AIR QUALITY SPECIALIST STUDY FOR THE EIA FOR THE PROPOSED ARCELORMITTAL CCGT POWER PLANT AT SALDANHA BAY

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Reviewer:	Yegeshni Moodley

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GLOSSARY OF ACRONYMS, TERMS AND UNITS

AEL	Atmospheric Emission License
AIR	Atmospheric Impact Report
CCGT	Combined Cycle Gas Turbine
C_6H_6	Benzene
CH_4	Methane
CNG	Compressed Natural Gas consists mostly of methane and is drawn from gas wells or in conjunction with crude oil production
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
Emission	The direct or indirect release of substances, vibrations, heat or noise from individual or diffuse sources in an installation into the air, water or land.
HSRG	Heat Recovery Steam Generator
IPCSA	International Power Consortium South Africa
IPP	Independent Power Producer
IDZ	Industrial Development Zone
LP	Low pressure [steam]
LNG	Liquefied Natural Gas is natural gas stored as a super-cooled (cryogenic) liquid
NEM: AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NAAQS	Ambient Air Quality Standards
NO	Nitrogen oxide
NO_2	Nitrogen dioxide
NO_X	Oxides of nitrogen ($NO_X = NO + NO_2$)
PM_{10}	Particulate matter with a diameter less than 10 microns
$PM_{2.5}$	Particulate matter with a diameter less than 2.5 microns
SAWS	South African Weather Service
SBM	Saldanha Bay Municipality
SO_2	Sulphur dioxide
TNPA	Transnet National Ports Authority
$\mu g/m^3$	Micrograms per cubic meter
VOC	Volatile organic compound
WCDM	West Coast District Municipality

DECLARATION

Air Quality Specialist study for the EIA for the proposed ArcelorMittal CCGT power plant at Saldanha Bay

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Telephone:	031 262 3265	Fax:	031 262 3266
E-mail:	mark@umoya-nilu.co.za		

I, MARK ZUNCKEL, declare that –

I act as the independent specialist in this matter;

- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in compiling the Air Quality Specialist Study report;
- That there are no circumstances that may compromise my objectivity in performing the work;
- I have expertise in compiling the Air Quality Specialist Study, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the Air Quality Specialist Study Report by the competent authority;
- All the particulars furnished by me in the Air Quality Specialist Study Report are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company: uMoya-NILU Consulting (Pty) Ltd

Date: August 2016

CONTENTS

1. INTRODUCTION

The International Power Consortium South Africa (IPCSA), have developed a solution to Saldanha Steel's requirement for stable, economical electricity over the long term. This solution consists of a 1 507 MW Combined Cycle Gas Turbine (CCGT) power plant to be erected adjacent to the ArcelorMittal's Saldanha Steel site. Phase 1 of the project will consist of five 48 MW nominal gas turbines in open cycle. Phase 2 will consist of three 435 MW nominal combined cycle turbines.

ArcelorMittal and IPCSA have signed a Power Generation and Natural Gas Project Development and Pre-Off Take Agreement that binds both parties to certain deliverables in developing the project up to the completion of the Bankable Feasibility Study.

The ArcelorMittal CCGT power plant will support Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG) as its main fuel supply and will consume approximately 76 million Giga Joules (GJ) of natural gas per year. CNG and LNG could be supplied by ship to the Port of Saldanha, where it will be offloaded via a submersible pipeline either from a mooring area located off shore or a berthing location in the Port in Saldanha. Discussions have been held with Transnet National Ports Authority (TNPA) in Saldanha in this regard.

The project will supply the power needs of ArcelorMittal Saldanha Steel (approximately 160 MW of base load energy, peaking up to 250 MW) and excess electricity will be made available to industries within the Saldanha Industrial Development Zone (IDZ) and/or Municipalities within the Western Cape Province.

ArcelorMittal have contracted ERM Southern Africa (Pty) Ltd to conduct an Environmental Impact Assessment (EIA) for the project in terms of South African regulations. In turn, ERM has sub-contracted uMoya-NILU Consulting (Pty) Ltd to undertake the air quality impact assessment for the EIA.

1.1 CONTENT OF THE SPECIALIST REPORT CHECKLIST

The content of this report has been prepared in terms of Regulation GNR 982 of 2014, Appendix 6, as shown in Table 1-1.

Table 1-1: Specialist study report checklist

Contents of this report in terms of Regulation GNR 982 of 2014, Appendix 6	Cross-reference in this report
(a) details of— the specialist who prepared the report; and the	Section 1.4 (Page

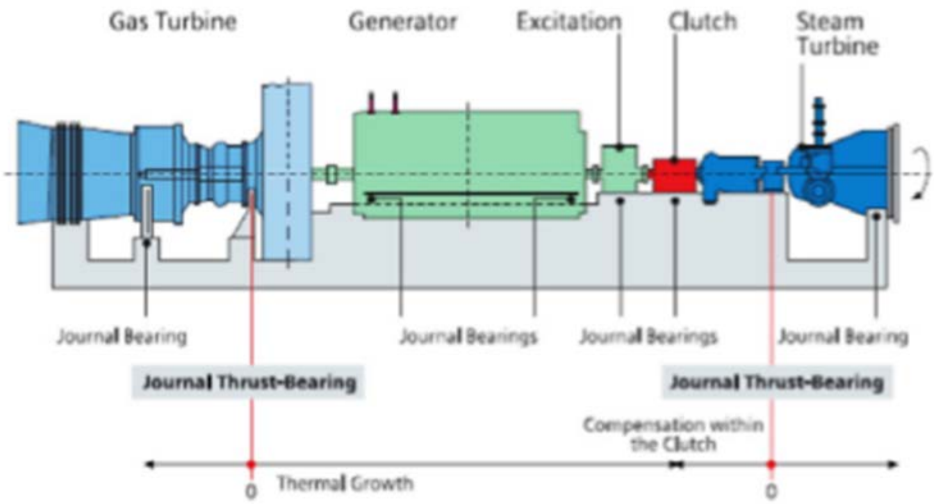
Table 1-1: Specialist study report checklist

Contents of this report in terms of Regulation GNR 982 of 2014, Appendix 6	Cross-reference in this report
expertise of that specialist to compile a specialist report including a curriculum vitae;	4) and Appendix 1
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page iv
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.5 (Page 4)
(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 3 (Page 16) and Section 7.2 (Page 27)
(f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Section 6 (Page 21)
(g) an identification of any areas to be avoided, including buffers;	N/A
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Sections 7.4 for NO_2 and Section 7.5 for CO
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 7.2.2, see model accuracy (Page 32)
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 7.6 (Page 37)
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 5.2 (Page 20)
(p) any other information requested by the competent authority.	N/A

1.2 OVERVIEW OF THE PROJECT

The proposed ArcelorMittal CCGT power plant is a 1 507 MW Combined Cycle Gas Turbine (CCGT) power plant. It will consist of eight air cooled gas turbines which are coupled to an alternator, which in turn, is coupled to a steam turbine in a single straight line shaft configuration (Figure 1.1). Natural gas fuel at -20 ˚C will be piped to the power plant. The gas pressure is reduced (or the gas is compressed) to meet the required feed in pressure of the gas turbines. The waste heat from the exhaust gas exits the gas turbines into a heat recovery steam generator (HRSG). The HRSGs capture heat from the high temperature exhaust gases to produce high temperature and high pressure dry steam, which is then supplied to a steam turbine to generate additional electric power.

Figure 1-1 Combined gas turbine process flow (ERM, 2015)



The high temperature exhaust gases are captured at the outlet exhaust of each gas turbine. This is fed into each HRSG via a short section of ductwork at the exhaust outlet point. The HRSG is a triple pressure boiler comprising a high pressure steam system, a reheat/medium pressure steam system and a low pressure steam system. The hot exhaust gases will then transfer heat to water in the HRSG, creating steam in the form of superheated high pressure (HP) steam, reheat/medium pressure and low pressure (LP) steam. Steam from each pressure level will be admitted to the steam turbine. A condenser will convert exhaust steam from the steam turbines back into water. The plant will have an air cooled condenser system behind each steam turbine.

Compressed Natural Gas (CNG) and Liquid Natural Gas (LNG) can be used. CNG and LNG will be supplied by ship to the Port of Saldanha where it will be off-loaded via a submersible pipeline either from a mooring located off shore or a berthing location in the Port of Saldanha. The gas pipeline of approximately 3900 m in length will be buried to a depth of 3 to 4 m.

The feeder power line for the initial 160 MW base load (peaking to 250 MW) from the power plant to the ArcelorMittal Steel Works will be the first priority. This 132 kV feeder line will be sized for a capacity of 400 MW. The additional 1 103 MW of power generated at the plant will be evacuated through the construction of a new 22 km High Voltage 400 kV line from the switch yard at the power plant to the existing Aurora 400 kV substation, following the existing Aurora to Blouwater 132 kV feeder servitude.

1.3 ENTERPRISE DETAILS

Entity details for ArcelorMittal South Africa Saldanha Works t/a Saldanha Steel Pty Ltd are listed in Table 1-1.

Table 1-2: Entity details

Entity Name:	ArcelorMittal South Africa Saldanha Works
Trading as:	Saldanha Steel Pty Ltd
Type of Entity, e.g. Company/Close Corporation/Trust, etc.:	Company
Company/Close Corporation/Trust Registration Number (Registration Numbers if Joint Venture):	1995/00628/07
Registered Address:	Private Bag X11 Saldanha 7395
Postal Address:	Private Bag X11 Saldanha 7395
Telephone Number (General):	022 709 4000
Fax Number (General):	022 709 4296
Company Website:	http://southafrica.arcelormittal.com/
Industry Type/Nature of Trade:	Power generation
Name of the Landowner/s or Landlord/s:	ArcelorMittal
Name of Mortgage Bondholder/s (if any):	N/A
Deeds Office Registration Number of Mortgage Bond:	N/A
Land Use Zoning as per Town Planning Scheme:	Industrial Development Zone
Land Use Rights if outside Town Planning Scheme:	N/A

1.4 MODELLING CONTRACTOR

The dispersion modelling for the AIR for the proposed Vopak Growth 4 project is conducted by:

Company: uMoya-NILU Consulting (Pty) Ltd
Modellers: Dr Mark Zunckel, Atham Raghunandan and Sarisha Perumal
Contact details: Tel: 031 266 7375
Cell: 083 690 2728
Email: mark@umoya-nilu.co.za or atham@umoya-nilu.co.za

Dr Zunckel's curriculum Vitae are included in Appendix 1.

1.5 IMPACT ASSESSMENT OBJECTIVES AND SCOPE

The objective of this air quality specialist study is to determine the potential impact on ambient air quality arising from proposed activities associated with the construction and operation of the proposed ArcelorMittal CCGT power plant and to advise on mitigation measures for identified significant risks/impacts and measures to enhance positive opportunities/impacts of the project.

1.6 REPORT STRUCTURE

This air quality impact assessment report is structured in the following manner. A description of the project is provided in Chapter 2 with an emphasis on identification of the sources of emission to the atmosphere and the pollutants of concern. Chapter 3 provides an overview of the administrative or legal context and includes, licensing, relevant emission standards and ambient air quality standards. The impact assessment methodology is defined in Chapter 4. The outcomes of the scoping study are included in Chapter 5. Chapter 6 includes the baseline or air quality status quo, including a description of Saldanha Bay climate information and ambient monitoring in Saldanha Bay. The air quality impact assessment in included in Chapter 7 including the assessment methodology, the assessment of impacts and recommendation for impact mitigation. The environmental management considerations are included in Chapter 8, with input to the Environmental Management Plan (EMP). A summary of impacts are presented in Chapter 9 with conclusions and recommendations in Chapter 10.

1.7 PROJECT DESCRIPTION

1.7.1 Construction phase

The construction phase will last approximately 28 months. Site clearance activities include clearing the land of vegetation, fencing the project boundary and site levelling. Internal site roads will be constructed as the site levelling will require a number of heavy trucks to bring infill to the site and remove unnecessary material. Site roads constructed during the site preparation phase will be used to transport the heavy plant equipment required during the construction phase. The construction phase will be initiated following the completion of site preparation activities. Earthworks will include the excavations and the backfilling. Piling of the foundations for the gas turbines and large main equipment items will take place followed by the construction of concrete and turbine pedestals constructed. The construction of buildings will also take place. Pipelines will be installed underground which involves the opening of a working strip along the right of way of the pipeline. The servitude is expected to be between 15 to 20 m wide.

1.7.2 Commissioning phase

In Phase 1 six Siemens Industrial Trent 60 open-cycle gas turbine units will be commissioned, delivering approximately 288 MW. In Phase 2 of commissioning of three Siemens SGT5-4000F combined-cycle units will, with Phase 1, collectively deliver 1 507 MW of electricity.

1.7.3 Operational phase

The completed project a 1 507 MW Combined Cycle Gas Turbine (CCGT) power plant using LNG or CNG as the fuel. It will consist of eight air cooled gas turbines each coupled to alternator, and in turn, coupled to a steam turbine in a single straight line shaft configuration. The waste heat from the exhaust gas exits the gas turbines into heat recovery steam generators (HRSG) which produce high temperature and high pressure dry steam, which is then supplied to a steam turbine to generate additional electric power. Power generated at the plant will be evacuated via the switch yard at the power plant to the existing Aurora 400 kV substation, following the existing Aurora to Blouwater 132 kV feeder servitude. A summary of the different unit process is provided in Table 1-2 for Phase 1 and for Phase 2. A schematic of process flow is illustrated in Figure 2-1 and relative location of the process units is shown in Figure 1-2.

Table 1-3: Unit processes for the ArcelorMittal power plant for Phase 1 and 2

Unit Process	Function of Unit Process	Batch/Continuous Process
	Phase 1	
Open Cycle Gas Turbine (T1)	Electricity generation	Continuous
Open Cycle Gas Turbine (T2)	Electricity generation	Continuous
Open Cycle Gas Turbine (T3)	Electricity generation	Continuous
Open Cycle Gas Turbine (T4)	Electricity generation	Continuous
Open Cycle Gas Turbine (T5)	Electricity generation	Continuous
	Phase 2	
Combined Cycle Gas Turbine (UNIT 1)	Electricity generation	Continuous
Combined Cycle Gas Turbine (UNIT 2)	Electricity generation	Continuous
Combined Cycle Gas Turbine (UNIT 3)	Electricity generation	Continuous

Figure 1-2: A basic block flow diagram for the operation at the ArcelorMittal power plant

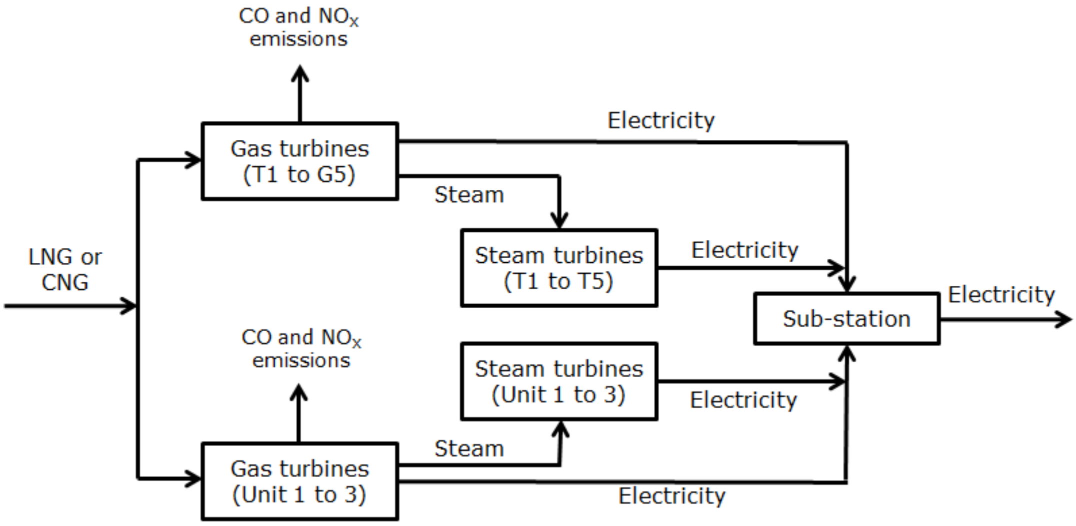
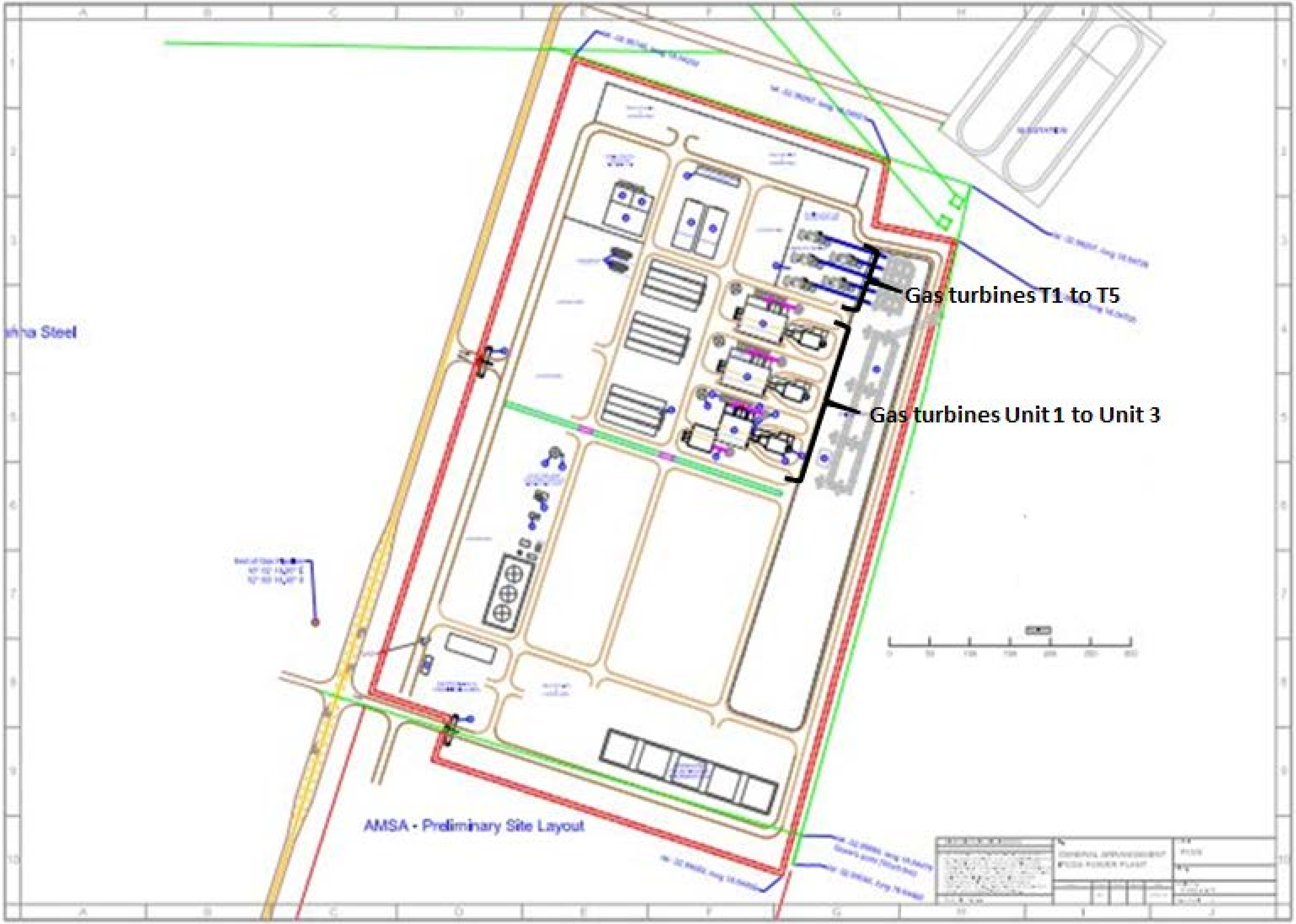


Figure 1-3: Proposed site layout of the ArcelorMittal power plant showing the relative location of the eight gas turbines (adapted from Savannah, 2016)



1.8 RAW MATERIALS AND PRODUCTS

The raw materials consumption rate at the ArcelorMittal CCGT are listed in Tables 1-3 to 1-5.

Table 1-4: Raw material used at the ArcelorMittal power plant

Raw material	Maximum consumption rate	Units
CNG/LNG	76 000 000	GJ/annum

Table 1-5: Production rates at the ArcelorMittal power plant

Product	**Maximum production capacity**	**Units**
Trent 60 DLE (T1)	48	MWe at MCR
Trent 60 DLE (T2)	48	MWe at MCR
Trent 60 DLE (T3)	48	MWe at MCR
Trent 60 DLE (T4)	48	MWe at MCR
Trent 60 DLE (T5)	48	MWe at MCR
SGT5-400F (UNIT 1)	435	MWe at MCR
SGT5-400F (UNIT 2)	435	MWe at MCR
SGT5-400F (UNIT 3)	435	MWe at MCR

MCR: Maximum Continuous Rating

Table 1-6: Energy sources used at the ArcelorMittal power plant

Energy source	**Sulphur content of fuel (%)**	**Ash content of fuel (%)**	**Maximum permitted consumption rate**	**Units**
CNG/LNG	0	0	76 000 000 1 461 000	GJ/annum Tonnes/annum

1 GJ = 1.923 x 10^{-8} Mt LNG

1.9 ATMOSPHERIC EMISSIONS

The physical data for the stacks at the ArcelorMittal power plant are listed in Table 1-6. Emission concentrations and emission rates for maximum generation using LNG are shown in Table 1-7.

Table 1-7: Point source characteristics at the ArcelorMittal power plant

Source ID	Stack height (m)	Stack diameter (m)	Stack base-height (m asl)	Emission release temperature (K)	Emission exit velocity (m/s)	Gas flow rate (kg/h)
T1	22	3.1	21-22	717	50	547 200
T2	22	3.1	21-22	717	50	547 200
T3	22	3.1	21-22	717	50	547 200
T4	22	3.1	21-22	717	50	547 200
T5	22	3.1	21-22	717	50	547 200
UNIT 1	45	7.1	21-22	368	25	2 430 000
UNIT 2	45	7.1	21-22	368	25	2 430 000
UNIT 3	45	7.1	21-22	368	25	2 430 000

Table 1-8: Emission rates and concentrations for the turbine stacks at the ArcelorMittal power plant

NO_X		CO	
Rate (t/a)	[1]Conc. (mg/Nm^3)	Rate (t/a)	[1]Conc. (mg/Nm^3)
169.2	13.7	28.9	2.4
169.2	13.7	28.9	2.4
169.2	13.7	28.9	2.4
169.2	13.7	28.9	2.4
169.2	13.7	28.9	2.4
1 021	32.7	248.8	20.8
1 021	32.7	248.8	20.8
1 021	32.7	248.8	20.8

1: Calculated from emission rate, stack diameter and exit velocity

1.10 PROJECT LOCATION

The ArcelorMittal CCGT power plant is to be developed on a green field site owned by ArcelorMittal within the IDZ of Saldanha Port (Figure 2-3). The site is located less than 1 km to the east of the existing ArcelorMittal Steelworks, immediately adjacent to the Blouwater substation. The site is located within an area identified for industrial development according the Saldanha Bay Municipal Spatial Development Framework (Saldanha Bay Municipality, 2011). The two properties on which the proposed site is located are the remaining extent of Portion 129 of Yzervarkensrug and parcel number 2 of Portion 195 of Jackels Kloof. Site information is provided in Table 1-8. Receptors in the vicinity of the proposed power plant are shown in Figure 1-4.

Figure 1-4: The location of the ArcelorMittal CCGT power plant and key components (ERM, 2015)

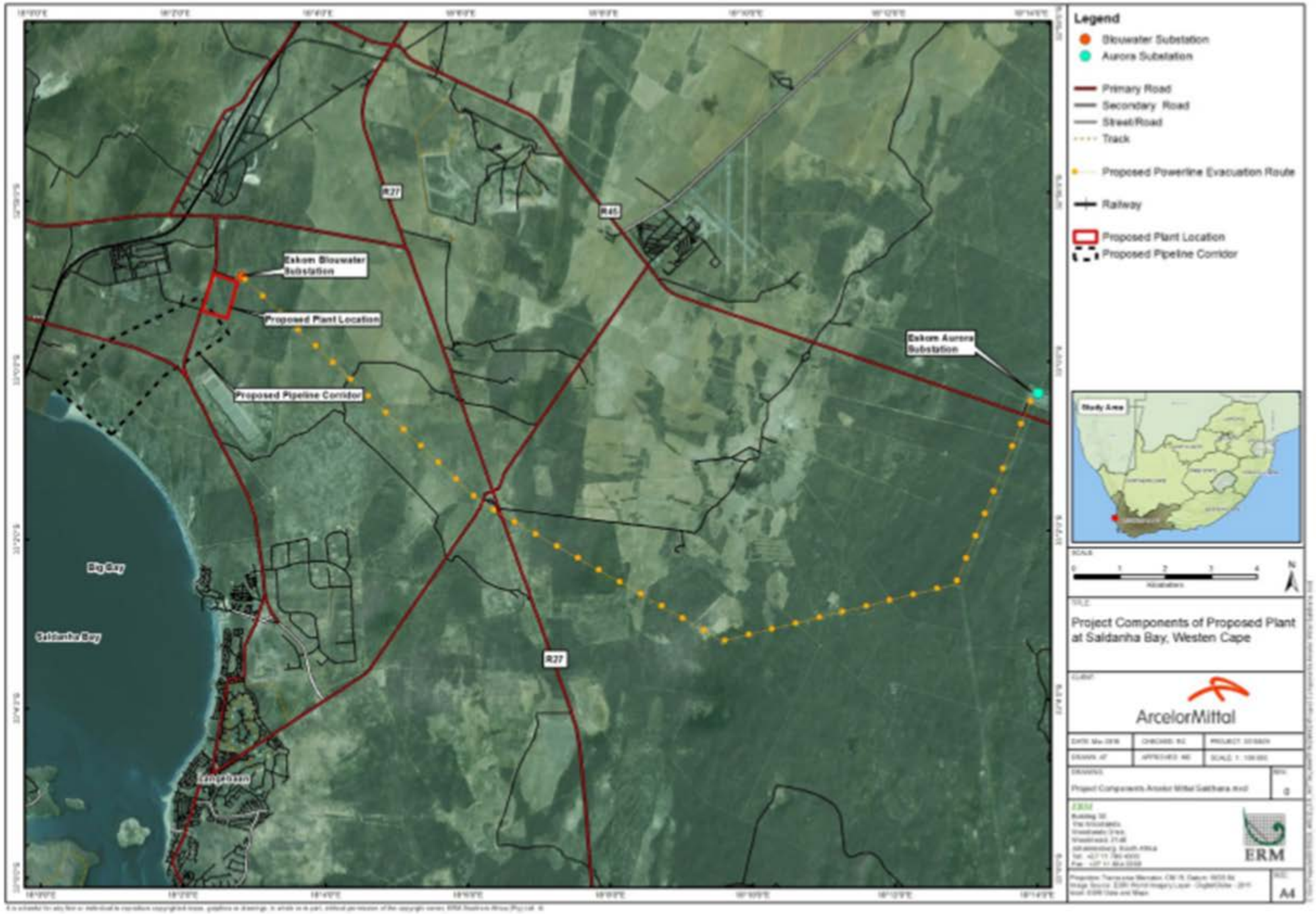


Table 1-9: Site information

Physical Address of the Licenced Premises:	
Description of Site (Where No Street Address):	Portion 129 of Yzervarkensrug and parcel number 2 of Portion 195 of Jackels Kloof
Property Registration Number (Surveyor-General Code):	N/A
Coordinates (latitude, longitude) of Approximate Centre of Operations (Decimal Degrees):	32˚ 59.1′ S 18˚ 02.5′ E
Coordinates (UTM) of Approximate Centre of Operations:	6346413 m S 34H 223588 m E 34H
Extent (km²):	1 000 m X 600 m
Elevation Above Mean Sea Level (m)	22
Province:	Western Cape
District/Metropolitan Municipality:	West Coast District Municipality
Local Municipality:	Saldanha Bay Local Municipality
Designated Priority Area (if applicable):	N/A

2 ADMINISTRATIVE FRAMEWORK

2.1 INTRODUCTION

In South Africa ambient air quality is regulated in terms of the National Environmental Management: Air Quality Act (No. 39 0f 2004) (NEM: AQA), the Air Quality Amendment Act (Act No. 20 of 2014) and supporting regulations.

Air quality objectives defines in Provincial and Municipal Air Quality Management Plans (AQMP) are achieved to a large extent through the enforcement of regulations supporting the NEM: AQA and through municipal by-laws. The legal requirements regarding the operation of the ArcelorMittal power plant in Saldanha Bay are discussed in the following sections.

2.2 NATIONAL ADMINISTRATIVE REQUIREMENTS

2.2.1 *Listed Activities*

Section 21 of the NEM: AQA requires that the Minister publishes a list of activities which result in atmospheric emissions which the Minister believes have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage, so-called Listed Activities. The first list was published in Government Notice No. 248 of 31 March 2010 (DEA, 2010), and a revised list followed on 22 November 2013 (DEA, 2013a).

Combustion facilities using liquid fuels or gas primarily for steam raising for electricity generation are classified as Listed Activity in terms of Section 21 of the NEM: AQA and GN 893, if the design capacity of the individual generating units is equal to or greater than 50 MW heat input (Category 1, sub-category 1.2 (liquid), sub-category 1.4 (gas)). Listed Activities require an Atmospheric Emission Licence (AEL) in order to operate. The proposed generation capacity of UNIT 1, UNIT 2 and UNIT 3 exceed this threshold and they are therefore Listed Activities. Minimum emission standards are defined for existing and new plants (Table 2-1).

Table 2-1: **Minimum emission standards in mg/Nm^3 for gaseous fuels (sub-category 1-4, DEA, 2013a)) used in combustion installations, measured at 3% O_2 at 273 K and 101.3 kPa**

Particulate matter	10
Sulphur dioxide (SO_2)	400
Oxides of nitrogen (NO_x expressed and NO_2)	50

2.2.2 *Atmospheric Emission Licence*

The consequence of listing an activity is described in Section 22 of the NEM: AQA, i.e. that no person may conduct a Listed Activity without a provisional Atmospheric Emission License or and Atmospheric Emission License (AEL).

The application process for an AEL is described in Section 37 of the NEM: AQA. The application should be lodged to the licensing authority with the prescribed licensing fee and documentation required by the licensing authority. In the case of strategic projects or projects of national importance, the licensing authority is the National Air Quality Officer, Dr Thuli Mdluli.

Regulations prescribing the AEL processing fee were gazetted on 11 March 2016 (DEA, 2016). The processing fee for new Listed Activities of R10 000 per Listed Activity should be paid on or before the date of the submission of the application.

2.2.3 *Atmospheric Impact Report*

The application for an AEL is a fundamental component of the environmental authorisation process. It is supported by an air quality specialist study in the form of an Atmospheric Impact Report (AIR) (Section 30 of the NEM: AQA).

The format of the AIR is defined in regulations published on 11 October 2013 (DEA, 2013b). The methodology and level of the assessment required is defined in the DEA's guideline for dispersion modelling (DEA, 2014). All the requirements of an AIR are addressed through this air quality impact report.

2.2.4 *Ambient air quality standards and guidelines*

The effects of air pollutants on human health occur in a number of ways with short-term, or acute effects, and chronic, or long-term, effects. Different groups of people are affected differently, depending on their level of sensitivity, with the elderly and young children being more susceptible. The factors that link the concentration of an air pollutant to an observed health effect are the level and the duration of exposure to that particular air pollutant.

The national ambient air quality standard (NAAQS) consists of a limit value and a permitted frequency of exceedance. The limit value is the fixed concentration level aimed at reducing the harmful effects of a pollutant. The permitted frequency of exceedance represents the tolerated exceedance of the limit value annually and accounts for high concentrations as a result of process upsets and meteorological variation. Compliance with the ambient standard implies that the frequency of exceedance does not exceed the permitted tolerance. The NAAQS are shown in Table 2-2.

Table 2-2: NAAQS for SO_2, NO_2, CO, O_3, benzene and PM_{10} (DEA, 2009) and $PM_{2.5}$ (DEA, 2012)

Pollutant	Averaging period	Limit value (µg/m³)	Tolerance	Compliance date
SO_2	1 hour	350	88	
	24 hours	125	4	
	1 year	50	0	
NO_2	1 hour	200	88	
	1 year	40	0	
CO	1-hour	30 000	88	
	8-hr running mean	10 000	11	
O_3	8-hr running mean	120	11	
PM_{10}	24 hours	75	4	
	1 year	40	0	
$PM_{2.5}$	24 hours	65	4	
		40	4	1 Jan 2016 to 31 Dec 2029

		25	4	1 Jan 2030
	1 year	25	0	
		20	0	1 Jan 2016 to 31 Dec 2029
		15	0	1 Jan 2030
Benzene	1 year	5	0	

The National Dust Control Regulations were published on 1 November 2013 (DEA, 2013c). It provides acceptable dustfall rates for residential and non-residential areas (Table 2-3).

Table 2-3: ***National limit values for dustfall rates in mg/m²/day as 30-day average (DEA, 2013c)***

Area	Dustfall rate (D)	Permitted frequency of exceedance
Residential	D < 600	Two within a year, not in sequential months
Non-residential	600 < D < 1 200	Two within a year, not in sequential months

2.3 AQMP FOR THE WEST COAST DM

The AQMP for the West Coast District Municipality (WCDM) was developed in 2011 (Gondwana, 2011). The vision driving the AQMP is for *attainment and maintenance of good air quality for the benefit of all inhabitants and natural environmental ecosystems within the West Coast District Municipality.*

The vision is supported by a five point mission statement, i.e.:

- To ensure the maintenance of good air quality through proactive and effective management principles that take into account the need for sustainable development into the future.
- To work in partnership with communities and stakeholders to ensure the air is healthy to breathe and is not detrimental to the well-being of persons in the District.
- To ensure that future developments (transportation, housing, etc.) incorporate strategies to minimise air quality impacts.
- To reduce the potential for damage to sensitive natural environmental systems from air pollution, both in the short and long-term.
- To facilitate intergovernmental communication at the Local, Provincial and National levels in order to ensure effective air quality management and control in the WCDM.

The WCDM AQMP includes nine goals that focus on the implementation of the plan. Goals that are specific to the ArcelorMittal CCGT project are the maintenance of good air quality within the boundaries of the West Coast District, and compliance monitoring and enforcement of air quality legislation, policies and regulations in the District.

2.4 AQMP FOR THE SALDANHA BAY MUNICIPALITY

The vision driving the AQMP for the Saldanha Bay Municipality is the *attainment and maintenance of good air quality for the benefit of all inhabitants and natural environmental* *ecosystems within the West Coast District Municipality and Saldanha Bay Local Municipality (Gondwana, 2013)*. The vision is supported by the following mission statement:

To ensure the maintenance of good air quality through proactive and effective management principles that take into account the need for sustainable development into the future.

- To work in partnership with communities and stakeholders to ensure the air is healthy to breathe and is not detrimental to the well-being of persons in the District.
- To ensure that future developments (transportation, housing etc.) incorporate strategies to minimise air quality impacts.
- To reduce the potential for damage to sensitive natural environmental systems from air pollution both in the short and long-term.
- To facilitate intergovernmental communication at the Local, Provincial and National levels in order to ensure effective air quality management and control in the WCDM.

The Saldanha Bay Municipality AQMP includes nine goals and objectives. Goals that are specific to the ArcelorMittal CCGT project are the maintenance of good air quality within the boundaries of the municipality, and compliance monitoring and enforcement of air quality legislation in the municipality.

3 IMPACT ASSESSMENT METHODOLOGY

Predicted impacts relating to air quality are described according to relevant characteristics, i.e., impact type, scale of impact, impact duration, frequency of occurrence, and extent of impact. The terminology used to describe impact characteristics is shown in Table 3-1.

Table 3-1: Impact characteristic terminology

Characteristic	Definition	Designation
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect)	Direct Indirect Induced
Extent	The "reach" of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.)	Local Regional International
Duration	The time period over which a resource / receptor is affected	Temporary Short-term Long-term Permanent
Scale	The size of the impact (e.g., the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.)	Numerical value relates to intensity

Frequency	A measure of the constancy or periodicity of the impact.	Numerical value relates to frequency

The definitions for the impact *type* designations are shown in Table 3-2.

Table 3-2: Impact type definitions

Direct	Impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the habitats which are affected)
Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of camp followers resulting from the importation of a large Project workforce).

The characteristics and definitions in Table 3-1 apply to planned and unplanned events. An additional characteristic that pertains only to unplanned events is *likelihood*. The *likelihood* of an unplanned event occurring is designated using a qualitative scale (Table 3-3).

Table 3-3: Definitions for likelihood designation

Unlikely	The event is unlikely but may occur at some time during normal operating conditions
Possible	The event is likely to occur at some time during normal operating conditions
Likely	The event will occur during normal operating conditions (i.e., it is essentially inevitable)

The definitions for the impact *extent* designations are shown in Table 3-4.

Table 3-4: Impact extent definitions

Local	Limited to the Project site and the boundaries of the Saldanha Bay Municipality
Regional	Extends beyond the boundaries of the Saldanha Bay Municipality
International	Extends beyond the boundaries of South Africa

The definitions for the impact *duration* designations are shown in Table 3-5.

Table 3-5: Impact duration definitions

Temporary	Acute impact as a result of operational upset condition
Short-term	Acute (hours to days) impact as a result of normal project operations
Long-term	Chronic (years) impact as a result of normal project activities
Permanent	Permanent (lifetime) impact as a result of normal project

	activities

The definitions for the impact *scale* designations are shown in Table 3-6.

Table 3-6: Impact scale definitions

Rank	Score	Definition
High	3	Exceedances of the limit value of the NAAQS at sensitive receptors
Medium	2	Exceedances of the limit value of the NAAQS at non-sensitive receptors
Low	1	No exceedances of the limit value of the NAAQS

The definitions for the impact *frequency* designations are shown in Table 3-7.

Table 3-7: Impact frequency definitions

Rank	Score	Definition
High	3	Exceedances of the tolerance of the NAAQS at sensitive receptors
Medium	2	Exceedances of the tolerance of the NAAQS at non-sensitive receptors
Low	1	No exceedances of the tolerance of the NAAQS

Once an impact's characteristics are defined, magnitude is to assign each impact. Magnitude is a function of extent, duration, scale and frequency. For unplanned events only, magnitude incorporates the 'likelihood' factor discussed above.

Magnitude describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the impact. The magnitude designations are:

- Positive
- Negligible
- Small
- Medium
- Large

The other principal impact evaluation step is definition of the sensitivity/vulnerability/importance of the impacted resource/receptor. Factors considered include physical, biological, cultural or human and legal protection, government policy, stakeholder views and economic value. Sensitivity/vulnerability/importance designations themselves universally consistent, i.e. low, medium and high, but the definitions vary on a resource/receptor basis (Table 3-8).

Table 3-8: ***Impact duration definitions***

Low	Unpopulated areas
Medium	Commercial or industrialised areas
High	Residential areas

Once magnitude of impact and sensitivity/vulnerability/importance of resource/receptor have been characterized, the significance can be assigned for each impact using the matrix in Figure 3-1. The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors.

Figure 3-1: ***Impact significance***

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

An impact of **negligible** significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.

An impact of **minor** significance is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/vulnerability/ importance. In either case, the magnitude should be well within applicable standards.

An impact of **moderate** significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit.

An impact of **major** significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors.

Once the significance of an impact has been characterized, the next step is to evaluate what mitigation and enhancement measures are warranted. Considering emission to the atmosphere and resultant impacts, the following mitigation applies:

Avoid at Source, Reduce at Source: avoiding or reducing at source through the design of the Project.

Abate on Site: add something to the design to abate the impact.

4 SCREENING AND SCOPING

4.1 OUTCOME OF SCREENING

Power generation using liquid or gaseous fuels is a Listed Activity in terms of Section 21 of the NEM: AQA as first published in Government Notice No. 248 of 31 March 2010 (DEA, 2010), and revised in Government Notice 893 published on 22 November 2013 (DEA, 2013a).

Section 22A of the NEM: AQA refers to the requirement for environmental authorisation for Listed Activities defined in the NEM: AQA according to Section 24G of the National Environmental Management Act (Act No. 107 of 1998). In other words, as a Listed Activity in terms of the NEM: AQA an EIA is required for the ArcelorMittal CCGT power plant project. In addition, an AEL is required from the licensing authority as part of the environmental authorisation.

5.2 SCOPING

Scoping defines the content and extent of the information required by the decision making authority. The scope and extent of the air quality specialist study in the regulations prescribes the format of the Atmospheric Impact Report (AIR) (DEA, 2013b). The AIR should include, amongst others, the following information:

- The location and extent of the proposed ArcelorMittal CCGT power plant
- A description of the proposed process
- Information of raw materials
- Emission control and abatement technology that will be installed and operated
- A comprehensive emission inventory including point and fugitive emissions
- An analysis of the impact of emissions on human health and other environmental receptors
- Planned air quality management

6 BASELINE CONDITIONS

6.1 INTRODUCTION

Saldanha Bay is located on the west coast of South Africa, approximately 100 km north of Cape Town. The Saldanha Bay Municipality includes the towns of Langebaan, Vredenburg and Saldanha Bay and has a population of approximately 72 000 people. The Port of Saldanha Bay is a key feature of the Saldanha Bay growing Industrial Development Zone (IDZ). Being a deep port was ideal for the establishment of South Africa's iron ore export terminal and accommodating large ore carriers. The IDZ also includes the Strategic Fuel Fund crude oil storage facility, and industries such as ArcelorMittal's Saldanha Steel and Tronox Namakwa Sands and smaller manufacturing industries. Saldanha Bay is also a popular holiday and retirement destination.

For this air quality assessment the baseline conditions include a description of the climate and meteorology, existing sources of atmospheric emissions and the current state of ambient air quality.

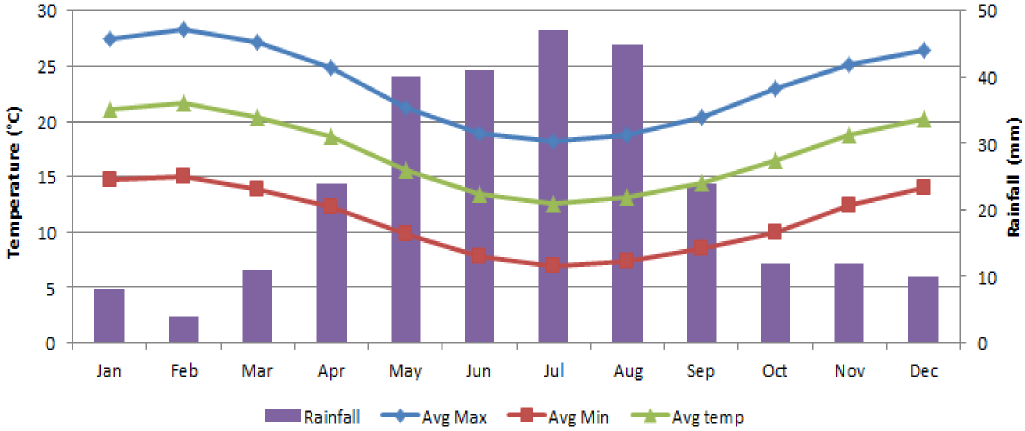
6.2 CLIMATE AND METEOROLOGY

The Saldanha Bay area is characterised by a semi-arid Mediterranean climate that is influenced by the cold Benguela Current and the relative position and strength of the Atlantic Ocean Anticyclone. The most climatologically representative data for the Saldanha Bay area is the South African Weather Service (SAWS) station at Langebaanweg.

Average daily temperatures at nearby Langebaanweg range from 21 °C in summer to 12 °C in winter, with summer maximums reaching 28 °C in February and winter minimums reaching 7 °C (Figure 6-1). The average annual rainfall at Langebaanweg is 278 mm. Although rainfall occurs throughout the year the majority occurs in winter between May and August.

The relative temperature difference between the relatively cold Atlantic Ocean, the overlying moist air mass and the warmer adjacent landmass results in a high occurrence of fog on the coast. On average 78 fog days occur, with the highest frequency of between 7 and 10 fog days between March and August.

Figure 6-1: Average monthly maximum, minimum and daily temperature at Langebaan and the average monthly rainfall in mm (SAWB, 1998)

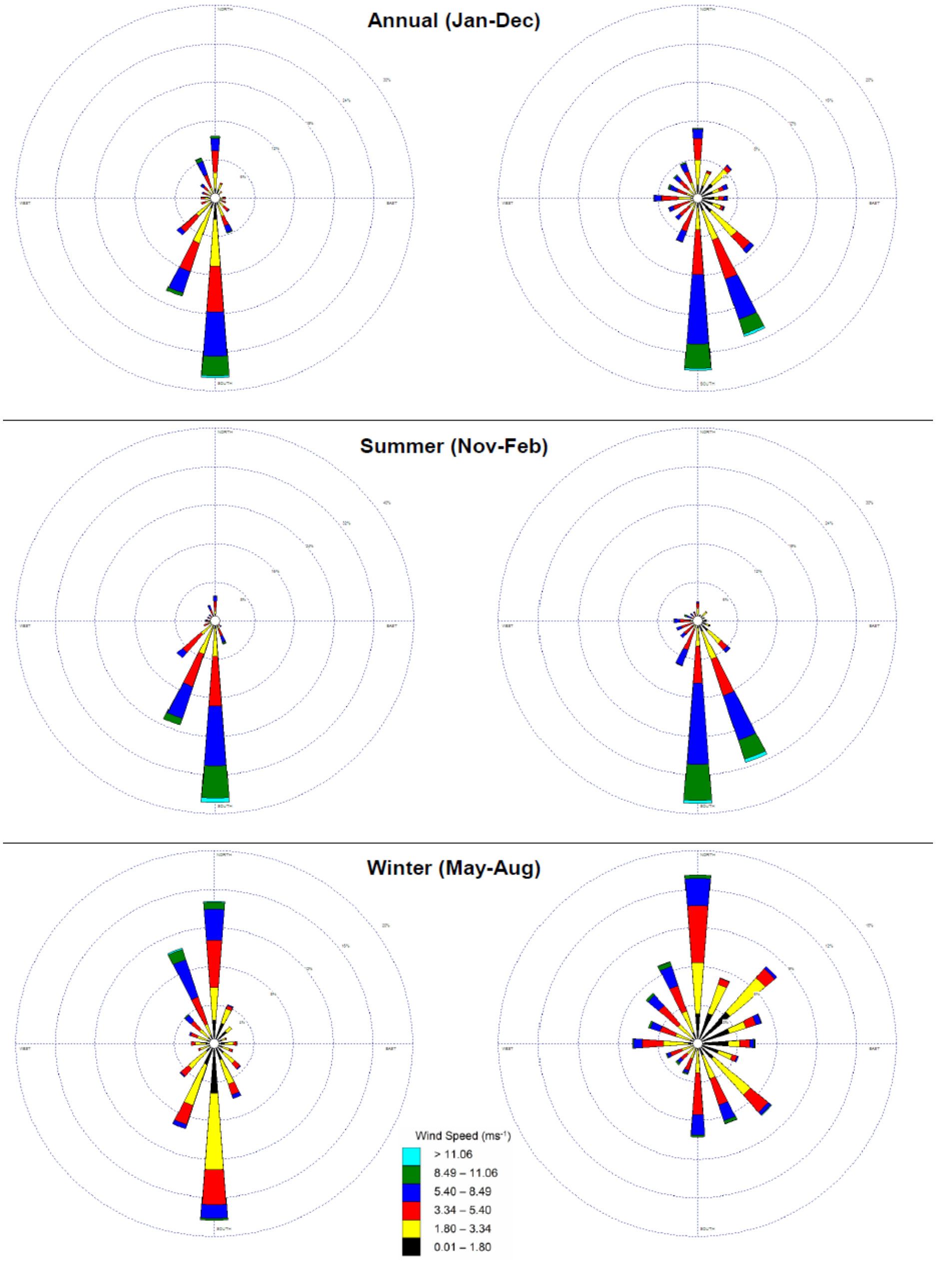


The SAWS stations at Langebaanweg and Geelbek provide a good indication of the prevailing wind direction across the Saldanha Bay region. The wind data at these two stations are depicted as windroses in Figure 6-2. Wind roses simultaneously depict the frequency of occurrence of wind from the 16 cardinal wind directions and wind speed classes, for a single site. Wind direction is given as the direction from which the wind blows, i.e., southwesterly winds blow from the southwest. Wind speed is given in m/s, and each arc represents a percentage frequency of occurrence (5% in this case).

The annual wind roses at Langebaanweg and Geelbek (Figure 6-2, top panels) indicate a dominant southerly wind, varying from southerly to southwesterly at Langebaanweg and southerly to south-southeasterly at Geelbek.

The prevailing winds at Langebaanweg and Geelbek shown by the annual wind roses in Figure 6-22 are very similar despite Langebaanweg being more than 12 km from the coast and the coastal location of Geelbek. Southerly winds dominate at both stations, tending to the southeast on the coast and veering to the southwest to the inland site and reaching more than 8.5 m/s. Northerly winds are also evident in the annual wind roses. In summer the southerly winds occur almost exclusively across the Saldanha Bay region. In winter the north-northwesterly to northerly winds are most frequent at both sites and also reach speeds of more than 8.5 m/s.

Figure 6-2: Wind roses for Langebaanweg (left panels) and Geelbek (right panels), with annual (top), summer (centre) and winter (bottom) (SAWS, 2012)



The atmospheric dispersion potential of an area relates to the stability (or instability) of the atmosphere, which in turn, is a function of wind speed and insolation (solar radiation). Stable conditions relate to poor atmospheric dispersion and generally coincide with low wind speeds and no insolation (night) or weak insolation due to overcast conditions which limits dilution of pollutants. Conversely, unstable conditions are conducive to good dispersion potential and occur with moderate winds and strong insolation. The wind disperses pollutants horizontally and unstable conditions dilute pollutants in a deeper layer of the atmosphere. The relationship between stability and wind speed and insolation is commonly conveyed through the Pasquill-Gifford stability classes from A to F, shown in Table 6-1.

The atmospheric dispersion potential in Saldanha Bay is expected to be effective for a lot of the time due to the frequent moderate to strong winds. Poor dispersion conditions are most likely to occur at night when cool temperatures coincide with light or calm winds. The poorest dispersion conditions are likely to occur between May and August when the coldest night time temperatures occur.

Table 6-1: Pasquill-Gifford stability classes

Stability classification	*Stability class*	*Atmospheric conditions*
A	Very stable	Calm wind, clear and hot daytime conditions
B	Moderately stable	Light wind, clear and hot daytime conditions
C	Unstable	Moderate wind, cloudy daytime conditions
D	Neutral	Strong wind, cloudy skies and at night
E	Stable	Moderate wind, cloudy and at night
F	Very stable	Low wind, clear skies, cold night time conditions

6.3 AMBIENT AIR QUALITY

The West Coast is sparsely vegetated and is relatively dry receiving an average annual rainfall of only 278 mm. It is naturally dusty, particularly during the drier summer months and prior to the winter rains when ploughing takes place in preparation for winter crops.

Ambient air quality in Saldanha Bay is also influenced by a number of anthropogenic sources of air pollution. These include industrial processing facilities such as ArcelorMittal's Saldanha Steel and Tronox Namakwa Sands and smaller manufacturing industries such as Duferco. Emissions from these facilities include SO_2, NO_X and particulate matter. Transnet Port Terminals operations at the Port of Saldanha include the iron ore export terminal which is a source of particulates. Other activities at the port include the handling of break bulk cargo and petroleum products which emit particulates and volatile organic compounds. Emissions from shipping and port side vehicles and equipment are also sources of particulates and volatile organic compounds (VOCs). The Strategic Fuel Fund (SFF) crude storage facility is a source of VOCs and H_2S. The Saldanha quarry and the unpaved access roads are a source of particulates.

The effect of these emissions on ambient air quality is determined through ambient air quality monitoring. Saldanha Bay Municipality (SBM) and industry conduct ambient air quality monitoring (Table 7-2). Data collected by SBM is reported monthly to the South African Ambient Air Quality Information System (SAAQIS) which is hosted and managed by SAWS. This data and that collected by industry are reported quarterly to the West Coast Air Quality Working Group which is chaired by the West Coast District Municipality's Air Quality Officer (AQO).

Table 6-2: ***Ambient monitoring in Saldanha Bay Municipality***

Facility	Methodology	Sites	Parameters
Saldanha Bay Municipality	Continuous monitoring	Saldanha Bay Verdenburg	SO_2, NO, NO_2, NO_X, O_3, PM_{10}, $PM_{2.5}$ and meteorology
	Dust monitoring	Saldanha Bay Verdenburg	Dust fallout
TPT	Continuous monitoring	Saldanha Bay	PM_{10} and meteorology
	Dust monitoring	Saldanha Bay Verdenburg Langebaan	Dust fallout
SFF	Passive sampling	Saldanha Bay	BTEX
ArcelorMittal	Continuous monitoring	Saldanha Bay	PM_{10} and meteorology

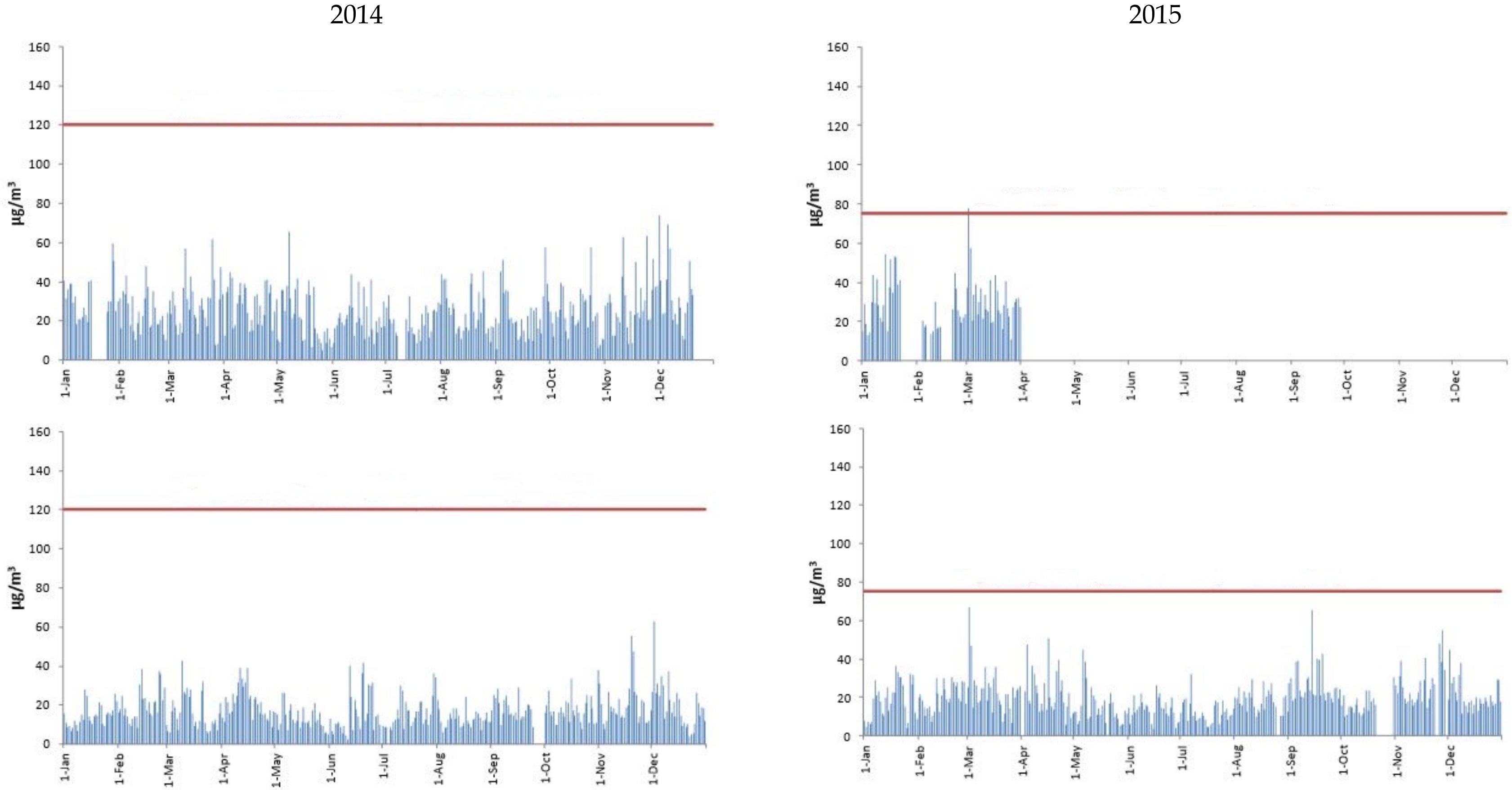
Despite the number of sources of air pollution in Saldanha Bay, ambient monitoring data from the SBM has shown that ambient concentrations of all pollutants are consistently below the NAAQS. Ambient monitoring by the SBM commenced in July 2014 and has continued reliably since then. Data was reported monthly with quarterly summary reports (uMoya-NILU, 2014a, 2014b; SGS, 2015a, 2015b). The monitoring station was initially located at the electrical sub-station, 200 m northwest of the yacht basin at Saldanha Bay Harbour, but moved to an electrical sub-station in the town of Saldanha Bay in August 2014.

Without any major coal burning facilities the ambient hourly SO_2 concentrations are very low relative to the NAAQS of 350 $\mu g/m^3$ (Table 6-2), and hourly average concentrations are consistently below 5 $\mu g/m^3$. Hourly ambient NO_2 concentrations are also very low relative to the NAAQS of 200 $\mu g/m^3$ (Table 6-2), and hourly average concentrations are consistently below 10 $\mu g/m^3$.

Daily average PM_{10} concentrations are also relatively low compared to NAAQS of 75 $\mu g/m^3$, ranging between 22 and 30 $\mu g/m^3$. The maximum 24-hour average PM_{10} concentration of 69 $\mu g/m^3$ was recorded in March 2015. Ozone (O_3) is not emitted by any particular source, but is formed in a photochemical reaction involving NO_2 and volatile organic compounds. O_3 is considered to be a regional pollutant. Ambient O_3 concentrations are relatively high compared with other pollutants in Saldanha Bay, but they are well below the 8-hour NAAQS of 120 $\mu g/m^3$. Typically hourly O_3 concentrations range between 20 and 30 $\mu g/m^3$.

As for other facilities monitoring ambient air quality in the area, the daily average PM_{10} concentrations measured by TPT at the NPA Offices in Saldanha Bay and at the Vredenburg reservoir are low relative to the NAAQS. The hourly data for 2014 and 2015 are shown in Figure 6-3.

Figure 6.3: ***Daily PM_{10} concentrations in µg/m³ at Saldanha Bay (top) and Vredenburg (bottom) in 2014 and 2015 (SGS, 2014 and 2016). The limit value of the ambient standard f 120 µg/m³in 2014 and 74 µg/m³ in 2015 is shown.***



7 AIR QUALITY IMPACT ASSESSMENT & MITIGATION/ENHANCEMENT MEASURES

7.1 INTRODUCTION

Emissions of air pollutants from the ArcerlorMittal CCGT power plant will result during construction and operations. Construction activities generate dust while during operations the combustion of LNG or CNG result in NO_X, CO and CO_2 emissions and some methane (CH_4). The assessment of impacts associated with the construction of the ArcelorMittal CCGT power plant is done qualitatively. The assessment of impacts associated with operations is quantitatively using dispersion modelling.

7.2 ASSESSMENT METHODOLOGY

7.2.1 Emission inventory

Emissions of CO and NO_X information for the gas turbines at the ArcelorMittal CCGT power plant are provide by the developer based on design specification, fuel composition, fuel consumption and appropriate emission factors. Two operational scenarios are assessed, for Phase 1 generating 240 MW and for Phase 2 generation 1 507 MW.

An emissions factor is a representative value that relates the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant (US EPA, 2015). These factors are usually expressed as the weight of pollutant divided by a unit weight, volume, distance, or duration of the activity emitting the pollutant (e.g., kg of particulate emitted per ton of coal burned). Such factors facilitate estimation of emissions from various sources of air pollution. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in the source category (US EPA, 2015).

The general equation for emissions estimation is: $E = A \times EF \times (1-ER/100)$, where:
E = emissions;
A = activity rate;
EF = emission factor; and
ER = overall emission reduction efficiency (%)

7.2.2 Dispersion modelling

The approach to the dispersion modelling in this assessment is based on the requirements of the DEA guideline for dispersion modelling (DEA, 2014). An overview of the dispersion modelling approach for the FPP Project is provided here.

Models used

This assessment is considered a Level 2 assessment, according to the definition on the dispersion modelling guideline (DEA, 2014). The CALPUFF suite of models (http://www.src.com/calpuff/calpuff1.htm) was therefore used. CALPUFF is a multi-layer, multi-species non-steady-state puff dispersion model that simulates the effects of time- and space-varying meteorological conditions on pollution transport, transformation and removal. CALPUFF can be applied on scales of tens to hundreds of kilometres. It includes algorithms for sub-grid scale effects (such as terrain impingement), as well as longer range effects (such as pollutant removal due to wet scavenging and dry deposition, chemical transformation, and visibility effects of particulate matter concentrations).

The Air Pollution Model (TAPM) (Hurley, 2000; Hurley et al., 2001; Hurley et al., 2002) is used to model surface and upper air metrological data for the study domain. TAPM uses global gridded synoptic-scale meteorological data with observed surface data to simulate surface and upper air meteorology at given locations in the domain, taking the underlying topography and land cover into account. The global gridded data sets that are used are developed from surface and upper air data that are submitted routinely by all meteorological observing stations to the Global Telecommunication System of the World Meteorological Organisation. TAPM has been used successfully in Australia where it was developed (Hurley, 2000; Hurley et al., 2001; Hurley et al., 2002), and in South Africa (Raghunandan et al., 2007). It is considered to be an ideal tool for modelling applications where meteorological data does not adequately meet requirements for dispersion modelling. TAPM modelled output data is therefore used to augment the site specific surface meteorological data for input to CALPUFF.

TAPM and CALPUFF parameterisation

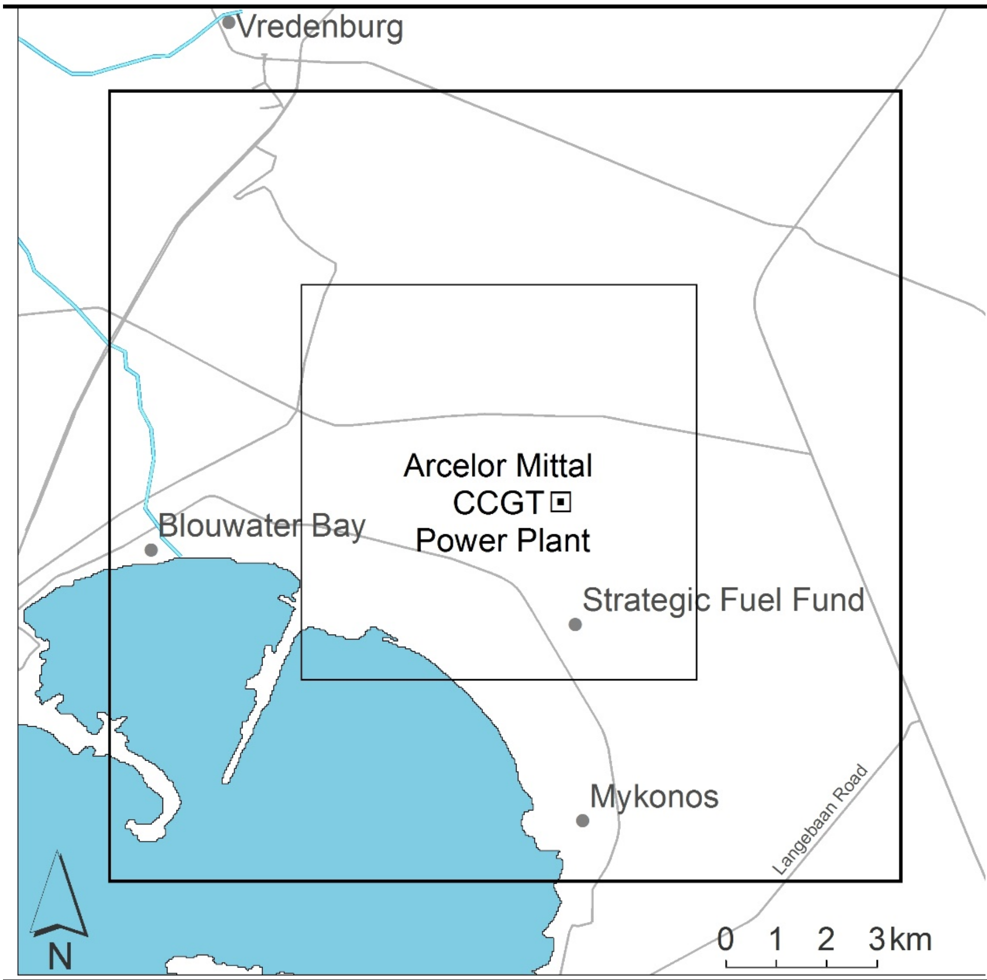
In Saldanha Bay TAPM is set-up in a nested configuration of three domains, centred on the Port of Saldanha Bay. The outer domain is 480 km by 480 km with a 24 km grid resolution, the middle domain is 240 km by 240 km with a 12 km grid resolution and the inner domain is 60 km by 60 km with a 3 km grid resolution (Figure 7.1). Three years (2012-2014) of hourly observed meteorological data from the SAWS station at Geelbek are used to 'nudge' the modelled meteorology towards the observations. The nesting configuration ensures that topographical effects on meteorology are captured and that meteorology is well resolved and characterised across the boundaries of the inner domain. Twenty seven vertical levels are modelled in each nest from 10 m to 5 000 m, with a finer resolution in the lowest 1 000 m. The 27 vertical levels are 10, 25, 50, 75, 100, 150, 200, 250, 300, 350, 400, 450, 500, 600, 750, 1000, 1250, 1500, 1750, 2000, 2250, 2500, 3000, 3500, 4000, 4500 and 5000 m.

The 3-dimensional TAPM meteorological output on the inner grid includes hourly wind speed and direction, temperature, relative humidity, total solar radiation, net radiation, sensible heat flux, evaporative heat flux, convective velocity scale, precipitation, mixing height, friction velocity and Obukhov length. The spatially and temporally resolved TAPM surface and upper air meteorological data is used as input to the CALPUFF meteorological pre-processor, CALMET.

A CALPUFF modelling domain of 900 km^2 is 30 km (west-east) by 30 km (north-south) and is centred on the Port of Saldanha Bay (Figure 7-1). It consists of a uniformly spaced receptor grid with 0.25 km spacing, giving 14 400 grid cells (120 X 120 grid cells).

The topographical and land use data for the respective modelling domains is obtained from the dataset accompanying the CSIRO's TAPM modelling package. This dataset includes global terrain elevation and land use classification data on a longitude/latitude grid at 30-second grid spacing from the US Geological Survey, Earth Resources Observation Systems (EROS) Data Centre Distributed Active Archive Centre (EDC DAAC).

Figure 7-1: TAPM and CALPUFF modelling domains (indicated by the thick and thin lines respectively)



The parameterisation of key variables that are applied in CALMET and CALPUFF are indicated in Table 7-1 and 7-2, respectively.

Table 7-1: Parameterisation of key variables for CALMET

Parameter	Model value
12 vertical cell face heights (m)	0, 20, 40, 80, 160, 320, 640, 1000, 1500, 2000, 2500, 3000, 4000
Coriolis parameter (per second)	0.0001
Empirical constants for mixing height equation	Neutral, mechanical: 1.41 Convective: 0.15 Stable: 2400 Overwater, mechanical: 0.12
Minimum potential temperature lapse rate (K/m)	0.001
Depth of layer above convective mixing height through which lapse rate is computed (m)	200
Wind field model	Diagnostic wind module
Surface wind extrapolation	Similarity theory
Restrictions on extrapolation of surface data	No extrapolation as modelled upper air data field is applied

Table 7-1: Parameterisation of key variables for CALMET

Parameter	Model value
Radius of influence of terrain features (km)	5
Radius of influence of surface stations (km)	Not used as continuous surface data field is applied

Table 7-2: Parameterisation of key variables for CALPUFF

Parameter	Model value
Chemical transformation	Default NO_2 conversion factor of 0.75 is applied (DEA, 2014).
Wind speed profile	Rural
Calm conditions	Wind speed < 0.5 m/s
Plume rise	Transitional plume rise, stack tip downwash, and partial plume penetration is modelled
Dispersion	CALPUFF used in PUFF mode
Dispersion option	Dispersion coefficients use turbulence computed from micrometeorology
Terrain adjustment method	Partial plume path adjustment

Model accuracy

Air quality models attempt to predict ambient concentrations based on "known" or measured parameters, such as wind speed, temperature profiles, solar radiation and emissions. There are however, variations in the parameters that are not measured, the so-called "unknown" parameters as well as unresolved details of atmospheric turbulent flow. Variations in these "unknown" parameters can result in deviations of the predicted concentrations of the same event, even though the "known" parameters are fixed.

There are also "reducible" uncertainties that result from inaccuracies in the model, errors in input values and errors in the measured concentrations. These might include poor quality or unrepresentative meteorological, geophysical and source emission data, errors in the measured concentrations that are used to compare with model predictions and inadequate model physics and formulation used to predict the concentrations. "Reducible" uncertainties can be controlled or minimised. This is achieved by making use of the most appropriate input data, preparing the input files correctly, checking and re-checking for errors, correcting for odd model behaviour, ensuring that the errors in the measured data are minimised and applying appropriate model physics.

Models recommended in the DEA dispersion modelling guideline (DEA, 2014) have been evaluated using a range of modelling test kits (http://www.epa.gov./scram001). It is therefore not mandatory to perform any modelling evaluations. Rather the accuracy of the modelling in this assessment is enhanced by every effort to minimise the "reducible" uncertainties in input data and model parameterisation.

For the FPP Project the reducible uncertainty in CALMET and CALPUFF is minimised by:

- Using representative quality controlled observed hourly meteorological data to nudge the meteorological processor to the actual values;
- Using 3-years of spatially and temporally continuous surface and upper air meteorological data fields for the modelling domain;
- Appropriate parameterisation of both models (Tables 7.2 and 7.3);
- Using representative emission data;
- Applying representative background concentrations to include the contribution of other sources; and
- Using a competent modelling team with considerable experience using CALPUFF.

7.2.3 *Assessment scenarios*

Most construction and decommissioning activities generate dust; and the emission of particulates into the atmosphere is through vehicle dust entrainment, demolition, excavation, ground levelling, etc. The main environmental problem with dust that is generated from these activities is that it settles on surrounding properties and land which is often more of a nuisance problem than a health issue. The dust is generally coarse, but may include fine respirable particles (PM_{10}) and these are known to be a risk to human health. Exhaust emissions from construction vehicles and equipment typically include particulates (including PM_{10}), carbon monoxide (CO), nitrogen oxides (NO_X), sulphur dioxide (SO_2) and volatile organic compounds (VOCs) including benzene. The construction and decommissioning activities are typically short lived and the pollutants are released close to ground level with little or no buoyancy which limits their dispersion and the potential impacts to the site. Emissions from construction and decommissioning are not quantified hence the assessment is qualitative.

Two operational scenarios are assessed using dispersion modelling to predict the ambient concentrations of NO_2 and CO resulting from emissions from the CCGT. Scenario 1 considers Phase 1 of the project for the five 48 MW open cycle units. Scenario 2 for considers the final configuration of the five open cycle units and the three combined cycle units collectively generating 1 507 MW (Table 7-3).

Table 7-3: Production rates at the ArcelorMittal power plant

Product	Maximum production capacity	Units
	Scenario 1	
Trent 60 DLE (T1)	48	MWe at MCR
Trent 60 DLE (T2)	48	MWe at MCR
Trent 60 DLE (T3)	48	MWe at MCR
Trent 60 DLE (T4)	48	MWe at MCR
Trent 60 DLE (T5)	48	MWe at MCR
	Scenario 2	
Trent 60 DLE (T1)	48	MWe at MCR
Trent 60 DLE (T2)	48	MWe at MCR
Trent 60 DLE (T3)	48	MWe at MCR
Trent 60 DLE (T4)	48	MWe at MCR
Trent 60 DLE (T5)	48	MWe at MCR
SGT5-400F (UNIT 1)	435	MWe at MCR
SGT5-400F (UNIT 2)	435	MWe at MCR
SGT5-400F (UNIT 3)	435	MWe at MCR

MCR: Maximum Continuous Rating

The 99^{th} percentile predicted ambient NO_2 and CO concentrations from the dispersion modelling for Emission Scenarios 1 and 2 are presented as isopleth maps over the modelling domain. Isopleth maps for benzene are not presented. The DEA (2014) recommend the 99^{th} percentile concentrations for short-term assessment with the NAAQS since the highest predicted ground-level concentrations can be considered outliers due to complex variability of meteorological processes. In addition, the limit value in the NAAQS is the 99^{th} percentile.

The impact assessment therefore compares the predicted 99th percentile concentrations with the respective ambient air quality standards (limit values and the permitted frequency of exceedance) for Scenarios 1 and 2, with consideration of populated areas in the modelling domain.

7.3 PREDICTED ANNUAL AND 99TH PERCENTILE CONCENTRATIONS

The predicted annual average NO_2 concentration and the 99th percentile of the 1-hour concentrations at the points of predicted highest ground-level concentration are presented in Table 7-4 for Scenarios 1 and 2.

Table 7-4: Annual average NO_2 concentration and the 99th percentile at the points of predicted maximum ground-level concentration in µg/m³

Averaging period	Scenario 1	Scenario 2
Annual	0.3	1.1
1-hour	7.5	40.7

7.4 PREDICTED NO_2 CONCENTRATIONS

Ambient concentrations of NO_2 are predicted from emissions of NO_X (NO_X=NO+NO_2). Emissions from combustion processes are dominated by NO_2, and furthermore, NO converts rapidly to NO_2 in the presence of N in the atmosphere. Comparing the predicted concentrations of NO_2 to the NAAQS is therefore somewhat conservative.

Predicted annual average NO_2 concentrations for Scenarios 1 and 2 are shown as isopleths in Figure 7-2 for the open cycle and combined cycle NO_X emissions cases respectively; and compared to the NAAQS of 40 µg/m³. The 99th percentile of the predicted 1-hour NO_2 concentrations are also presented as isopleths in Figure 7-3 for Scenarios 1 and 2; and compared with the NAAQS of 200 µg/m³.

Annual average NO_2 – Scenario 1 NO_X emissions (Figure 7-2)
In the case of NO_X emissions, the predicted annual average NO_2 concentrations are well below the NAAQS for Scenarios 1. The NO_2 concentrations predicted in Scenario 1 has a maximum concentration of 0.03 µg/m³. The maximum concentration in this scenario occurs in the immediate vicinity of the facility and approximately 4 km northwest of the facility.

Annual average NO_2 – Scenario 2 NO_X emissions (Figure 7-2)
The predicted concentrations are comparatively higher for Scenario 2. The predicted annual average NO_2 concentrations are well below the NAAQS. The NO_2 concentrations predicted in Scenario 2 are similar, with a maximum concentration of 1.1 µg/m³. The maximum concentrations in Scenario 2 occurs in the immediate vicinity of the facility

Figure 7-2: Predicted annual average NO_2 concentrations (μg/m³) resulting from emissions from ArcelorMittal CCGT power plant for Scenario 1 (left) and Scenario 2 (right)

1-hour NO_2 – Scenario 1 NO_X emissions (Figure 7-3)

The 99th percentile of the predicted 1-hour NO_2 concentrations for Scenario 1 do not exceed the NAAQS of 200 μg/m³ with a maximum predicted concentration of 7.5 μg/m³. The maximum concentration occurs close to the ArcelorMittal CCGT power plant Site.

1-hour NO_2 – Scenario 2 NO_X emissions (Figure 7-3)

The 99th percentile of the predicted 1-hour NO_2 concentrations for Scenario 2 are higher than in Scenario 1, but do not exceed the NAAQS. The predicted maximum concentration is 2.1 μg/m³ which occurs close to the ArcelorMittal CCGT power plant Site.

Figure 7-3: 99th percentile of the predicted 1-hour NO_2 concentrations (µg/m³) resulting from emissions from ArcelorMittal CCGT power plant for Scenario 1 (left) and Scenario 2 (right)

7.5 PREDICTED CO CONCENTRATIONS

Predicted 8-hour average and 1-hour average CO concentrations resulting from LNG or CNG combustion in both Scenarios 1 and 2 are very low and several orders of magnitude below the respective NAAQS. The concentrations at the points of predicted highest ground-level concentration are presented in Table 7-5 for Scenarios 1 and 2. The concentrations for Scenario 2 and somewhat higher than for Scenario 1.

Table 7-5: Maximum predicted CO concentrations in µg/m3

Averaging period	Scenario 1	Scenario 2
8-hour	0.97	6.1
1-hour	1.6	12.0

The isopleth plots of the 8-hour average concentrations for the both scenarios are shown in Figure 7.4 and for the 99-th percentile of predicted 1-hour concentrations in Figure 7.5. Similarly the predicted concentration for the full generation capacity (Scenario 2) are higher than for Scenario 1.

Figure 7-4: Predicted 8-hour average CO concentrations (µg/m³) resulting from emissions from ArcelorMittal CCGT power plant for Scenario 1 (left) and Scenario 2 (right)

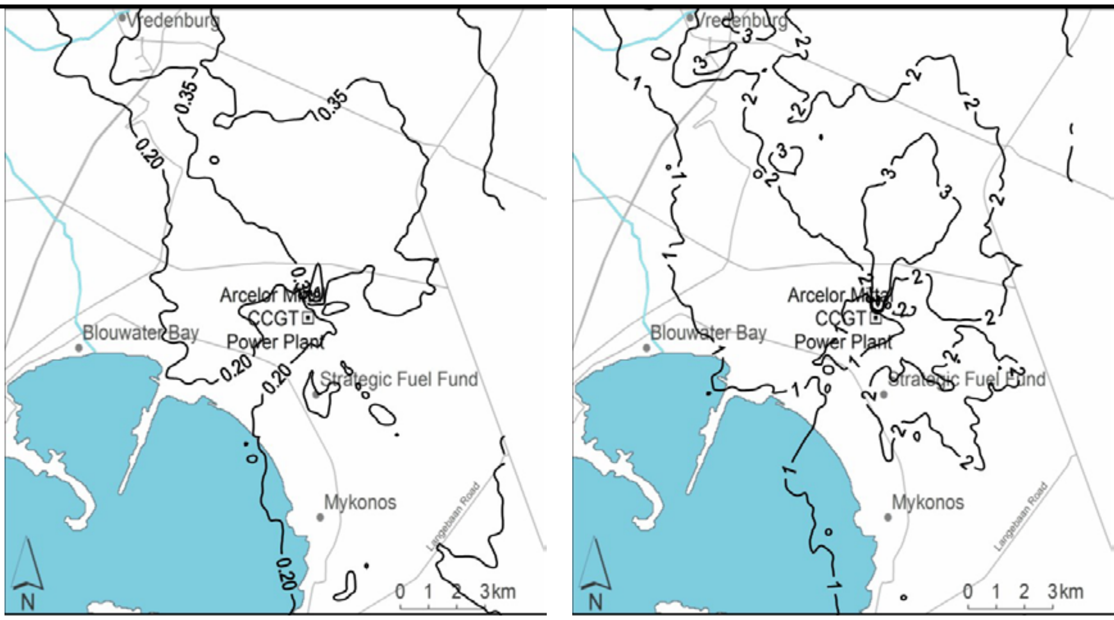
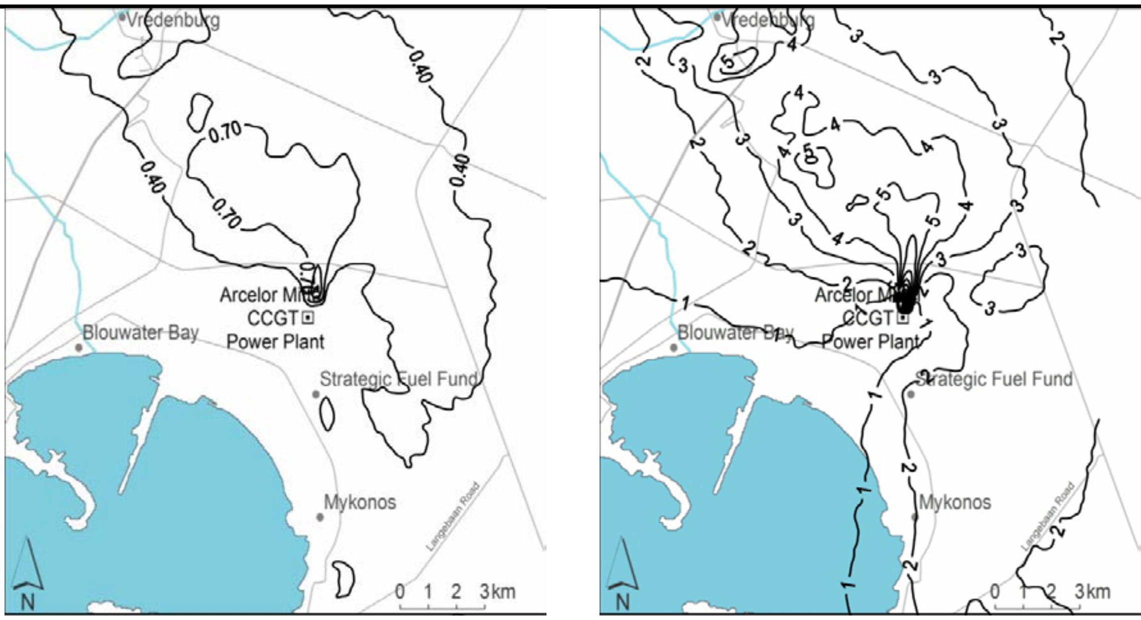


Figure 7-5: 99th percentile of the predicted 1-hour CO concentrations (µg/m³) resulting from emissions from ArcelorMittal CCGT power plant for Scenario 1 (left) and Scenario 2) (right)



7.6 IMPACT ASSESSMENT

The air quality impacts associated with dust and vehicle exhaust emissions during construction and decommissioning are assessed qualitatively in Table 7-6 and the assessment of air quality impacts during operations is based on the predicted ambient concentrations for Scenario 1 and Scenario 2 (1 507 MW) in Table 7-7 and 7-8 according to the assessment methodology presented in Chapter 4.

Table 7-6: Impact Assessment Table for emissions of dust and exhaust emissions during construction and decommissioning activities

Criterion	Rating	Comment
Impact – Emissions of dust and exhaust emissions during construction and decommissioning activities		
Nature	Negative	These impacts are expected to cause an increase in ambient concentrations of dust and construction vehicle and construction equipment exhaust emissions such as SO_2, NO_2, PM_{10}, CO and benzene in the environment.
Type	Direct	The impacts associated with construction and decommissioning activities are a direct consequence of emissions of pollutants into the atmosphere during these phases of the project. The impacts manifest as a nuisance with respect to dust and a risk of exposure through inhalation of the other pollutants.
Duration	Short-term	The duration of the impact will be limited to the construction and decommissioning phase of the project, which is short-term.
Extent	Local	The impacts are predicted to be of *local* extent for all pollutants since they are released close to ground level with little or no buoyancy which limits their dispersion and the potential impacts to the site.
Scale	Low	The scale of the impact is related to whether the predicted ambient concentrations of the pollutants exceed the limit values of the NAAQS in sensitive areas, i.e. residential or non-industrial areas. In the case of dust, SO_2, NO_2, PM_{10}, CO and benzene the ambient concentrations are expected to be well below the respective NAAQS. The scale of the impact is therefore scored **low** with a value of 1.
Frequency	Low	The frequency of the impact is related to whether the predicted exceedances of the limit values exceed the permitted number of exceedances provided in the NAAQS, i.e. the tolerance. In the case of dust, SO_2, NO_2, PM_{10}, CO and benzene, no exceedances of the NAAQS are expected and the frequency of the impact is scored **low** with a value of 1.
Magnitude	Low	Magnitude describes the intensity of the change in air quality that is predicted to occur. For dust, SO_2, NO_2, PM_{10}, CO and benzene it is expected that ambient concentrations will be low and are not likely to add to or significantly change the existing state of the environment. The magnitude of the change is predicted to be **low** with a score of 1.

Receptor Sensitivity	Low	Sensitive receptors include, but are not limited to, schools, churches, residences, apartments, hospitals, day care facilities, elderly care facilities and nursing homes. These are areas where the occupants are more susceptible to the adverse effects of exposure to pollutants and contaminants. Extra care must be taken when dealing with contaminants and pollutants in close proximity to areas recognised as sensitive receptors. Ambient concentrations of dust, SO_2, NO_2, PM_{10}, CO and benzene are predicted to be low throughout the study area and there no sensitive receptors in the vicinity of the site. The receptor sensitivity is therefore predicted to be **low**.
Significance	Minor	The significance of the impact combines the magnitude with the sensitivity of the environment. With a low magnitude expected for dust, SO_2, NO_2, PM_{10}, CO and benzene concentrations resulting from emissions from the construction and decommissioning phase and with a low sensitivity, the significance is predicted to be **minor** or **negligible**.

Table 7-7: Impact assessment for Scenario 1 for NO_2 and CO

Criterion	Rating	Comment
Impact – Emission of NO_2 and CO resulting from gas turbines combusting LNG		
Nature	Negative	This impact will cause an increase in ambient concentrations of NO_2 and CO in the environment.
Type	Direct	The predicted impacts are a direct consequence of emissions of pollutants into the atmosphere resulting from the combustion of LNG. The impacts manifest as ambient concentrations of the respective pollutants with a risk of exposure through inhalation.
Duration	Long-term	The duration of the impacts will be for the operational life of the facility, i.e. **long-term**, enduring for as long as the facility is operational and emitting air pollutants.
Extent	Local	The impacts are predicted to be of **local** extent for all pollutants since the modelled ambient concentrations are low and their dispersion is limited to the site and the surrounding areas.
Scale	Low	The scale of the impact is related to whether the predicted ambient concentrations of the pollutants exceed the limit values of the NAAQS in sensitive areas, i.e. residential or non-industrial areas. For all NO_2 and CO the predicted ambient concentrations are well below the respective NAAQS and the scale of the impact is scored **low** with a value of 1.
Frequency	Low	The frequency of the impact is related to whether the predicted exceedances of the limit values exceed the tolerance provided in the NAAQS. There are no predicted exceedances of the NAAQS for either NO_2 and CO so the frequency of the impact is scored **low** with a value of 1.
Magnitude	Low	Magnitude describes the intensity of the change in air quality that is predicted to occur. The predicted ambient concentrations are low for all pollutants and are not expected to significantly add to or change the existing state. The magnitude of the change is therefore predicted to be **low**.
Receptor Sensitivity	Low	Sensitive receptors include, but are not limited to, schools, churches, residences, apartments, hospitals, day care facilities, elderly care facilities and nursing homes. These are areas where the occupants are more susceptible to the adverse effects of exposure to pollutants and contaminants. Extra care must be taken when dealing with contaminants and pollutants in close proximity to areas recognised as sensitive receptors. Ambient concentrations of NO_2 and CO are predicted to be low throughout the study area and there no sensitive receptors in the vicinity of the site. The

		receptor sensitivity is therefore predicted to be **low**.
Significance	Minor	The significance of the impact combines the magnitude with the sensitivity of the environment. With a low magnitude expected for NO_2 and CO concentrations resulting from emissions from the combustion of LNG with and a low sensitivity, the significance is predicted to be **minor** or **negligible**.

Table 7-8: Impact assessment for Scenario 2 (1 507 MW) for NO_2 and CO

Criterion	Rating	Comment
Impact – Emission of NO_2 and CO resulting from gas turbines combusting LNG		
Nature	Negative	This impact will cause an increase in ambient concentrations of NO_2 and CO in the environment.
Type	Direct	The predicted impacts are a direct consequence of emissions of pollutants into the atmosphere resulting from the combustion of LNG. The impacts manifest as ambient concentrations of the respective pollutants with a risk of exposure through inhalation.
Duration	Long-term	The duration of the impacts will be for the operational life of the facility, i.e. **long-term**, enduring for as long as the facility is operational and emitting air pollutants.
Extent	Local	The impacts are predicted to be of **local** extent for all pollutants since the modelled ambient concentrations are low and their dispersion is limited to the site and the surrounding areas.
Scale	Low	The scale of the impact is related to whether the predicted ambient concentrations of the pollutants exceed the limit values of the NAAQS in sensitive areas, i.e. residential or non-industrial areas. For all NO_2 and CO the predicted ambient concentrations are well below the respective NAAQS and the scale of the impact is scored **low** with a value of 1.
Frequency	Low	The frequency of the impact is related to whether the predicted exceedances of the limit values exceed the tolerance provided in the NAAQS. There are no predicted exceedances of the NAAQS for either NO_2 and CO so the frequency of the impact is scored **low** with a value of 1.
Magnitude	Low	Magnitude describes the intensity of the change in air quality that is predicted to occur. The predicted ambient concentrations are low for all pollutants and are not expected to significantly add to or change the existing state. The magnitude of the change is therefore predicted to be **low**.
Receptor Sensitivity	Low	Sensitive receptors include, but are not limited to, schools, churches, residences, apartments, hospitals, day care facilities, elderly care facilities and nursing homes. These are areas where the occupants are more susceptible to the adverse effects of exposure to pollutants and contaminants. Extra care must be taken when dealing with contaminants and pollutants in close proximity to areas recognised as sensitive receptors. Ambient concentrations of NO_2 and CO are predicted to be low throughout the study area and there no sensitive receptors in the vicinity of the site. The

		receptor sensitivity is therefore predicted to be **low**.
Significance	Minor	The significance of the impact combines the magnitude with the sensitivity of the environment. With a low magnitude expected for NO_2 and CO concentrations resulting from emissions from the combustion of LNG with and a low sensitivity, the significance is predicted to be **minor** or **negligible**.

7.7 RESIDUAL IMPACT ASSESSMENT CONCLUSIONS

Impacts on ambient air quality are associated with emissions from the CCGT while it is in operation. The impacts will cease if operations stop. In other words, there will be no residual impacts on air quality.

7.8 CUMULATIVE IMPACT ASSESSMENT

A cumulative impact is one that arises from a result of an impact from the Project interacting with an impact from another activity to create an additional impact. How the impacts and effects are assessed is strongly influenced by the status of the other activities (e.g. already in existence, approved or proposed) and how much data is available to characterise the magnitude of their impacts.

It is difficult to assess the cumulative effect of the ArcelorMittal CCGT and other possible future development projects considering the uncertainty of such projects. Future projects may include but not be limited to i) 1 500 MW LNG power plant in the vicinity of the IDZ, ii) LNG storage facilities, iii) a chlorine, caustic soda and hydrochloric acid in Saldanha Bay, and iv) a cement manufacturing plant to the east of the IDZ.

Of these plants, emissions CO and NO_X, i.e. those assessed for the ArcelorMittal CCGT, will be emitted from the power plant as a result of LNG combustion and from the cement manufacturing plant as a result of fuel combustion and heat generated in the kiln. For the cement plant the incremental predicted incremental NO_2 concentrations were very low, while CO was not assessed (Aurecon, 2013). For the power plant using LNG and Best Available Technology for power generation the NO_X and CO emissions is also expected to be very low.

Given the findings of this impact assessment (the ArcelorMittal CCGT), that of the cement plant (Aurecon, 2013) and the understanding of emissions from LNG power plants it seem unlikely that the cumulative effect will exceed the NAAQS for CO and NO_2 in Saldanha Bay. It should however be recognised that this statement is speculative and based on professional judgement. The cumulative impact of a suite of industries is best assessed using emissions from the relevant sources and dispersion modelling.

The potential cumulative impact on air quality is rated in Table 7-9.

Table 7-9: Assessment of cumulative impacts

Criterion	Rating	Comment
Impact – Emission of NO_2 and CO from the Arcelor Mittal CCGT Power Plant and other sources, e.g. power generation using LNG and cement manufacturing		
Nature	Negative	These will cause an increase in ambient concentrations of NO_2 and CO in the environment.
Type	Direct	The cumulative impacts are a direct consequence of emissions of pollutants into the atmosphere resulting from fuel combustion at the respective facilities. The impacts manifest as ambient concentrations of the respective pollutants with a risk of exposure through inhalation.
Duration	Long-term	The duration of the impacts will be for the operational life of the facilities, i.e. **long-term**, enduring for as long as the facility is operational and emitting air pollutants.
Extent	Local	The impacts are predicted to be of **local** extent for all pollutants since the cumulative ambient concentrations are expected to be low and their dispersion will be limited to the respective sites and the surrounding areas.
Scale	Low	The scale of the cumulative impact is related to whether the ambient concentrations of the pollutants are likely to exceed the limit values of the NAAQS in sensitive areas, i.e. residential or non-industrial areas. For all NO_2 and CO the cumulative ambient concentrations are likely to be well below the respective NAAQS and the scale of the impact is scored **low** with a value of 1.
Frequency	Low	The frequency of the cumulative impact is related to whether exceedances of the limit values exceed the tolerance provided in the NAAQS. It is unlikely that exceedances of the NAAQS will occur for either NO_2 and CO so the frequency of the cumulative impact is scored **low** with a value of 1.
Magnitude	Low	Magnitude describes the intensity of the change in air quality that is expected to occur. The ambient concentrations are expected to be low for all pollutants and cumulatively little change the existing state is expected. The magnitude of the change is therefore predicted to be **low**.
Receptor Sensitivity	Low	Sensitive receptors include, but are not limited to, schools, churches, residences, apartments, hospitals, day care

		facilities, elderly care facilities and nursing homes. These are areas where the occupants are more susceptible to the adverse effects of exposure to pollutants and contaminants. Extra care must be taken when dealing with contaminants and pollutants in close proximity to areas recognised as sensitive receptors. Cumulative ambient concentrations of NO_2 and CO are expected to be low throughout the Saldanha Bay Municipality. The receptor sensitivity is therefore predicted to be **low**.
Significance	Minor	The significance of the cumulative impact combines the magnitude with the sensitivity of the environment. With a low magnitude expected for NO_2 and CO concentrations resulting from emissions from the combustion of LNG with and a low sensitivity, the significance is predicted to be **minor** or **negligible**.

7.9 RECOMMENDED MITIGATION MEASURES

7.9.1 Construction and decommissioning

The main concern for the construction and decommissioning phase is the generation of dust and exhaust emissions from vehicles and equipment on site. Mitigation and management of these is to implement rules on site to minimise dust and exhaust emissions. The following mitigation measures are proposed:

- Loads on vehicles carrying dusty construction materials should be covered;
- Loading and unloading bulk material should be in areas protected from the wind or carried out in calm conditions;
- Limit access to construction site to construction vehicles only;
- Impose vehicle speed restrictions on the construction site;
- Avoid unnecessary removal of vegetation and re-vegetate as soon as possible;
- Maintain high moisture content on exposed surfaces and roads by spraying with water; operate a maintenance programme for construction vehicles and construction equipment to ensure optimal performance, thereby reducing exhaust emissions.

7.9.2 Operations

The main concern for the operational phases of the CCGT are the potential to increase ambient concentrations on NO_2 and CO. The predicted ambient concentrations are low and significantly below the respective NAAQS as a result of the generation technology and the properties of LNG. As a result mitigation and management measures are aimed at ensuring optimum performance of the turbines and the on-going use of LNG. The following is proposed:

- The development and implementation of servicing programs for all operational components of the facility according to design specifications and requirements;
- Stocking of critical components to ensure the availability of spares in the event of mechanical faults;
- Commitment to use only LNG or CNG as the primary fuel.

8 MANAGEMENT & MONITORING

8.1 ENVIRONMENTAL MANAGEMENT REQUIREMENTS

Mitigation measures for incorporation into the EMP are suggested with respect to construction and decommissioning activities to limit nuisance impacts (Table 8-1). Although the predicted impacts from operations are low, it is important that the plant is maintained to ensure performance continually meets the design specifications.

It is also recommended to conduct ambient monitoring to measure compliance with the NAAQS for NO_2 thus allowing proactive management of the plant in the event of measured exceedances. It is recommended that ArcelorMittal's current ambient air quality monitoring program at is expanded to include continuous NO_2 monitoring at an appropriate site northwest of the plant where ambient concentrations are predicted to be relatively high.

Table 8-1: Recommended mitigation and management action for construction and decommissioning

Impact	Recommended Mitigation/Management action	Monitoring		
		Methodology	Frequency	Responsibility
Dust and other pollutants from construction and decommissioning	• Loads on vehicles carrying dusty construction materials should be covered • Loading and unloading bulk construction should be in areas protected from the wind on in calm conditions • Vehicles carrying dusty materials should be cleaned before leaving the site • Limit access to construction site to construction vehicles only • Impose vehicle speed restrictions on the construction site • Maintain high moisture content on exposed surface and roads by spraying with water • Maintenance programme for construction vehicles to ensure optimum performance reduced emissions	Include dust management in contractors contract conditions	On-going during construction	Contractor

Table 8-2: Recommended mitigation and management action for operations

Impact	Recommended Mitigation/Management action	Monitoring		
		Methodology	Frequency	Responsibility
Increase in ambient concentrations of NO_2 and CO	• Develop and implement servicing programs for all operational components of the facility;	Based on design specifications	On-going	Operations manager
	• Maintain stock of critical components for the facility to ensure the availability of spares in the event of mechanical faults or failures;	Based on design specifications	On-going	Operations manager
	• Commitment to use only LNG or CNG as the primary fuel;	Strategic planning	Annually	Senior management
	• The inclusion of NO_2 in the current ambient air quality monitoring program	NO_2 gas analyser	On-going	Environmental manager

8.2 ENVIRONMENTAL MANAGEMENT SYSTEM

An Environmental Management System consists of an emissions inventory, monitoring system and reporting.

The operation of the power plant is a Listed Activity in terms of the NEM: AQA. Requirements for environmental management will be dictated by the conditions in the Atmospheric Emission License (AEL). These are likely to include:

i. Annual emission measurements to assess compliance with the Minimum Emission Standards for Listed Activities (Government Gazette 37054, Notice No. 893 of 22 November 2013);
ii. Registration on the National Atmospheric Emission Inventory System (NAEIS) and annual reporting of emissions to the NAEIS (Government Gazette 38633, Notice No. R 283 of 2 April 2015);
iii. Registration on the South African Atmospheric Emission and Licensing Portal (SAAELIP) and annual reporting to the Licensing Officer.

9 IMPACT SUMMARY

All impacts arising from the scoping study have been assessed in detail. Table 9-1 and 9-2 provide a summary of impacts addressed in this study, before mitigation and with mitigation.

Table 9-1: ***Construction and decommissioning Impact Assessment Outcomes***

Project Activities/Impacts	Significance of Impacts	
Construction/Decommissioning Phase	Before Mitigation	With Mitigation
Increase in ambient concentrations of dust and construction vehicle and construction equipment exhaust emissions such as SO_2, NO_2, PM_{10}, CO and benzene in the environment.	Minor	Minor

Table 9-2: ***Operational Phase Impact Assessment Outcomes***

Project Activities/Impacts	Significance of Impacts	
Operational Phase	Before Mitigation	With Mitigation
Increase in ambient concentrations of NO_2 and CO in the environment.	Minor	Minor

10 CONCLUSION AND RECOMMENDATIONS

Air quality impacts are assessed for the operation of the proposed ArcelorMittal CCGT power plant at Saldanha Bay using LNG as the fuel. Dispersion modelling is used to predict the ambient concentrations of CO and NO_2 for to operational scenarios. The assessment of ambient air quality impacts compares the predicted concentrations of the pollutants with the respective NAAQS and considers sensitivity of the receiving environment and defines the significance of the impacts according to their type, extent, duration, scale, frequency and magnitude.

LNG is a clean fuel and its use in the ArcelorMittal CCGT power plant results in relatively low emissions of CO and NO_X. As a result the predicted ambient concentrations of CO and NO_2 are well below the respective NAAQS. The significance of the air quality impacts when LNG is used in the ArcelorMittal CCGT power plant are minor.

Employing the generic design parameters provided for the project, it is predicted that the site operations will low generate emissions, low ambient concentrations, and low environmental impacts overall. Mitigation and management measures are recommended for construction, operations and decommissioning.

It is a reasonable opinion that the project should be authorised considering the outcomes of this impact assessment.

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APPENDIX 1

MARK ZUNCKEL

uMOYA-NILU

Firm	:	uMoya-NILU (Pty) Ltd
Profession	:	Air quality consultant
Specialization	:	Air quality assessment, air quality management planning, air dispersion modelling, boundary layer meteorology, project management
Position in Firm	:	Managing director and senior consultant
Years with Firm	:	New firm started on 1 August 2007
Nationality	:	South African
Year of Birth	:	1959
Language Proficiency	:	English and Afrikaans

EDUCATION AND PROFESSIONAL STATUS

Qualification	Institution	Year
National Diploma (Meteorology)	Technikon Pretoria	1980
BSc (Meteorology)	Univ. of Pretoria	1984
BSc Hons (Meteorology)	Univ. of Pretoria	1988
MSc	Univ. of Natal	1992
PhD	Univ. Witwatersrand	1999

Registered Natural Scientist: South African Society for Natural Scientific Professionals

Council Member: National Association for Clean Air
Member: African Meteorological Society
Member: Air and Waste Management Association

EMPLOYMENT AND EXPERIENCE RECORD

Period	**Organisation details and responsibilities/roles**
1976 – May 1992	*South African Weather Bureau :* Observer, junior forecaster, senior forecast, researcher, assistant director
June 1992 – July 2007	*CSIR:* Consultant and researcher, Research group Leader: Atmospheric Impacts
August 2007 to present	*uMoya-NILU Consulting:* Managing Director and senior air quality consultant

Key and Recent Project Experience:

1996	Project leader & Principal researcher: Atmospheric impact assessment for the proposed Mozal aluminium smelter in Maputo, Mozambique.
1996	Project leader & Principal researcher: Dry sulphur deposition during the Ben MacDhui High Altitude Trace Gas and Transport Experiment (BATTEX) in the Eastern Cape.

1997	Project leader & Principal researcher: Atmospheric impact assessment of the proposed capacity expansion project for Alusaf in Richards Bay.
1997	Project leader & Principal researcher: The Uruguayan ambient air quality project with LATU.

1997	Principal researcher on the Air quality specialist study for the Strategic Environmental Assessment on the industrial and urban hinterland of Richards Bay.
1997	Project leader & Principal researcher: Feasibility study for the implementation of a fog detection system in the Cape Metropolitan area: Meteorological aspects.
2001	Project leader & Principal researcher: Air quality specialist study for the Environmental Impact Assessment for the proposed expansion of the Hillside Aluminium Smelter, Richards Bay.
2001-2003	Researcher: The Cross Border air Pollution Impact (CAPIA) project. A 3-year modelling and impacts study in the SADC region.
2002	Project leader & Principal researcher: Air quality assessment specialist study for the proposed Pechiney Smelter at Coega.
2002	Project leader & Principal researcher: Air quality assessment specialist study for the proposed N2 Wild Coast Toll Road.
2002-2005	Project leader on the NRF project – development of a dynamic air pollution prediction system
2004	Project leader on the specialist study for expansion at the Natal Portland Cement plant at Simuma, KwaZulu-Natal.
2004-2005	Researcher: National Air Quality Management Plan implementation project for Department Environmental Affairs and Tourism.
2005	Researcher in the assessment of air quality impacts associated with the expansion of the Natal Portland Cement plant at Port Shepstone.
2005	Technical assistance to the Department of Environment Affairs and Tourism in the implementation of the Air Quality Act
2006-2007	Project team leader of a multi-national team to develop the National Framework for Air Quality Management for the Department of Environment Affairs and Tourism
2007	Air quality assessment for Mutla Early Production System in Uganda for ERM Southern Africa on behalf of Tullow Oil.
2007-2010	Lead consultant on the development of a dust mitigation strategy fro the Bulk Terminal Saldanha and an ambient guideline for Fe_2O_3 dust for Transnet Projects and on-going monitoring.
2008	Lead consultant on the Air quality status quo assessment and scoping for the EIA for the Sonangol Refinery
2008-09	Lead consultant on the development of the air quality management plan for the Western Cape Provincial. Department of Environmental

	Affairs and Development Planning.
2008-10	Lead consultant on the development of the Highveld Priority Area air quality management plan for the Department of Environmental Affairs and Tourism.
2008	Lead consultant in the development of an odour management and implementation strategy for eThekwini.
2008 & 2010	Lead consultant on the Air Quality Specialist Study for the EIA for the proposed Kalagadi Manganese Smelter at Coega
2008	Lead consultant on the Air Quality Assessment for the Proposed Construction and Operation of a Second Cement Mill at NPC-Cimpor, Simuma near Port Shepstone.
2008	Lead consultant on the Air Quality Specialist Study Report for the New Multi-Purpose Pipeline Project (NMPP) for Transnet Pipelines.
2008	Lead consultant on the Air quality assessment for the proposed UTE Power Plant and RMDZ coal mine at Moatize, Mozambique for Vale.
2009	Lead consultant on the Air quality assessment for the development of the ETA STAR coal mine at Moatize, Mozambique for Impacto.
2008-09	Lead consultant on the Dust source apportionment study for the Coedmore region in Durban for NPC-Cimpor.
2009	Consultant on the Air quality specialist study for the upgrade of the Kwadukuza Landfill, KwaZulu-Natal
2009-10	Lead consultant on the Audit of ambient air quality monitoring programme and air quality training for air quality personnel at PetroSA
2010	Lead consultant on the Qualitative assessment of impact of dust on solar power station at Saldanha Bay
2010	Lead consultant on the Air quality specialist study for the EIA for the Kalagadi Manganese Smelter at Coega
2010	Lead consultant on the Qualitative air quality assessment for the EIA for the Sechaba Aphalt plant, Ferrobank
2009 – 2010	Lead consultant on the Air quality specialist study for the Environmental Management Framework for the Port of Richards Bay
2010	Lead consultant on the Air quality status quo assessment and abatement planning at Idwala Carbonates, Port Shepstone
2010	Lead consultant on the Air quality status quo assessment and abatement planning at Sappi Tugela, Mandeni
2010 – 2011	Air quality status quo assessment and revision of the Air Quality Management Plan for City of Johannesburg
2010	Lead consultant on the Air quality status quo assessment and abatement planning at First Quantum Mining's Bwana Mkubwa and Kansanshi mines, Zambia
2010 – 2011	Lead consultant on the Air quality specialist study for the EIA for the Alternative Fuel and Resources Project at Simuma, Port Shepstone

2010 – 2011	Lead consultant on the Air quality specialist study for the EIA for the Coke Oven re-commissioning at ArcelorMittal Newcastle
2010	Qualitative air quality assessment for the EIA for the Mozpel sugar to ethanol project , Mozambique
2011	Development of the South African Air Quality Information System – Phase II The National Emission Inventory
2011	Ambient baseline monitoring for Riversdale's Zambeze Coal Project in Tete, Mozambique
2010 - 2011	Ambient quality baseline assessment for the Ncondeze Coal Project, Tete Mozambique
2011-12	Air quality assessment for the mining and processing facilities at Longmin Platinum in Marikana
2012	Air quality assessment for the proposed LNG and OLNG plants in Mozambique
2012	Modelling study in Abu Dhabi for the transport and deposition of radio nuclides
2012	Air quality assessment for the proposed manganese ore terminal at the Ngqura Port
2012-13	Air quality management plan development for Stellenbosch Municipality
2012-12	Air quality management plan development for the Eastern Cape Province
2013	Air quality specialist for Tullow Oil Waraga-D and Kinsinsi environmental audit
2013	Air quality specialist study for the EIA for the Thabametsi IPP station
2013	Air quality specialist study for the EIA for the Mamathwane Common User facility
2013	Air quality management plan for the Ugu District Municipality
2013-14	Air quality specialist study for the application for postponement of the minimum emission standards for 9 Eskom power stations
2014	Air quality specialist study for the application for postponement of the minimum emission standards for the Engen Refinery in Merebank, Durban
2014-15	Baseline assessment and AQMP development for the uThungulu District Municipality
2013-15	Baseline assessment and air quality management plan for the Waterberg-Bojanala Priority Area
2014-15	AQMP review for eThekwini Municipality
2014-14	Dispersion modelling study for Richards Bay Minerals
2015	Air quality assessment for Rainbow Chickens at Hammersdale
2015	Air quality status quo assessment and planning for TNPA managed ports in South Africa

PUBLICATIONS

Author and co-author of 34 articles in scientific journals, chapters in books and conference proceedings. Author and co-author of more than 100 technical reports and presented 47 papers at local and international conferences. A full publications list is available on request.