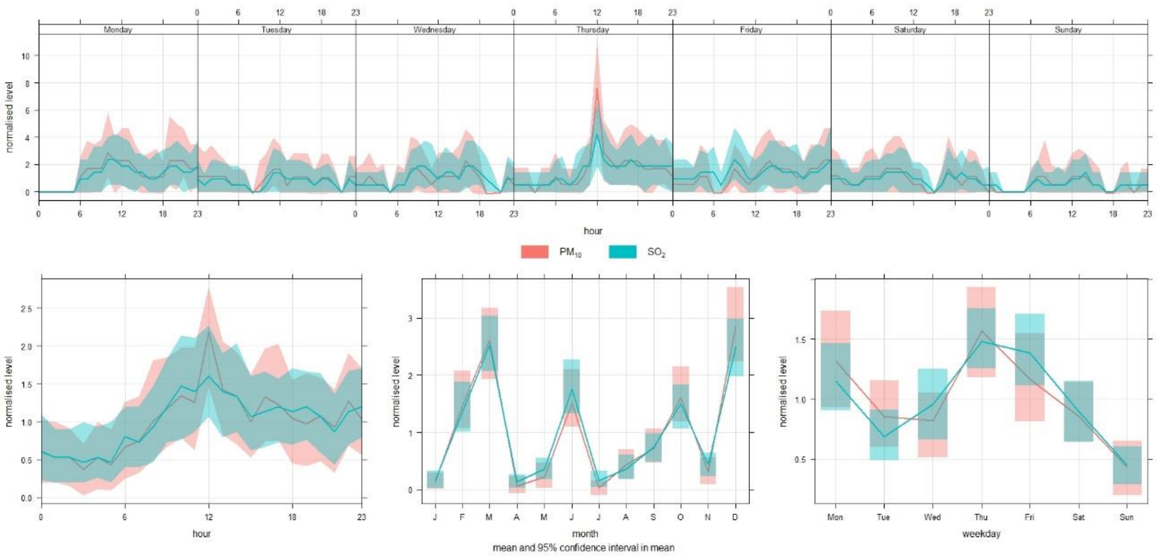


Figure 3-12: Time variation plot for the pollutants measured as RBCAA eNseleni Monitoring Station

3.3.5 *RBCAA eSikhaleni Station*

There were no exceedances of the 24-hour or 1-year NAAQS for PM_{10} (Table 3-8). The SO_2 1-hour, 24-hour and 1-year NAAQS were not exceeded. Higher concentrations of PM_{10} and SO_2 occur in the afternoons. Higher concentrations of PM_{10} occur during winter and the beginning of spring (Figure 3-13).

Table 3-8: Ambient concentrations and data availability for the pollutants measured at the RBCAA eSikhaleni Monitoring Station

RBCAA eSikhaleni AQMS						
Period	**Data Availability**	**Hourly**	**Daily**	**Annual Average**	**No of recorded hourly exceedances**	**No of recorded daily exceedances**
		99th Percentile	**99th Percentile**			
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2016	87%	107.6	10.4	3.6	0	0
2017	82%	89.3	13.7	5.3	0	0
2018	95%	89.0	15.5	5.4	0	0
2019	94%	99.0	20.2	9.3	0	0
PM_{10} (µg/m³)						
Criteria			*75 µg/m³*	*40 µg/m³*		*4 days per year*
2016	87%		60.3	27.5		1
2017	82%		51.2	22.4		1
2018	95%		48.8	24.5		0
2019	94%		67.0	24.0		2

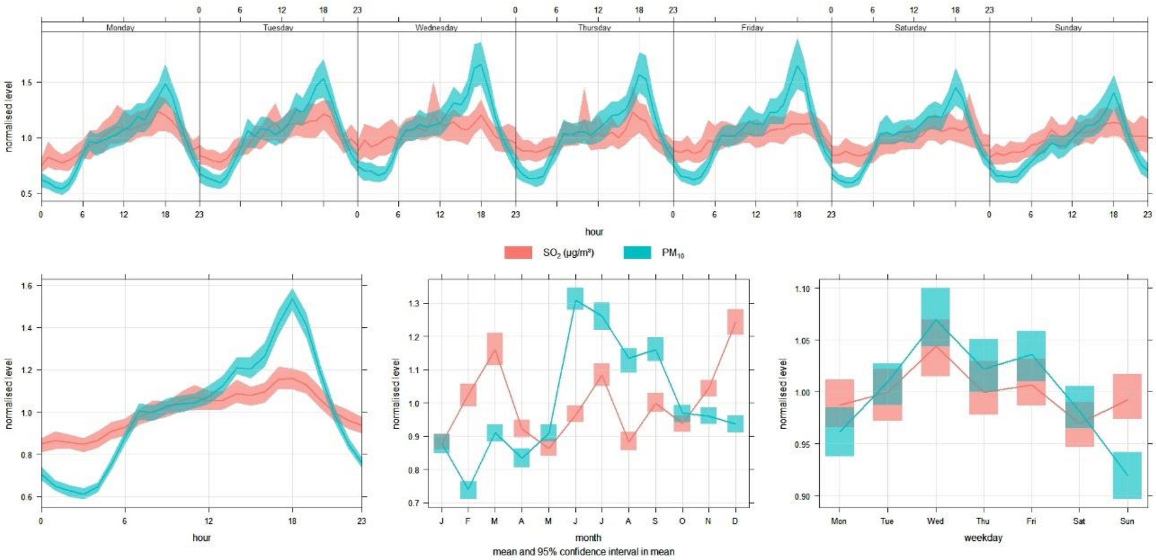


Figure 3-13: Time variation plot for the pollutants measured as RBCAA eSikhaleni Monitoring Station

3.3.6 *RBCAA Felixton Station*

There were no exceedances of the short-term or long-term NAAQS for any of the pollutants (Table 3-9). The PM_{10} appears to have higher concentrations occurring in the afternoons and during winter and the beginning of spring (Figure 3-14). SO_2 appears has higher concentrations occurring just after midday (Figure 3-14).

Table 3-9: Ambient concentrations and data availability for the pollutants measured at the RBCAA Felixton Monitoring Station

RBCAA Felixton AQMS						
Period	Data Availability	Hourly 99th Percentile	Daily 99th Percentile	Annual Average	No of recorded hourly exceedances	No of recorded daily exceedances
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2016	85%	34.5	19.1	4.7	0	0
2017	83%	32.0	16.9	4.5	0	0
2018	98%	33.5	19.1	6.5	0	0
2019	69%	32.2	19.5	7.4	0	0
PM_{10} (µg/m³)						
Criteria			*75 µg/m³*	*40 µg/m³*		*4 days per year*
2016						
2017						
2018	99%		59.6	24.7		1
2019	81%		61.1	26.2		0

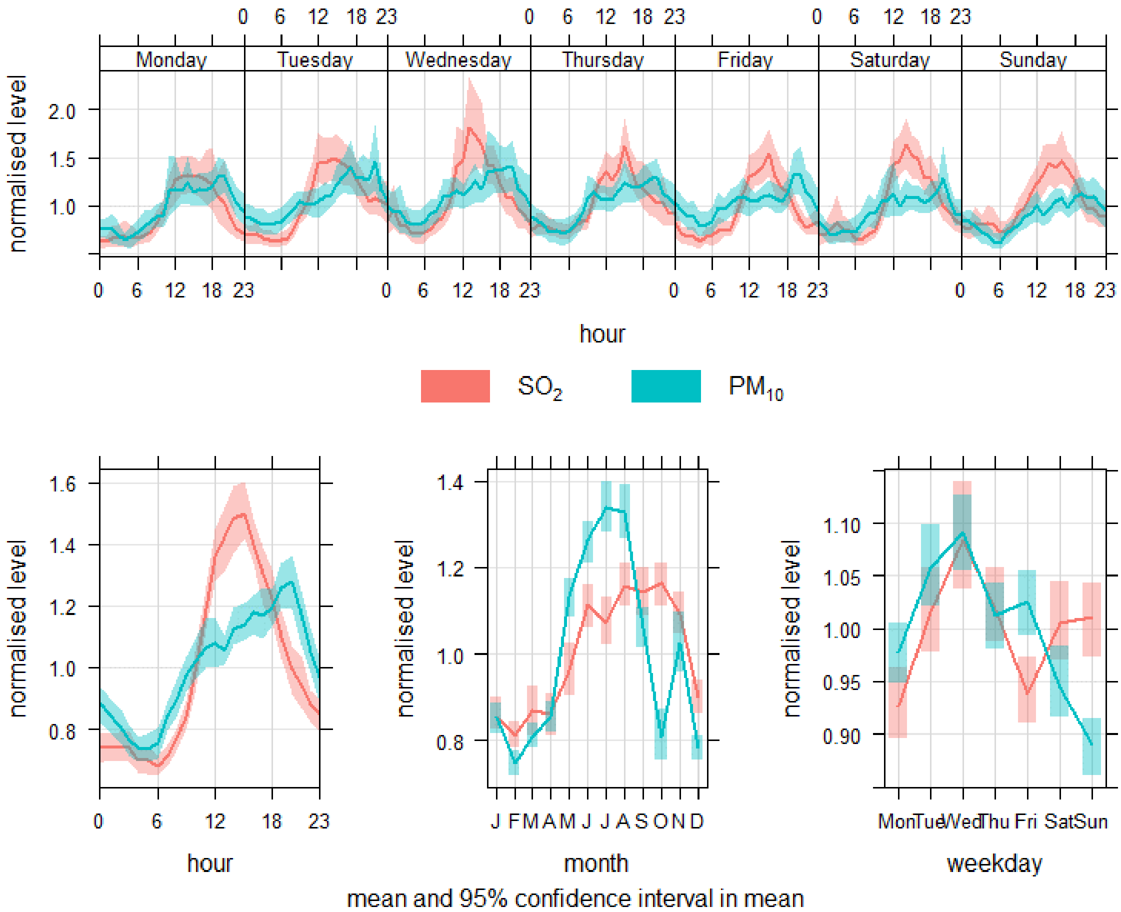


Figure 3-14: Time variation plot for the pollutants measured as RBCAA Felixton Monitoring Station

3.3.7 *RBCAA Harbour West Station*

There were exceedances of the 24-hour NAAQS for SO_2 in 2018. There were no exceedances of the long-term NAAQS for SO_2 (Table 3-10). Higher concentrations of SO_2 occur in the mornings and during winter when the rainfall is less (Figure 3-15).

Table 3-10: Ambient concentrations and data availability for the pollutants measured at the RBCAA Harbour West Monitoring Station

RBCAA Harbour West AQMS						
Period	**Data Availability**	**Hourly** 99th **Percentile**	**Daily** 99th **Percentile**	**Annual Average**	**No of recorded hourly exceedances**	**No of recorded daily exceedances**
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2016	81%	119.9	71.7	19.1	1	0
2017	83%	140.8	80.8	17.7	0	0
2018	99%	246.2	102.8	23.6	22	**5**
2019	99%	137.5	78.4	17.3	0	1

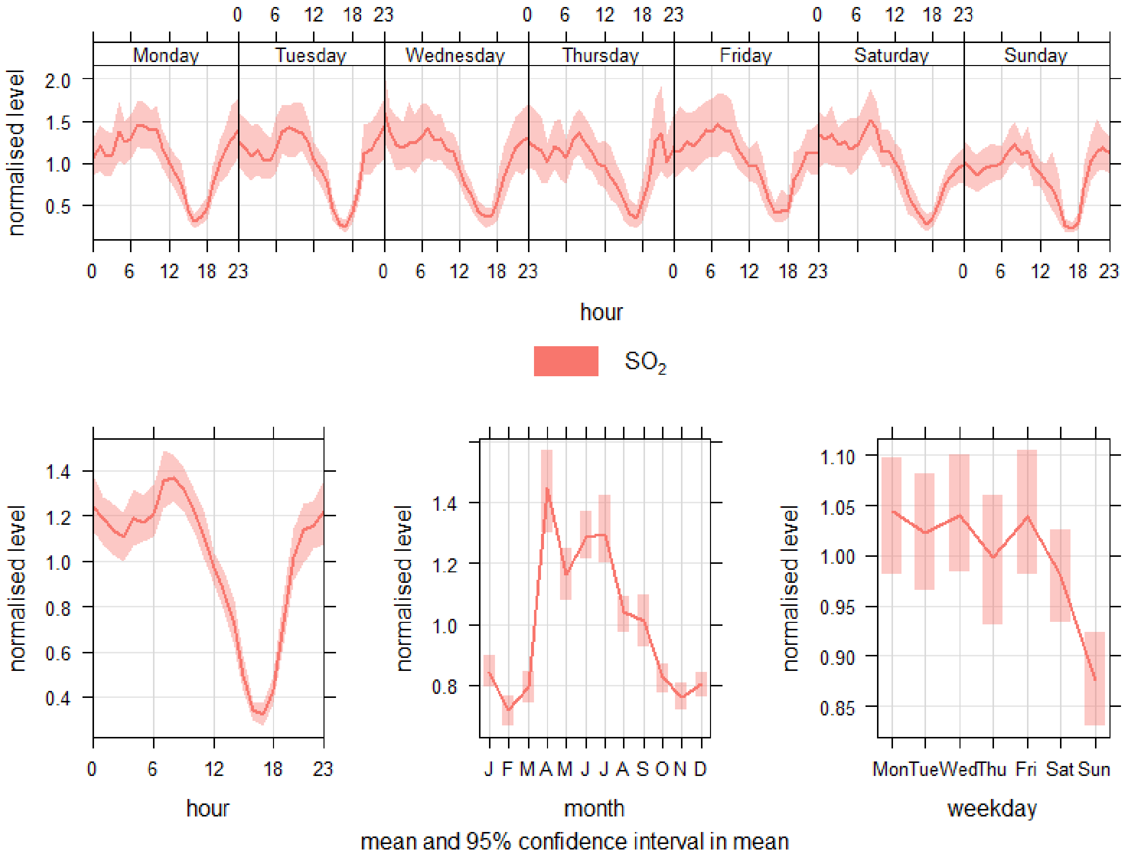


Figure 3-15: Time variation plot for the pollutants measured as RBCAA Harbour West Monitoring Station

3.3.8 *RBCAA Scorpio Station*

The SO_2 1-hour, 24-hour and 1-year NAAQS were not exceeded (Table 3-11). The SO_2 appears to have higher concentrations occurring between 07H00 and 10H00 and especially during winter when the area has lower rainfall (Figure 3-16).

Table 3-11: Ambient concentrations and data availability for the pollutants measured at the RBCAA Scorpio Monitoring Station

RBCAA Scorpio AQMS						
Period	**Data Availability**	**Hourly 99th Percentile**	**Daily 99th Percentile**	**Annual Average**	**No of recorded hourly exceedances**	**No of recorded daily exceedances**
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2016	84%	141.3	62.7	19.2	2	0
2017	84%	187.5	74.8	19.8	0	0
2018	98%	232.3	115.6	22.9	12	1
2019	99%	182.9	88.9	17.8	5	0

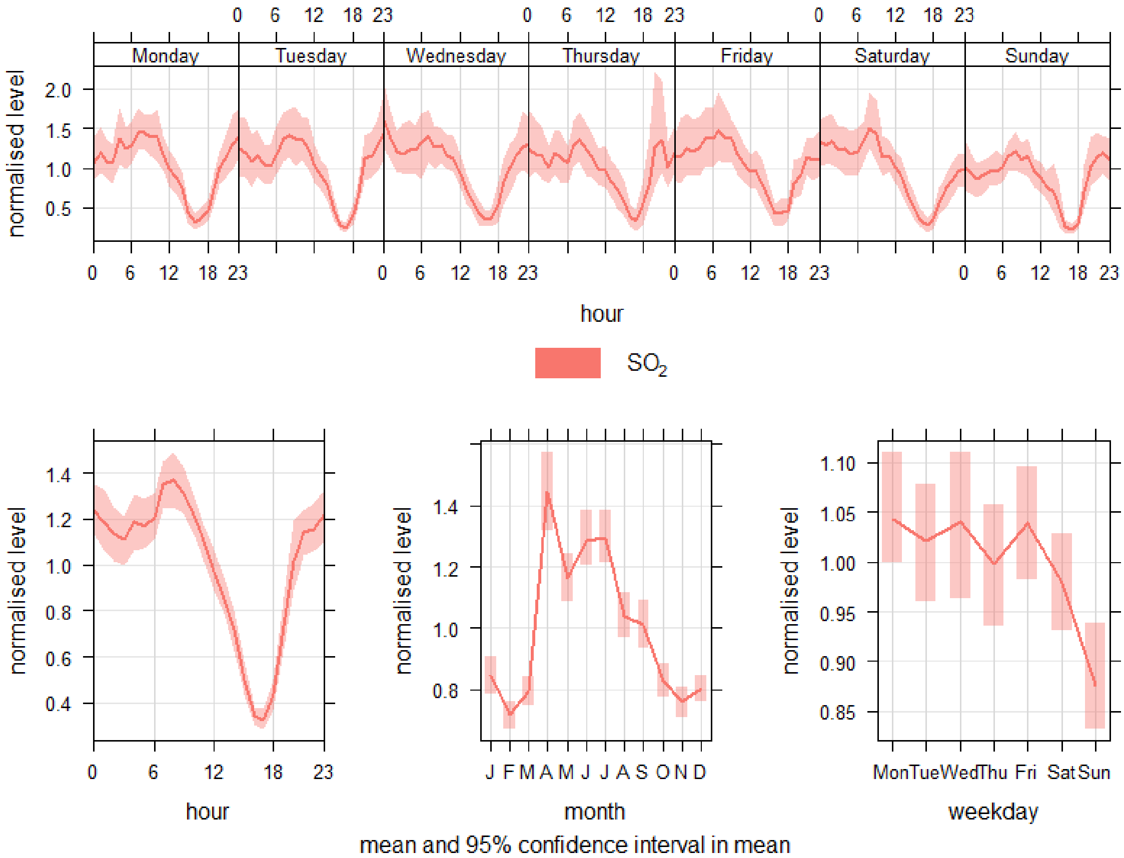


Figure 3-16: Time variation plot for the pollutants measured as RBCAA Scorpio Monitoring Station

3.3.9 *uMhlathuze Local Municipality Arboretum Station*

There were no exceedances of the short-term or long-term NAAQS for any of the pollutants (Table 3-12). Higher concentrations of NO_2 occur in the mornings around 07H00 and the evenings around 18H00 (Figure 3-17); this could be indicative of traffic as the main contributing source. Higher concentrations of SO_2 occur mid-morning and during the autumn and winter (Figure 3-17). Higher concentrations of $PM_{2.5}$ and PM_{10} occur during late night and early morning and April to July (Figure 3-18).

Table 3-12: Ambient concentrations and data availability for the pollutants measured at the uMhlathuze Local Municipality Arboretum Monitoring Station

Arboretum AQMS						
Period	**Data Availability**	**Hourly**	**Daily**	**Annual Average**	**No of recorded hourly exceedances**	**No of recorded daily exceedances**
		99th Percentile	**99th Percentile**			
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2019	84%	31.4	16.6	8.2	0	0
NO_2 (µg/m³)						
Criteria		*200 µg/m³*		*40 µg/m³*	*88 hours per year*	
2019	84%	32.0		7.5	0	
PM_{10} (µg/m³)						
Criteria			*75 µg/m³*	*40 µg/m³*		*4 days per year*
2019	84%		31.4	8.1		1
$PM_{2.5}$ (µg/m³)						
Criteria			*40 µg/m³*	*20 µg/m³*		*4 days per year*
2019	84%		27.4	6.7		0

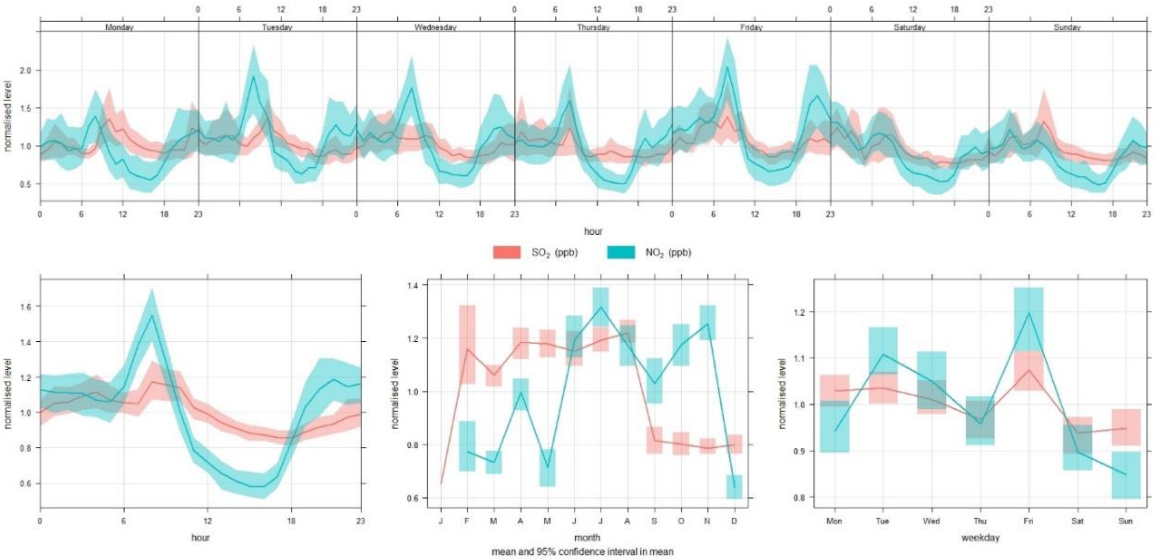


Figure 3-17: Time variation plot for the measured SO_2 and NO_2 at uMhlathuze Local Municipality Arboretum Monitoring Station

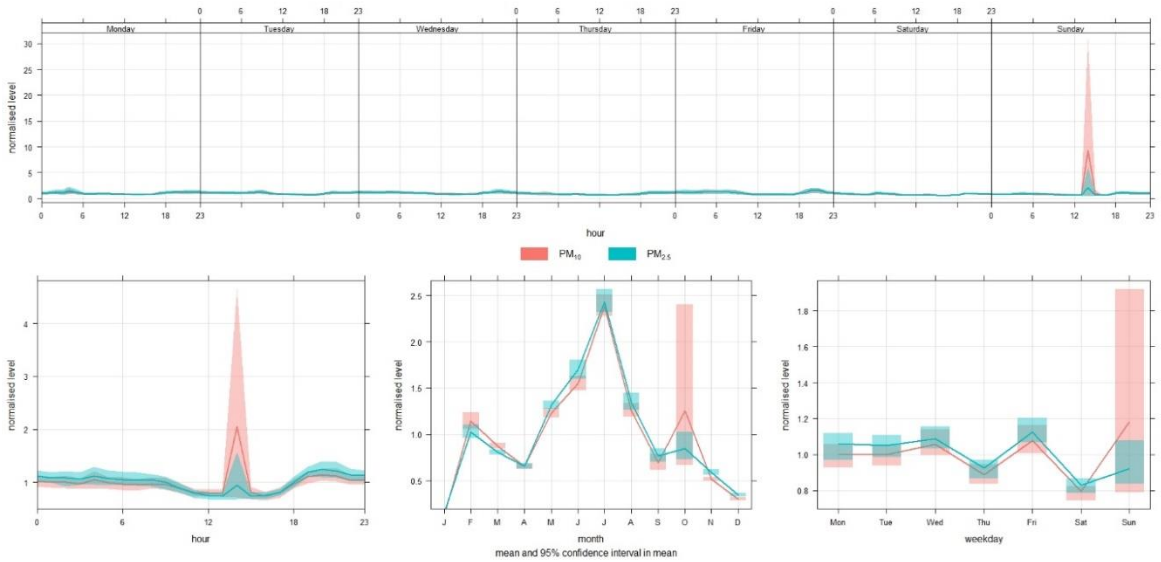


Figure 3-18: Time variation plot for the measured PM at uMhlathuze Local Municipality Arboretum Monitoring Station

3.3.10 *uMhlathuze Local Municipality Brackenham Station*

There were no exceedances of the short-term or long-term NAAQS for any of the pollutants (Table 3-13). Higher concentrations of PM_{10} occur midday and July (Figure 3-19). Higher concentrations of NO_2 and $PM_{2.5}$ occurring in the mornings and the evenings around 18H00 (Figure 3-19); this could be indicative of traffic as the main contributing source. Higher concentrations of SO_2 occurring between 06H00 and 18H00, peaking at 15H00 and during the winter (Figure 3-19).

Table 3-13: Ambient concentrations and data availability for the pollutants measured at the uMhlathuze Local Municipality Brackenham Monitoring Station

Brackenham AQMS						
Period	**Data Availability**	**Hourly**	**Daily**	**Annual Average**	**No of recorded hourly exceedances**	**No of recorded daily exceedances**
		99th Percentile	**99th Percentile**			
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2019	83%	28.8	13.8	4.1	0	0
NO_2 (µg/m³)						
Criteria		*200 µg/m³*		*40 µg/m³*	*88 hours per year*	
2019	80%	32.0		9.8	0	
PM_{10} (µg/m³)						
Criteria			*75 µg/m³*	*40 µg/m³*		*4 days per year*
2019	83%		33.5	9.3		0
$PM_{2.5}$ (µg/m³)						
Criteria			*40 µg/m³*	*20 µg/m³*		*4 days per year*
2019	83%		23.6	7.1		0

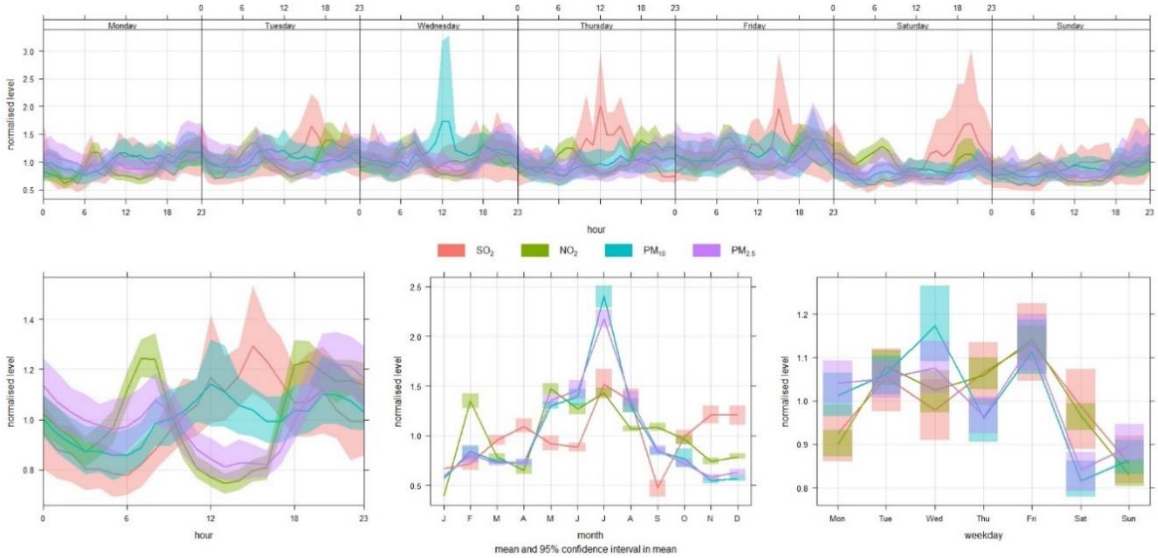


Figure 3-19: Time variation plot for the pollutants measured at uMhlathuze Local Municipality Brackenham Monitoring Station

3.3.11 *uMhlathuze Local Municipality eSikhaleni Station*

There were exceedances of the 24-hour NAAQS for both $PM_{2.5}$ and PM_{10} in 2019. The annual NAAQS was also exceeded for $PM_{2.5}$. There were no exceedances of the short-term or long-term NAAQS for SO_2 or NO_2 (Table 3-14). Higher concentrations of PM_{10} and $PM_{2.5}$ occur during late night and early morning and during winter months (Figure 3-20). Higher concentrations of NO_2 occurring in the mornings around 06H00 and the evenings around 18H00 (Figure 3-20); this could be indicative of traffic as the main contributing source.

Table 3-14: Ambient concentrations and data availability for the pollutants measured at the uMhlathuze Local Municipality eSikhaleni Monitoring Station

eSikhaleni AQMS						
Period	**Data Availability**	**Hourly**	**Daily**	**Annual Average**	**No of recorded hourly exceedances**	**No of recorded daily exceedances**
		99th Percentile	**99th Percentile**			
SO_2 (µg/m³)						
Criteria		*350 µg/m³*	*125 µg/m³*	*50 µg/m³*	*88 hours per year*	*4 days per year*
2019	77%	21.0	17.0	10.0	0	0
NO_2 (µg/m³)						
Criteria		*200 µg/m³*		*40 µg/m³*	*88 hours per year*	
2019	82%	43.2		9.8	0	
PM_{10} (µg/m³)						
Criteria			*75 µg/m³*	*40 µg/m³*		*4 days per year*
2019	78%		119.0	30.1		**20**
$PM_{2.5}$ (µg/m³)						
Criteria			*40 µg/m³*	*20 µg/m³*		*4 days per year*
2019	68%		146.9	**27.4**		**65**

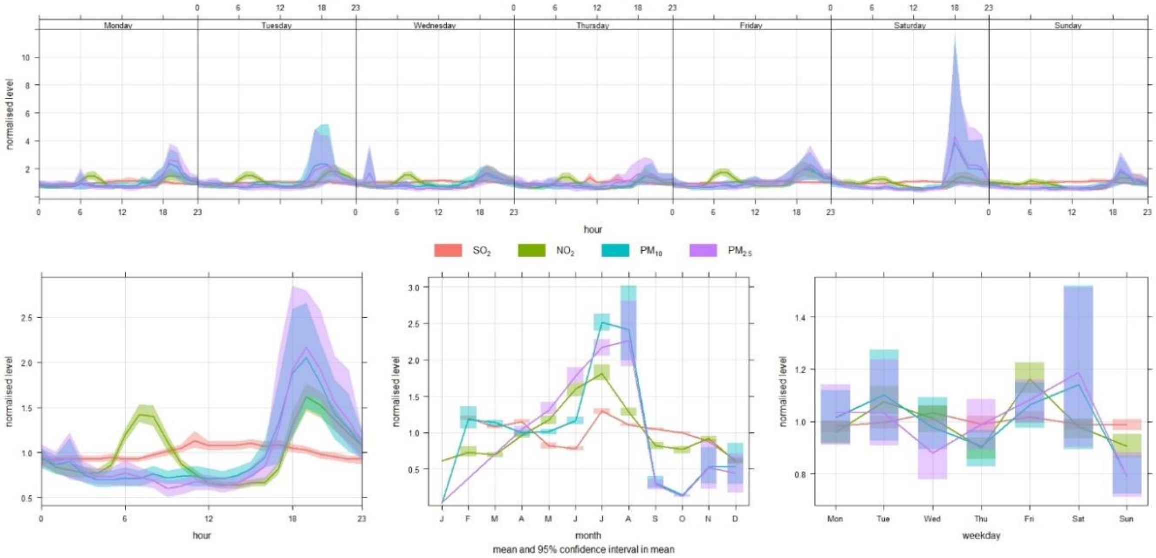


Figure 3-20: Time variation plot for the pollutants measured at uMhlathuze Local Municipality eSikhaleni Monitoring Station

3.3.12 *Summary of Ambient Air Quality*

In general, the ambient air quality in Richards Bay is in compliance with NAAQS, with the exception of Harbour West for daily SO_2, Brackenham for daily PM_{10}, and eSikhaleni for $PM_{2.5}$ and PM_{10}.

Table 3-15: NAAQS Compliance Summary for Ambient monitoring network of Richards Bay (2016-2019)

Monitoring Station	SO_2			NO_2		PM_{10}		$PM_{2.5}$	
	hour	day	annual	hour	annual	day	annual	day	annual
Arboretum (RBCAA)	√	√	√	-	-	-	-	-	-
Brackenham (RBCAA)	√	√	√	-	-	**X (2018)**	√	-	-
CBD (RBCAA)	√	√	√	-	-	√	√	-	-
eNseleni (RBCAA)	√	√	√	-	-	√	√	-	-
eSikhawini (RBCAA)	√	√	√	-	-	√	√	-	-
Felixton (RBCAA)	√	√	√	-	-	√	√	-	-
Harbour West (RBCAA)	√	**X (2018)**	√	-	-	-	-	-	-
Scorpio (RBCAA)	√	√	√	-	-	-	-	-	-
Arboretum (uMhlathuze)	√	√	√	√	√	√	√	√	√
Brackenham (uMhlathuze)	√	√	√	√	√	√	√	√	√
eSikhaleni (uMhlathuze)	√	√	√	√	√	**X 2019**	√	**X 2019**	**X 2019**
Note: - indicates that a pollutant is not measured at the station									

3.4 Dispersion Modelling Results for Richards Bay

A recent air quality dispersion modelling study assessing the cumulative impact of operations within the Richards Bay domain was consulted with permission of the authors (WSP Environment and Energy) and the RBCAA (under request for confidentiality of its members). The report is considered by the RBCAA to be the most comprehensive assessment of normal operations of the industries in the Richards Bay airshed, although limitations of the assessment are detailed in the report. These include omission of some industrial sources (where information was not available); exclusion of vehicular traffic emissions; and intermittent sources such as sugarcane burning. Simulated annual average concentrations of PM_{10}, NO_2, and SO_2 were provided for cumulative assessment of the baseline conditions.

3.4.1 *Emissions Quantification*

Emissions were quantified from 11 industries within the Richards Bay airshed, based on information provided by the industries and the AELs. Total annual point source emissions for the pollutants of concern are summarised in Table 3-16.

Table 3-16: Baseline annual pollutant emission rates in the Richards Bay airshed

Source group	**Annual emission rates (tonnes per year)**		
	SO_2	**NO_X**	**PM_{10}**
Point sources	23 253	8 452	3 411
Area sources	(not reported)		

3.4.2 *Simulated Annual Average Respirable Particulate Matter (PM_{10})*

The baseline operations were simulated to result in exceedances of the currently enforceable NAAQS (40 µg/m³) across much of the port area and adjacent areas mainly due to coal stockpiling and handling operations (Figure 3-21).

3.4.3 *Simulated Annual Average Sulfur dioxide (SO_2)*

Annual average SO_2, due to normal operations of the industrial sources in Richards Bay, were simulated to comply with the NAAQS across the domain, where the highest concentrations are expected close to Richards Bay central, Alton, and Brackenham (Figure 3-22).

3.4.4 *Simulated Annual Average Nitrogen dioxide (NO_2)*

Annual average NO_2 was simulated to comply with the NAAQS across the domain for normal operation of the industries operating in Richards Bay, with maximum concentrations occurring near Alton and Richards Bay Central (Figure 3-23).

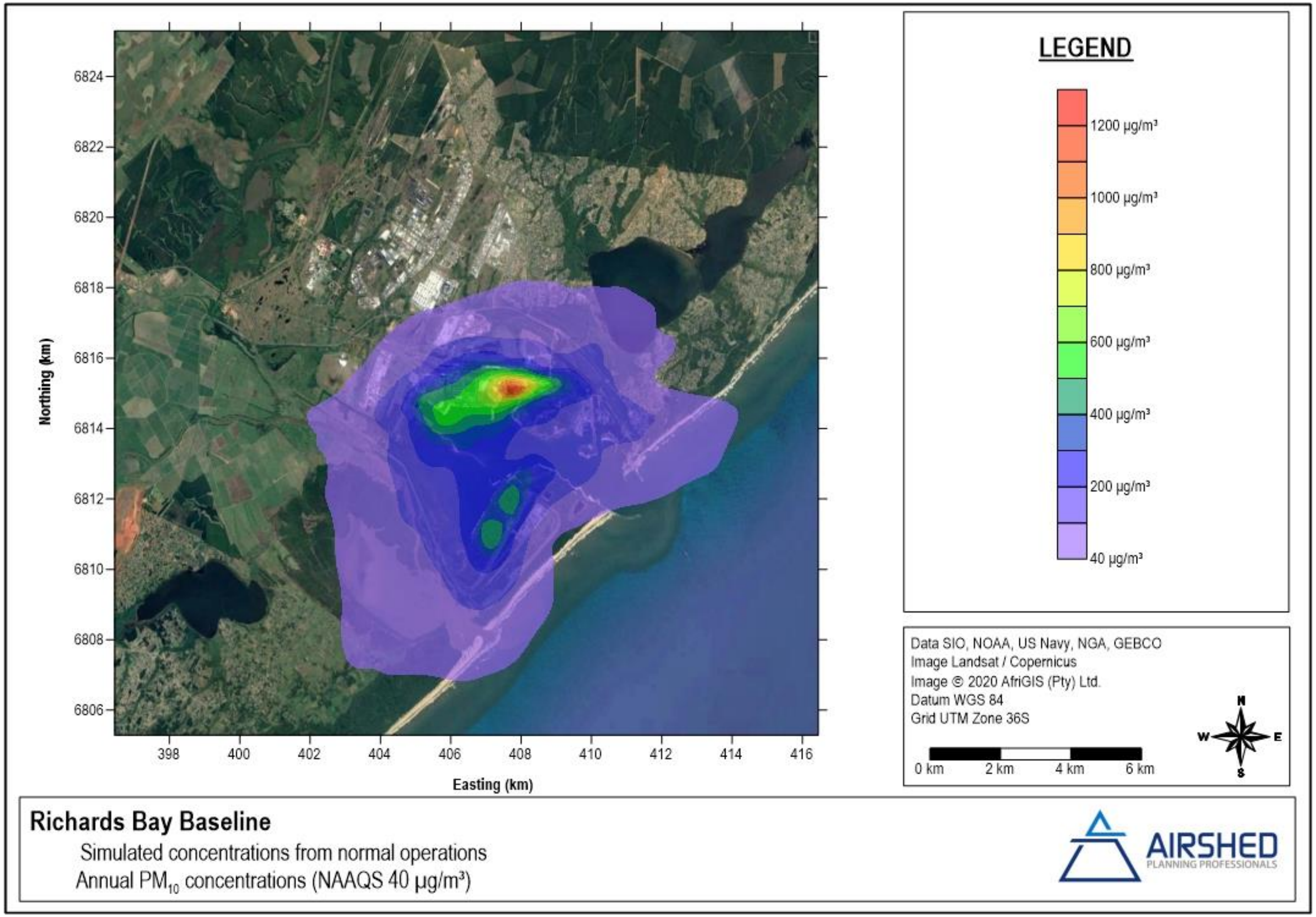


Figure 3-21: Simulated annual average PM_{10} concentrations for the Richards Bay baseline

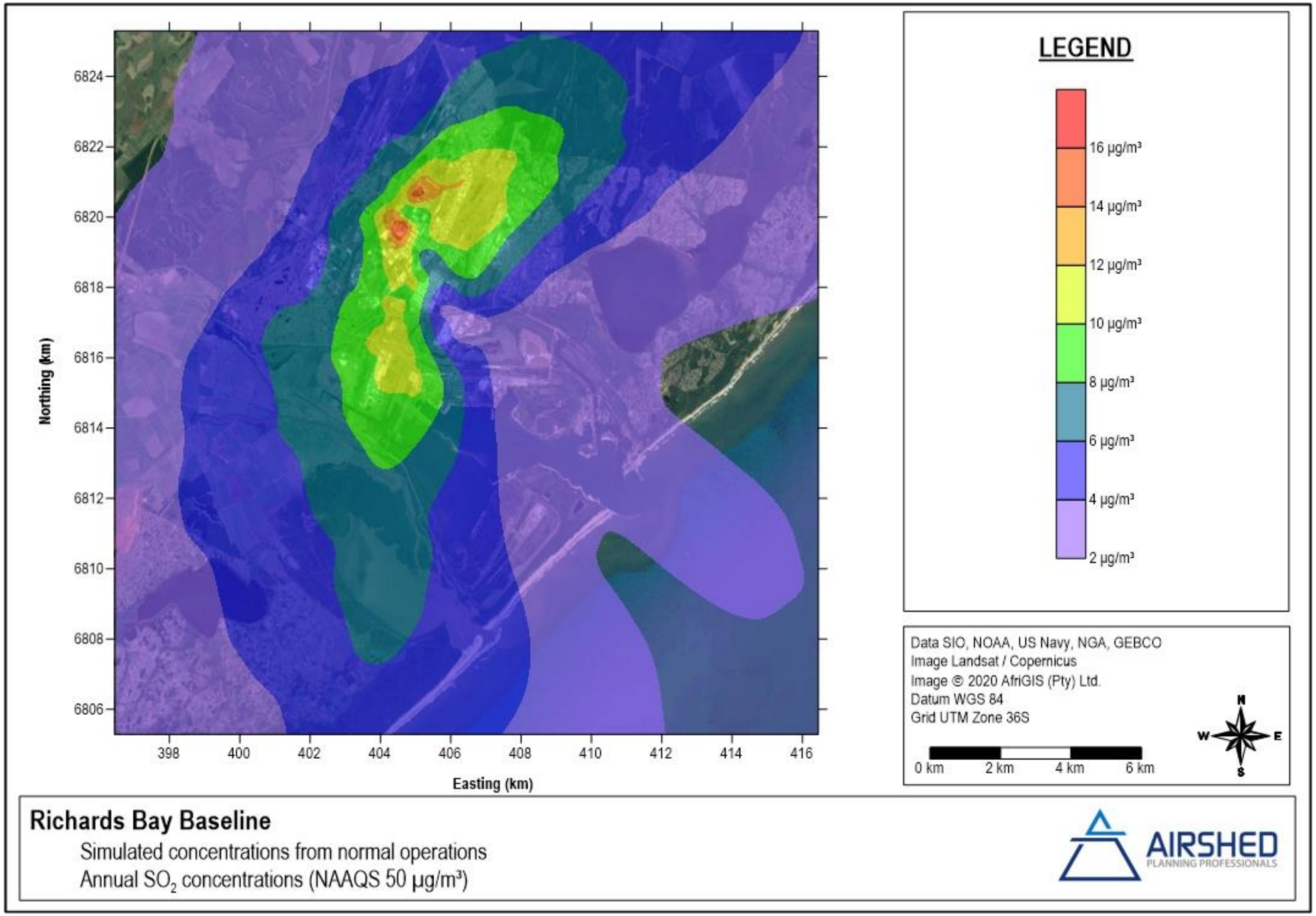


Figure 3-22: Simulated annual average SO_2 concentrations for the Richards Bay baseline

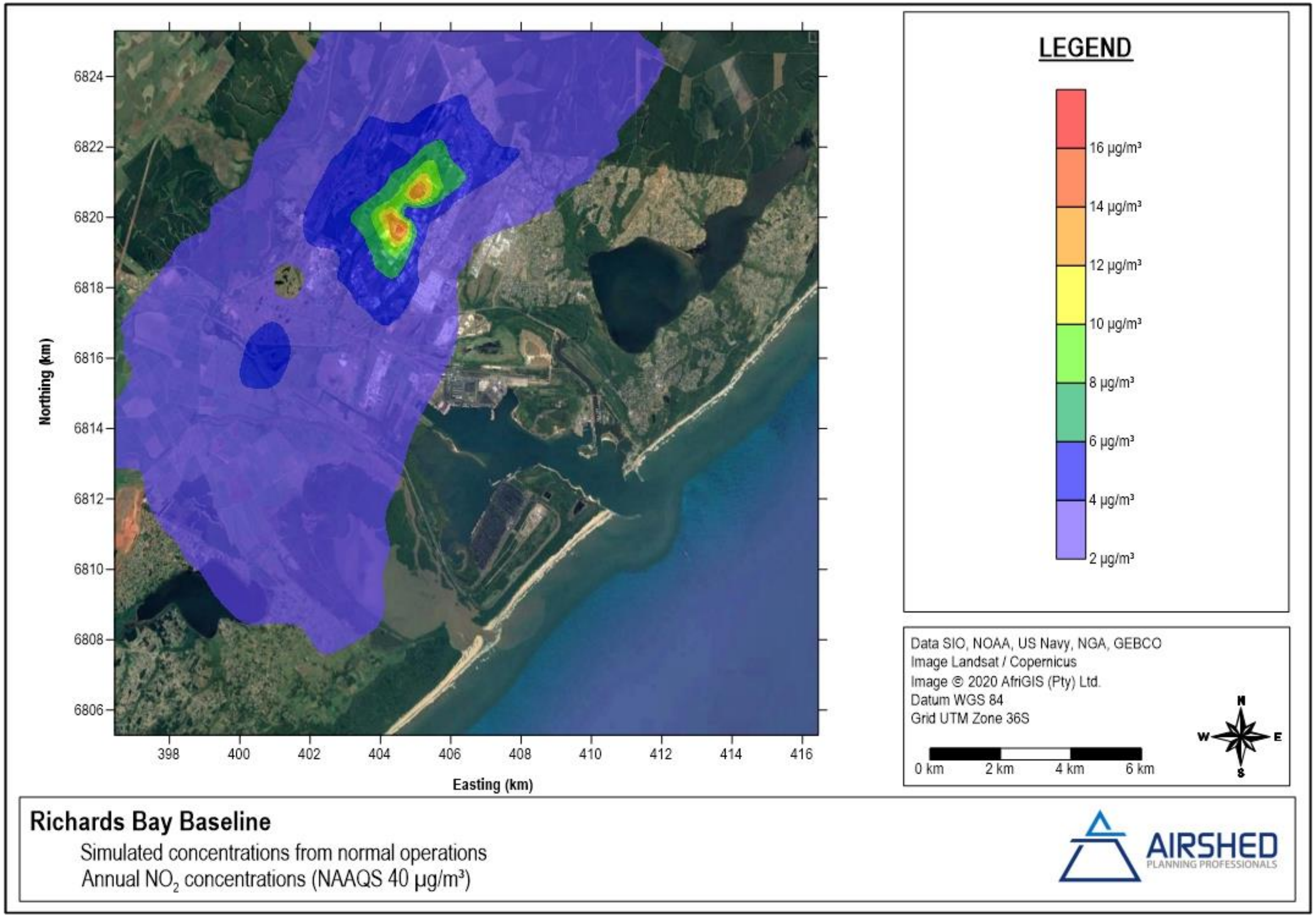


Figure 3-23: Simulated annual average NO_2 concentrations for the Richards Bay baseline

4 Scoping Phase Impact Assessment

The purpose of the Scoping Report is to identify the main issues and potential impacts of the proposed project based on a desktop assessment of existing information. The impact assessment methodology provided by Savannah Environmental (Appendix A) was used to summarise the potential impacts of the construction (Table 4-1) and operation phases (Table 4-2) of the proposed project. It should be noted that this a preliminary assessment based on the information available during the Scoping Phase. The assessment will be updated during the Impact Assessment Phase.

Table 4-1: Expected Potential Impact Associated with the Construction of the 450 MW RMPPP at the Scoping Phase

Nature: Elevated ambient concentrations of particulate and gaseous atmospheric pollutants as a result of construction activities.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (15)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: Impacts from these activities can, through good housekeeping practices, be limited to a local extent.		
Cumulative impacts: Bulk earth works and vehicle activity on-site will result in cumulative local impacts, with possible non-compliance with the NAAQS near site within the industrial area but not at sensitive receptors.		
Residual Risks: With mitigation, construction activities are not likely to result in a significant change to current levels.		
Gaps in knowledge & recommendations for further study The duration and scale of construction activities is unknown at this stage. Construction impacts will be assessed during the EIA phase. Relevant information required includes: expected fuel use; vehicle types, activity patterns and on-site road usage; and, full extent of bulk earthworks.		

Table 4-2: Expected Potential Impact Associated with the Operation phase of the 450 MW RMPPP at the Scoping Phase

Nature: Elevated ambient concentrations of gaseous atmospheric pollutants as a result of 450 MW RMPPP operational activities (gas combustion in turbine units or reciprocal engines).		
	Without mitigation	**With mitigation**
Fuel type	**Naphtha**	**LPG, Natural Gas, LNG**
Extent	Surrounding suburbs (2)	Surrounding suburbs (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: No mitigation is expected to be needed if gas turbines comply with NMES.		
Cumulative impacts: Cumulative impacts are expected due to the proximity to other industrial sources in Richards Bay.		
Residual Risks: Operational activities are not likely to result in a significant change from current levels.		
Gaps in knowledge & recommendations for further study There are likely to be NO_X emissions from the gas combustion during the operation phase. Ambient NO_X and NO_2 are not currently monitored by the RBCAA, only at the uMhlathuze AQMSs during 2019. Atmospheric dispersion modelling will be used during the EIA phase to assess the extent of the impact of the proposed facility and the cumulative impact, of the pollutants of concern, including NO_X.		

5 MAIN FINDINGS AND CONCLUSIONS

The main findings from the scoping assessment are as follows:

- The airflow in the study area and project site is dominated by winds from the north-westerly and south-easterly sectors. There is little diurnal variation with the prevailing wind field from the southwest during the night and early morning, and more frequent flow from the northeast during the afternoon and evening. The seasonal wind-field reflects the same prevailing north-westerly and south-easterly winds with stronger winds in spring and summer.
- The area is highly populated with numerous settlements along the coast, to the north of Richards Bay and south along the coast to Mtunzini. The towns in the area are Richards Bay, Empangeni, Felixton and Mtunzini.
- The main pollutants of concern in the greater Richards Bay area are mainly SO_2 and PM_{10}. Measured and modelled SO_2 concentrations indicated elevated levels over the main industrial and some residential areas of Richards Bay. Measured and modelled PM_{10} concentrations also indicated elevated levels over the CBD of Richards Bay, eSikhaleni and Brackenham.
- Pollutants of concern from the proposed 450 MW RMPPP, mainly associated with gas turbines or engines, are NO_x, CO and to a lesser extent, SO_2, PM and VOCs.

The main issues and potential impacts of the proposed project based on a desktop assessment of existing information from an air quality perspective.

The proposed 450 MW RMPPP may result in elevated (and potentially non-compliance with NAAQS) daily PM_{10} concentrations during the construction phase due to background PM_{10} and the proximity to other particulate emission sources. The impacts are likely to be local and of short duration.

During the operation phase, the proposed 450 MW RMPPP is likely to contribute NO_X, CO, and VOCs to the exiting baseline concentrations. Operational activities, when using LPG, natural gas, or LNG, are not likely to result in a significant change from current levels. Operational activities, when using naphtha, could increase VOC and NOx relative to the baseline. However, cumulative impacts of SO_2 and PM emissions, although small in contribution from the 450 MW RMPPP, may contribute to non-compliance with the NAAQS due to already elevated baseline concentrations. The impacts are likely to be regional.

It should be noted that this a preliminary assessment based on the information available during the Scoping Phase. Atmospheric dispersion modelling will be used to assess incremental and cumulative impacts on ambient pollutant concentrations during the EIA phase of assessment.

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7 APPENDIX A: IMPACT ASSESSMENT METHODOLOGY

The purpose of the Scoping Report is to determine the main issues and potential impacts of the proposed project during the scoping phase at a desktop level based on existing information:

- Identify potential sensitive environments and receptors that may be impacted on by the proposed facility and the types of impacts (i.e. direct, indirect and cumulative) that are most likely to occur.
- Summarise the potential impacts that will be considered further in the EIA Phase through specialist assessments.

Direct, indirect, cumulative impacts and residual risks of the identified issues must be evaluated within the Scoping Report in terms of the following criteria:

- the **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected, for each impact anticipated;
- the **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high);
- The **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;
- The **consequences (magnitude)**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes;
- The **probability** of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures);
- the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the **status**, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the degree to which the impact can be mitigated.

Direct, indirect and cumulative impacts of the issues identified through the EIA process must be assessed in terms of the following criteria:

The **significance** is calculated by combining the criteria in the following formula:

S = (E+D+M)P

S = Significance weighting

E = Extent

D = Duration

M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

Assessment of impacts must be summarised in the following table format. The rating values as per the above criteria must also be included. The table must be completed and associated ratings for **each** impact identified during the assessment should also be included.

Example of Impact table summarising the significance of impacts (with and without mitigation):

Nature: **[Outline and describe fully the impact anticipated as per the assessment undertaken]**		
	Without mitigation	**With mitigation**
Extent	High (3)	Low (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation: "Mitigation", means to anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible. Provide a description of how these mitigation measures will be undertaken keeping the above definition in mind.		
Cumulative impacts: "Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.		
Residual Risks: "Residual Risk", means the risk that will remain after all the recommended measures have been undertaken to mitigate the impact associated with the activity.		