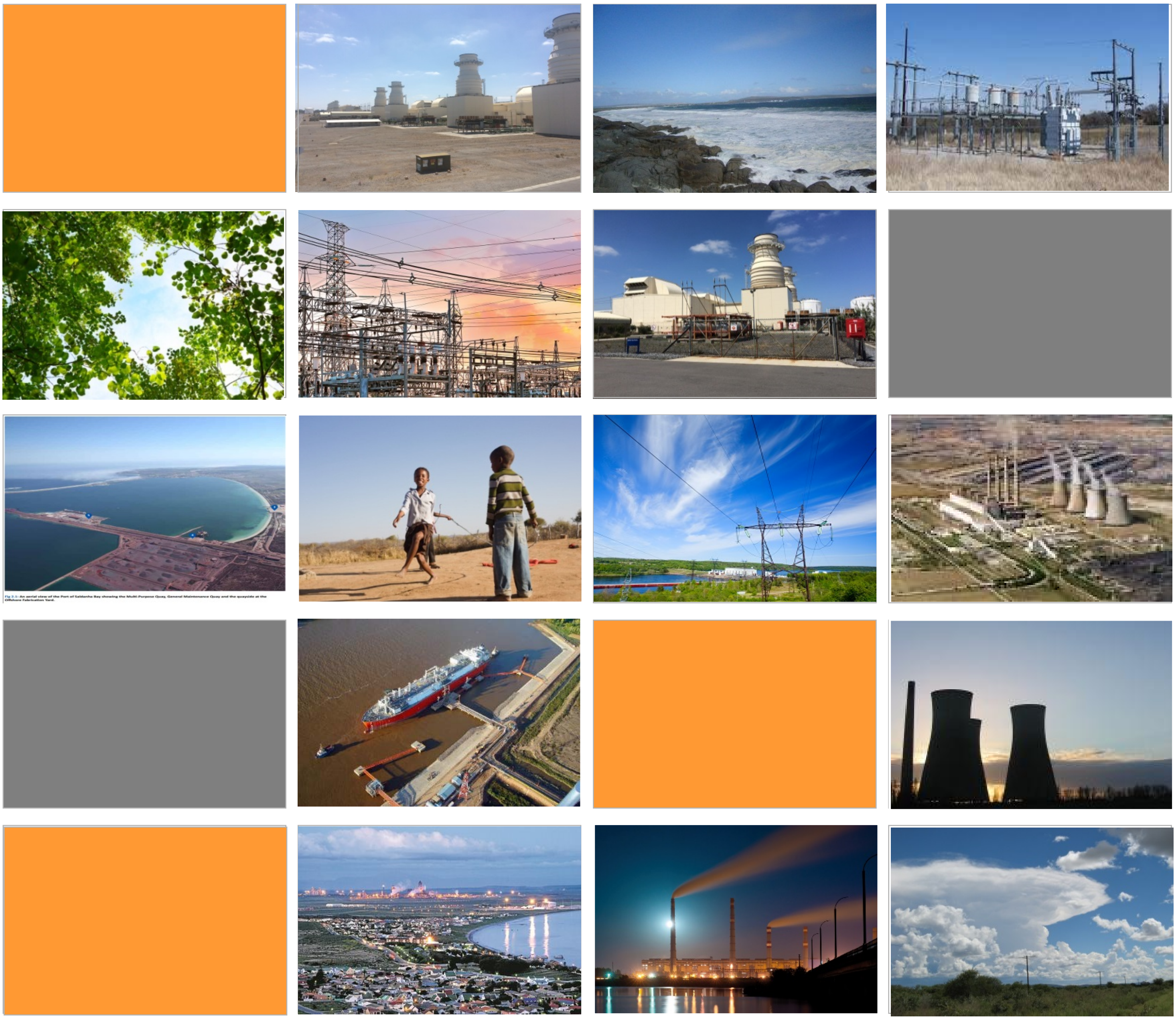

ArcelorMittal

Environmental Impact Assessment for a Gas-fired Independent Power Plant to Support Saldanha Steel and Other Industries in Saldanha Bay, Western Cape

Draft Report

ArcelorMittal

July 2016

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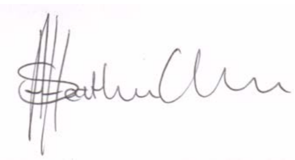
ERM

Environmental Impact Assessment Report for a Gas-fired Independent Power Plant to Support Saldanha Steel and Other Industries in Saldanha Bay

Environmental Resources Management

Draft Report

Client: ArcelorMittal	Project No: 0315829
Summary and version history: V1 This EIA Report has been compiled as part of the EIA process in accordance with the regulatory requirements stipulated in the EIA Government Notice Regulations (GNR 982/2014) promulgated in terms of Section 24(5) of NEMA. This EIA Report documents the findings of the Specialist Study and Impact Assessment Phases.	Date: 22 July 2016 Approved by: 
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1	Draft EIA Report
	Compiled by: Claire Alborough, Nadia Mol, Lindsey Bungartz and Stephan van den Berg Reviewed by: Stuart Heather-Clark and Brett Lawson

This report has been prepared for ArcelorMittal in accordance with the terms and conditions of ERM's contract with ArcelorMittal for submission to commenting authorities and the Competent Authority in support of ArcelorMittal's application for an Environmental Authorisation and for disclosure through the prescribed review process. Any other use, distribution or publication of this report is prohibited without the prior written approval of ERM and ArcelorMittal	**Distribution**: Public

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FIGURES

TABLES

List of Abbreviations and Terms

ACC	Air Cooled Condenser
ADI	Area of Direct Influence
AII	Area of Indirect Influence
ALARP	As Low As Reasonably Practicable
AMSS	ArcelorMittal Saldanha Steel
ANSI	American National Standards Institute
AoI	Area of Influence
ART	Antiretroviral Treatment
BAR	Basic Assessment Report
BFS	Bankable Feasibility Study
CAPEX	Capital Expenditure
CBA	Critical Biodiversity Area
CCGT	Combined Cycle Gas Turbine
CFR	Cape Floristic Region
CMDM	Cape Metro District Municipality
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO2	Carbon Dioxide
COTO	Committee of Transport Officials
CP	Cathodic Protection
CPI	Consumer Price Index
CWDM	Cape Winelands District Municipality
DBSA	Development Bank of Southern Africa
DC	Decision Control
DCS	Decision Control Systems
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DOE	Department of Energy
DTI	Department of Trade and Industry
EAP	Environmental Action Plan
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Plan
EPC	Engineering Procurement Construction
ERA	Electricity Regulations Act
ERM	Environmental Resources Management
FSRU	Floating Storage Regasification Unit
G2P	Gas to Power
GDP	Gross Development Product
GDPR	Regional Gross Development Product
GHG	Greenhouse Gas
GJ	Giga Joules
GNR	Government Notice Regulation
GUMP	Gas Utilisation Master Plan
HFO	Heavy Fuel Oil
HGV	Heavy Goods Vehicle
HIV/Aids	Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome
HP	High Pressure
HRSG	Heat Recovery Steam Generator
HV	High Voltage

HWC	Heritage Western Cape
I&APs	Interested and Affected Parties
ICDA	Internal Corrosion Direct Assessment
IDZ	Industrial Development Zone
IPCSA	International Power Consortium South Africa
IPPPP	Independent Power Producers Procurement Programme
IRP	Integrated Regional Plan
ISO	International Organisation for Standardization
kV	kilo Volt
LED	Light Emitting Diode
LHV	lower heating value
LNG	Liquefied Natural Gas
LP	Low Pressure
LPG	Propane
LQSM	Langeberg Quartz Sand Member
LRAS	Langebaan Road Aquifer System
MAE	Mean Annual Evaporation
MCR	Maximum Continuous Rating
MOGS	Mass Oil and Gas Services
MPPM	Muishond Fontein Pelletal Phosphorite Member
MSFD	Multi-Stage Flash Distillation
MW	Mega Watt
NCDM	Northern Cape District Municipality
NDP	National Development Plan
NEMA	National Environmental Management Act
NEMAQA	National Environmental Management: Air Quality Act
NEMBA	National Environmental Management: Biodiversity Act
NEMICMA	National Environmental Management: Integrated Coastal Management Act
NEMWA	National Environmental Management: Waste Act
NERSA	National Energy Regulator of South Africa
NGA	National Groundwater Archive
NID	Notice of Intent to Develop
NOx	Nitrogen Oxide
NSD	Noise Sensitive Developments
OCGT	Open Cycle Gas Turbine
PCS Africa	Power & Combustion Services Africa
PM	Particulate Matter
PV	Photovoltaics
RISFSA	Road Infrastructure Strategic Framework for South Africa
RO	Reverse Osmosis
RoW	Right of Way
S&EIR	Scoping and Environmental Impact Report
SABAP	South African Bird Atlas Project
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SBLM	Saldanha Bay Local Municipality
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SDFP	Spatial Development Framework Plan
SO2	Sulfur Dioxide

TB	Tuberculosis
TDS	Total Dissolved Solids
TNPA	Transnet National Ports Authority
UAV	Unmanned Aerial Vehicle
UNIDO	United Nations Industrial Development Organization
VOC	Volatile Organic Compounds
WCDM	West Coast District Municipality
WML	Waste Management Licence
ZLD	zero liquid discharge

List of Abbreviations and Terms

BAR	Basic Assessment Report
BFS	Bankable Feasibility Study
CBA	Critical Biodiversity Area
CCGT	Combined Cycle Gas Turbine
CFR	Cape Floristic Region
CNG	Compressed Natural Gas
CWDM	Cape Winelands District Municipality
DBSA	Development Bank of Southern Africa
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DOE	Department of Energy
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EPC	Engineering Procurement Construction
ERA	Electricity Regulations Act
ERM	Environmental Resources Management
GDPR	Regional Gross Development Product
GJ	Giga Joules
GNR	Government Notice Regulation
GUMP	Gas Utilisation Master Plan
HP	High Pressure
HFO	Heavy Fuel Oil
HRSG	Heat Recovery Steam Generator
HV	High Voltage
IDZ	Industrial Development Zone
HWC	Heritage Western Cape
IPCSA	International Power Consortium South Africa
IPPPP	Independent Power Producers Procurement Programme
IRP	Integrated Regional Plan
LNG	Liquefied Natural Gas
LP	Low Pressure
NCDM	Northern Cape District Municipality
NDP	National Development Plan
MW	Mega Watt
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NEMWA	National Environmental Management: Waste Act
NEMAQA	National Environmental Management: Air Quality Act
NEMICMA	National Environmental Management: Integrated Coastal Management Act
NERSA	National Energy Regulator of South Africa
NID	Notice of Intent to Develop
OCGT	Open Cycle Gas Turbine
PCS Africa	Power & Combustion Services Africa
SAHRA	South African Heritage Resources Agency
SDFP	Spatial Development Framework Plan
S&EIR	Scoping and Environmental Impact Report
TNPA	Transnet National Ports Authority
ToR	Terms of Reference

WCDM	West Coast District Municipality
WML	Waste Management Licence

1 INTRODUCTION

1.1 PROJECT BACKGROUND

The International Power Consortium South Africa (IPCSA) has developed a solution to Saldanha Steel's requirement for stable, economical electricity over the long term. This solution consists of a 1507 MW (net capacity) Combined Cycle Gas Turbine (CCGT) power plant to be erected adjacent to ArcelorMittal's Saldanha Steel site.

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 Bankable Feasibility Study (BFS) completion.

The Project will require Liquefied Natural Gas (LNG) as its main fuel supply and will consume about 76 Million Gigajoules of natural gas per year. LNG will be supplied by ship to the Port of Saldanha, where it will be regasified and then offloaded via a submersible pipeline either from a mooring area located off shore or a berthing location in the Port in Saldanha. Initial discussions have been held with Transnet National Ports Authority (TNPA) in Saldanha in this regard (1).

The Project will supply the power needs of ArcelorMittal Saldanha Steel (+/- 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.

1.2 PURPOSE OF THIS REPORT

Environmental Resources Management Southern Africa (ERM) has been appointed by ArcelorMittal to conduct the Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998, as amended). This EIA Report has been compiled as part of the EIA process in accordance with the regulatory requirements stipulated in the EIA Government Notice Regulations (GNR 982/2014) promulgated in terms of Section 24(5) of NEMA.

This EIA has been undertaken in three phases, namely Scoping Phase, Specialist Study Phase and Impact Assessment Phase. This EIA Report documents the findings of the Specialist Study and Impact Assessment Phases.

(1) The supply of fuel and import facilities have not been considered in this EIA. The Department of Energy initiated a project in 2015 to permit the construction of an LNG import terminal at the Port of Saldanha, it was understood that individual developers were not required to undertake the EIA for this component. Should this information change, a separate EIA for the import of gas will be undertaken.

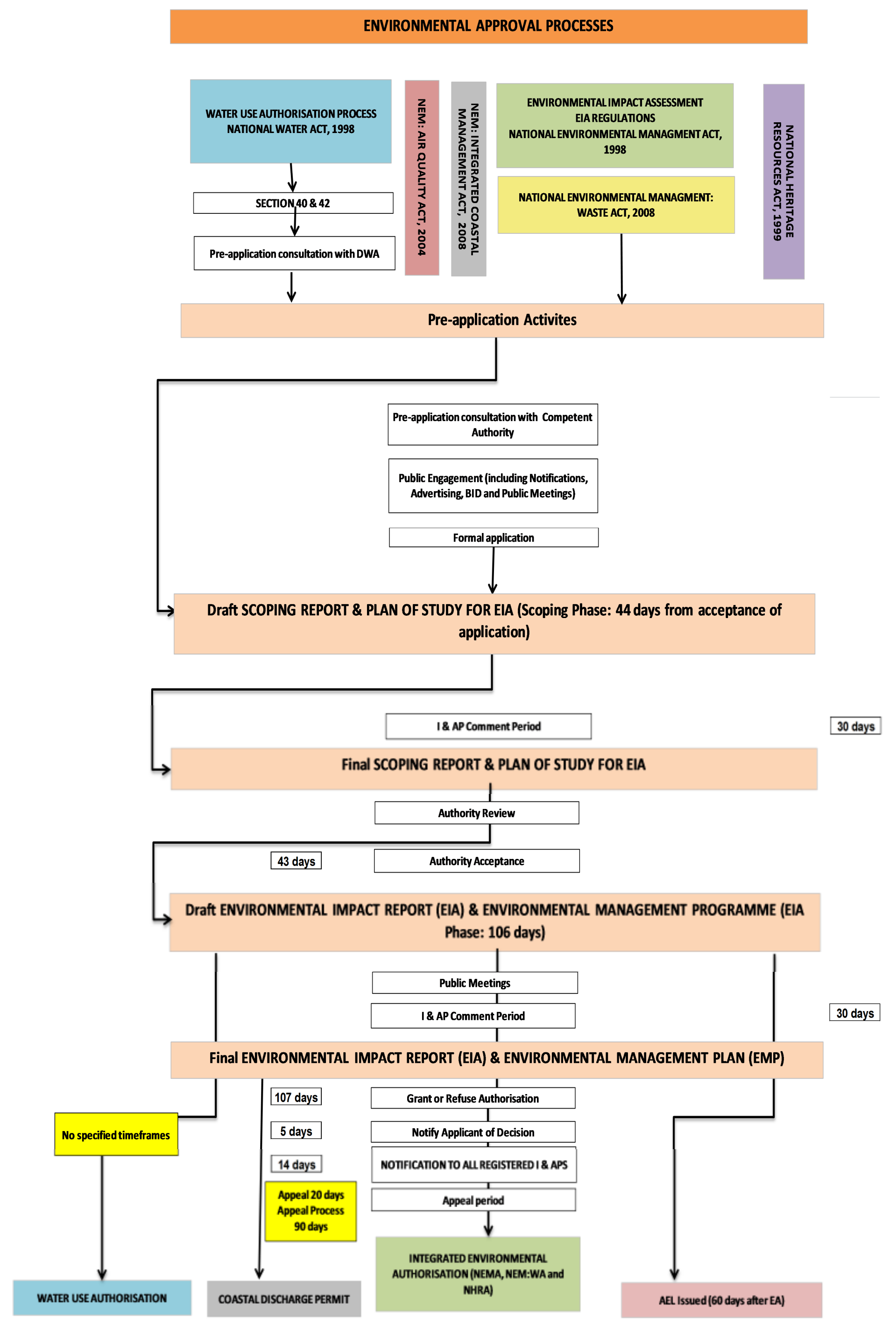
The purpose of this EIA is to present the following:

- A detailed description of the proposed Project and relevant Project alternatives;
- The EIA process and a legal review of legislation and guidelines pertinent to the proposed Project and associated EIA;
- The outcomes associated with stakeholder engagement activities carried out to date;
- A detailed baseline review of the physical, biological and socio-economic characteristics of the study area;
- An assessment of impacts to the physical, biological and socio-economic environments related with the different phases (construction, operational and decommissioning phases) of the proposed Project;
- Mitigation measures that aim to avoid /minimise/manage the severity of identified impacts; and
- An assessment of cumulative impacts associated with project-related developments in the study area.

1.3 OVERVIEW OF THE EIA PROCESS

The EIA process in South Africa is regulated by the NEMA Environmental Assessment Regulations (GNR R982/2014). The overall Scoping and EIR process is illustrated in *Figure 1.1.*

Figure 1.1 Integrated Environmental Impact Assessment Process



1.3.1 Pre Assessment Public Participation

The EIA process is initiated through a pre-assessment Public Participation Process (PPP). The pre-assessment process is not a mandatory requirement in terms of the EIA regulations (2014) but is beneficial in order to identify Interested and Affected Parties (I&APs). An open house meeting was held at

Hoedjiesbaai Hotel, Saldanha Bay on 16 February 2016 to present the proposed Project and solicit input from stakeholders into the scoping process.

1.3.2 Application

An application form for the Project was completed and submitted to the National Department of Environmental Affairs (DEA) on 22 February 2016. The application included the proposed listed activities for the Project. The DEA responded on the 25 February 2016 acknowledging receipt of the application.

1.3.3 Scoping

A principal objective of the scoping phase is to identify the key physical, biological and socio-economic issues and those Project activities with the potential to cause or contribute to impacts to the environmental and social receptors.

At the scoping stage, the key issues are identified (often together with input from key stakeholders) and understood to a level which allows the definition of the Plan of Study for the EIA.

Issues that are not relevant are scoped out. This enables the resources for the EIA to be focused on collecting required information and identifying significant impacts while carrying out specialist studies and stakeholder engagement activities in an effective and efficient manner.

The draft Scoping Report was made available to stakeholders through the Project website, selected libraries, and hard copies provided on request for a period of 30 days (4 March – 6 April 2016). After the 30 day public comment period, a Comments and Responses Report was compiled and included as an annex to the Final Scoping Report. The objective of the stakeholder engagement undertaken was to present the proposed Project and EIA process as well as identify associated issues, concerns and opportunities. Further details on the stakeholder consultation and engagement process are included in *Chapter 9*.

A Final Scoping Report, including ToR for the EIA, was submitted to the DEA on 11 April 2016. The letter of acceptance from DEA for the Scoping Report was received on 16 May 2016. The Final Scoping Report addressed comments received by the proponent on the draft Scoping Report during the 30 day public comment period mentioned above.

1.3.4 Baseline Data Collection

The EIA report provides a description of the existing biophysical, biological and socio-economic conditions as a basis against which the impacts of the Project can be assessed. The baseline includes information on receptors and resources that were identified during scoping as having the potential to be significantly affected by the proposed Project. The description of the baseline has the following main objectives:

- to identify the key physical, biological and socio-economic resources and conditions in areas potentially affected by the Project;
- to describe, and where possible quantify, their characteristics (i.e. their nature, condition, quality and extent);
- to provide data to aid the prediction and evaluation of possible impacts;
- to inform judgements about the importance, value and sensitivity or vulnerability of resources and receptors; and
- to serve as a reference for future monitoring of impacts of the Project.

For the current Project, baseline data collection was obtained from existing sources including previous EIAs, government census data, and existing academic research documents.

Additional primary baseline data were collected by the noise, heritage, flora and fauna specialists (specialists details provided in *Section 1.5.3* below).

1.3.5 Quantitative Assessment

The following quantitative studies were undertaken by the EIA team to support the impact assessment:

- An assessment of the potential noise impacts of the construction and operations phases of the power plant and associated infrastructure.
- An assessment of the potential impacts on air quality during the construction and operation of the power plant, including cumulative impacts.
- A Quantitative Risk Assessment of the risks associated with the natural gas pipeline and the storage of Propane on site.

1.3.6 Impact Assessment

Impact assessment and development of mitigation measures is an iterative process that commences during the scoping stage and continues throughout the EIA process. The key objectives of this process are as follows:

- To analyse how the Project may interact with the baseline conditions in order to define, predict and evaluate the likely extent and significance of environmental, social and health impacts that may be caused by the Project.

- To develop and describe acceptable and cost effective mitigation measures that avoid, reduce, control, remedy or compensate for negative impacts and enhance positive benefits.

- To evaluate the predicted positive and negative residual impacts of the Project.

- To develop a system whereby mitigation measures will be integrated with the Project and will be taken forward as commitments. This is achieved through the development of a draft Environmental Management Programme, included in *Chapter 11*.

The objectives of the impact assessment process described above may thus be summarised by reference to the following four main steps:

- Prediction of what will happen as a consequence of Project activities;
- Evaluation of the importance and significance of the impact;
- Development of mitigation measures to manage significant impacts where practicable; and
- Evaluation of the significance of the residual impact.

Where significant residual impacts remain after mitigation measures are applied, further options for mitigation may be considered and impacts re-assessed until they are reduced to as low as reasonably practicable (ALARP) levels. This approach takes into account the technical and financial feasibility of mitigation measures.

In addition to predicted impacts from planned activities, those impacts that could result from an accident or a non-routine event within the Project are taken into account. In these cases the likelihood (probability) of the event occurring is considered. The impact of non-routine events is therefore assessed in terms of the risk, taking into account both the consequence of the event and the probability of occurrence.

1.3.7 Management Planning

The range of measures to mitigate impacts identified through the EIA process is reported in the EIA report within the project description and impact assessment chapters. These have been brought together in the draft EMPr for the Project (see *Chapter 11*).

The EMP consists of the set of management, mitigation and monitoring measures to be taken during implementation of the Project, to eliminate adverse environmental and socioeconomic impacts, offset them, or reduce them to acceptable levels. The plan details the specific actions that are required to implement the controls and mitigation measures that have been agreed through the EIA process, including details on monitoring, responsible parties, documentation and reporting and estimated costs.

1.3.8 *Reporting and Disclosure*

This draft EIA will be released for a 30 day public comment period. Notifications will be sent out to I&APs. The report will be made available online on the Project webpage (www.erm.com/saldanhasteel) and in the Saldanha Bay Library.

Comments received will be incorporated into a revised version of the EIA report and documented in the Comments and Responses Report. The Final EIA report will be submitted to the DEA for decision making.

1.4 *THE APPLICANT*

The contact details for the applicant are presented below:

Box 1.1 Contact Details of the Applicant

ArcelorMittal South Africa
Saldanha Works t/a Saldanha Steel Pty Ltd
Reg. No: 1995/00628/07
Private Bag X11
Saldanha
7395
Tel: 022 709 4000
Fax: 022 709 4296

1.5 *THE EIA TEAM*

1.5.1 *ERM Southern Africa*

ERM is a global environmental consulting organisation employing over 5,000 specialists in over 150 offices in more than 40 countries. In South Africa, ERM Southern Africa employs over 150 environmental consultants out of offices in Johannesburg, Durban and Cape Town.

Declaration of Independence

The requirement for environmental consultants to act independently and objectively is a well-established principle in South African law and elsewhere. The EIA regulations (GNR 982/2014), specifically state that:

"'independent', in relation to an EAP, a specialist or the person responsible for the preparation of an environmental audit report, means –

(a) that such EAP, specialist or person has no business, financial, personal or other interest in the activity or application in respond of which that EAP, specialist or person is appointed in terms of these Regulations; or

(b) that there are no circumstances that may compromise the objectivity of that EAP, specialist or person in performing such work;

excluding-

(i) normal remuneration for a specialist permanently employed by the EAP; or

(ii) fair remuneration for work performed in connection with that activity, application or environmental audit."

ERM is a privately owned company registered in South Africa. ERM has no financial ties to, nor is ERM a subsidiary, legally or financially, of ArcelorMittal. Remuneration for the services by the Proponent in relation to this EIA is not linked to an approval by the decision-making authority. Furthermore, ERM has no secondary or downstream interest in the development.

The role of the environmental consultants is to provide credible, objective and accessible information to government and other stakeholders, so that an informed decision can be made about whether the project should proceed or not.

1.5.2 The ERM Project Team

The ERM team selected for this Project possess the relevant expertise and experience to undertake this EIA. As such, ERM has signed the legally required declaration of independence to function as an objective Environmental Assessment Practitioner (EAP). The CVs and details of the independent EAP are presented in *Annex A*.

The contact details of the EAP for the application are presented in *Box 1.2.*

Box 1.2 Contact Details of the EAP

Environmental Resources Management Southern Africa (Pty) Ltd.
Postnet Suite 90
Private Bag X12
Tokai
7966

Mr Stuart Heather Clark
2nd Floor | Great Westerford | 240 Main Road | Rondebosch | 7700
Cape Town | South Africa
T +27 21 681 5400 | F +27 21 686 0736
E stuart.heather-clark@erm.com

The core EIA team members involved in this EIA are listed in *Table 1.1*.

Table 1.1 The EIA Team

Name	Role	Qualifications, Experience
Stuart Heather-Clark	Partner in Charge	BSc., MPhil. Registered EAP >20 years
Stephan van den Berg	Project Manager	BSc (Hons) > 9 years' experience
Claire Alborough	Environmental Specialist	BSc (Hons), MPhil, > 8 years' experience
Lindsey Bungartz	Social Specialist	BSocSc (Hons), >8 years' experience
Nadia Mol	Environmental Specialist	BSc (Hons) Pr.Sci.Nat > 17 years' experience

1.5.3 Specialist Team

The following specialists have been appointed to provide input into this EIA process. The specialists' reports are attached in *Annex D*. As required by the DEA, peer reviews have been undertaken for the specialist studies done internally by ERM.

Table 1.2 List of EIA Specialists

Specialist Study	Specialist
Air quality	uMoya-NILU Consulting (Pty) Ltd
Terrestrial flora	Nick Helme Botanical Surveys
Terrestrial fauna	Simon Todd Consulting
Noise	Enviro Acoustic Research cc
Cultural and heritage	ACO and Associates
Palaeontology	ACO and Associates
Socio-economic	ERM
Quantitative Risk Assessment	ERM
Climate change	ERM

1.6 UNDERTAKING BY EAP

ERM believes that the information provided in this EIA Report is correct, based on what has been received from the proponent and specialists thus far. Inputs and recommendations from the specialists' reports have been included into the report where relevant.

Proof of correspondence between the EAP and I&APs is included in *Annex C*.

1.7 ASSUMPTIONS AND LIMITATIONS

During the compilation of this EIA Report, the following limitations and assumptions were made:

- Information sourced from secondary sources was correct.
- The report was prepared based on the most up to date project description provided. However, it should be recognised that during the course of the design phase, the project description may be amended.
- All information received from the proponent and associated specialist team is accurate.

1.8 REPORT STRUCTURE

The remainder of this Report is structured as follows:

- Chapter 2: Project Motivation
- Chapter 3: Project Description
- Chapter 4: Project Alternatives
- Chapter 5: Administrative and Legal Framework
- Chapter 6: Biophysical Baseline
- Chapter 7: Social Baseline
- Chapter 8: Stakeholder Engagement
- Chapter 9: EIA Methodology
- Chapter 10: Impact Assessment and Mitigation
- Chapter 11: Environmental and Social Management Plan
- Chapter 12: Summary and Conclusion

The Report is supported by the following annexes:

- Annex A: Details of Environmental Assessment Practitioner and Declaration of Independence
- Annex B: Stakeholder Engagement Materials
- Annex C: Layout Plans and Maps
- Annex D: Specialist Reports

1.9 EIA REPORT REQUIREMENTS AS PER EIA REGULATIONS GNR 982/2014

Table 1.3 illustrates the legislated content of the EIA Report.

Table 1.3 Legislated Content of EIA Report (GNR 982/2014) and Corresponding Sections in this Report

Legislated Content- Appendix 3 Section 3	**Section in this Report**
(a) details of-	
(i) the EAP who prepared the report	*Annex A*
(ii) the expertise of the EAP, including a curriculum vitae	
(b) the location of the activity (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	*Chapter 3*
(c) a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	*Chapter 3 and Annex C*
(d) a description of the scope of the proposed activity, including-	
(i) all listed and specified activities triggered and being applied for; and	*Chapter 5*
(ii) a description of the associated structures and infrastructure related to the development;	*Chapter 3*
(e) a description of the policy and legislative context within which the development is located and explanation of how the proposed development complies with and responds to the legislation and policy context;	*Chapter 5*
(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;	*Chapter 2*
(g) a motivation for the preferred development footprint within the approved site;	*Chapter 4*
(h) a full description of the process followed to reach the proposed development footprint within the approved site, including:	
(i) details of all the development footprint alternatives considered;	*Chapter 4*
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	*Chapter 8 and Annex B*
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	*Chapter 8 and to be included in Final EIA report*
(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	*Chapters 6 and 7*
(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated.	*Chapter 10*
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives	*Chapter 4*
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	*Chapter 4 and Chapter 10*
(viii) the possible mitigation measures that could be applied and level of	*Chapter 10 and*

Legislated Content- Appendix 3 Section 3	**Section in this Report**
residual risk	*11*
(ix) if no alternative development locations for the activity were investigated, the motivation for not considering such; and	*N/A*
(x) a concluding statement indicating the preferred alternative development location within the approved site;	*Chapter 4*
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-	
(i) a description of all environmental issues and risks that were identified during the environmental impact process; and	*Chapter 10*
(ii) an assessment of the significance of each issue and risk and an identification of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	*Chapter 10*
(j) an assessment of each identified potentially significant impact and risk, including-	*Chapter 10*
(i) cumulative impacts;	
(ii) the nature, significance and consequences of the impact and risk;	
(iii) the extent and duration of the impact and risk;	
(iv) the probability of the impact and risk occurring;	
(v) the degree to which the impact and risk can be reversed;	
(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and	
(vii) the degree to which the impact and risk can be mitigated;	
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	*Chapter 10 and Annex D*
(l) an environmental impact statement which contains-	*Chapter 10 and 12*
(i)a summary of the key findings of the environmental impact assessment;	
(ii)a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	
(iii)a summary of the positive and negative impacts of the proposed activity and identified alternatives;	
(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	*Chapter 10 and 11*
(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through assessment;	
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	*Chapter 10 and 12*
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	*Chapter 12*
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	*N/A*

Legislated Content- Appendix 3 Section 3	**Section in this Report**
(s) an undertaking under oath or affirmation b the EAP in relation to:	*Chapter 1 and Annex A*
(i) the correctness of the information provided in the reports;	
(ii)the inclusion of comments and inputs from stakeholders and I&APs;	
(iii)the inclusion of inputs and recommendations from the specialist reports where relevant; and	
(iv)any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	
(t) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	*N/A*
(u) an indication of any deviation from the approved scoping report, including the plan of study, including-	*N/A*
(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and	
(ii)a motivation for the deviation;	
(v) any specific information that may be required by the competent authority; and	
(w) any other matters required in terms of section24(4)(a) and (b) of the Act.	

2 PROJECT MOTIVATION

When considering an application submitted under the EIA Regulations (GNR 982/2014), the relevant competent authority must take a number of factors into consideration, including the need for, and desirability of the activity.

The need and desirability of this Project is discussed below, including strategic plans, frameworks and policies applicable to the area and Project.

2.1 NEED AND DESIRABILITY

2.1.1 Project Background: South Africa's Energy Crisis

Electricity consumption has outpaced power system capacity building in South Africa (Independent Power Producer (IPP) Projects, n.d.). As a result the country has been experiencing severe electricity supply constraints since 2008. To maintain system stability, load shedding in the form of scheduled rolling black outs are instituted when required, but with negative implications for the economy (IPP Projects, n.d.).

The National Development Plan (NDP) is a long term (2030) development plan and aims to eliminate poverty and reduce inequality by growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society (RSA, 2012). The NDP requires the development of 10,000 MW of additional electricity capacity to be established by 2025, against the 2013 baseline of 44,000 MW (IPP Projects, n.d.). This plan presents the overall national power generation plan.

An Integrated Resource Plan (IRP, 2010) has been developed in addition to the NDP. The IRP outlines the preferred energy mix to meet electricity needs over a 20 year planning horizon to 2030 (IPP Projects, n.d.). In terms of gas turbine power, the IRP highlights the need to commission 2,370 MW with Combined Cycle Gas Turbines (CCGT) technology and 3,910 MW with Peak-Open Cycle Gas Turbine (OCGT) technology by the end of 2030.

In May 2011, the Department of Energy (DoE) gazetted the Electricity Regulations on New Generation Capacity ("New Generation Regulations") under the Electricity Regulation Act, 2006 (Act No. 4 of 2006) ("the ERA"). Section 34 of the ERA and the New Generation Regulations enable the Minister of Energy (in consultation with the National Energy Regulator of South Africa (NERSA)) to determine, *inter alia*, what new capacity is required (IPP Projects, n.d.).

These determinations specify that new generation capacity should be procured from, *inter alia*, hydro, coal and gas sources to support South Africa's

baseload energy mix and that new generation from gas and cogeneration should be part of the medium-term risk mitigation project programme**.**
The proposed ArcelorMittal Saldanha Steel (AMSS) Gas Fired Power Plant Project is thus aligned with the Government's vision for additional power generation in the country. The Project will:

- Initially reduce AMSS's power need off the national grid, by enabling it to be more self-sufficient;
- Further meet the demand for power of other users by providing excess power to the grid;
- Contribute towards the requirements of the IRP in terms of gas power production; and
- Reduce environmental impacts associated with the generation of baseload power through coal and large hydro-dam projects by providing an environmentally cleaner and less harmful alternative.

2.1.2 Alternative Energy Sources

AMSS requires power at a consistent and guaranteed price in order to continue operating beyond 2018. A comparative analysis of alternative methods of generating power was undertaken by AMSS. Based on the needs and desirability for the project, four key criteria were defined for the comparative analysis, as follows:

- Cost per MW hour;
- Baseload power requirement;
- Time to first power; and
- Difficultly of obtaining regulatory approval.

The following power generation options were considered:

1. Nuclear – The cost of this option over a 50 year time horizon is competitive. However, the option was not considered viable because the regulatory framework is very onerous and this option has a very high initial capital expenditure (CAPEX) cost. Also, the time to first power is more than 10 years, which is too long considering the needs of AMSS within the short term.

2. Coal – This option was not considered viable based on the greenhouse gas (GHG) reduction drive and environment emission requirements (National Environment Management: Air Quality Act, 2004) and the feasibility of locating a coal fire power station far from a source of coal.

3. Renewable power (solar PV, concentrated solar or wind energy) – This alternative was investigated in detail. Renewable power generation facilities cannot provide baseload power (without backup storage) so the cost of this option becomes too high for an individual off-taker, since reliance on Eskom would be required in the time periods of no generation

to provide baseload power. In order to achieve total independence, back up storage is required which increases the costs significantly and makes this option too expensive to implement.

With regard to the provision of solar power, when comparing like for like capacity with all the competing technologies, solar has consistently shown to be undesirable; this mainly due to a high capital cost per kW to plant factor ratio. Where solar PV has penetrated the market significantly, high electricity tariffs reflect the cost of energy and thus can only be effectively utilised in wealthier economies where the consumer pays a premium or else the government subsides the higher electricity cost. Other constraints to solar energy options are:

- Changes in output with weather elements.
- Not stable during disturbances.
- Inability to change output on demand and with demand.
- Requires large amounts of land.

It should however be noted that the Project will include solar PV panels on the roof of the buildings. The integration of solar panels will be undertaken after the commissioning of the main plant. It is estimated that up to 500 kW of solar panels can be installed on building roofs, generating up to 800 MWh of solar power per year which will help dissipate the plant's parasitic loads (1).

Winds are irregular, both by season and vary widely diurnally. They also as per solar projects require large tracts of land for the generation of adequate power to make projects viable.

4. Liquid hydrocarbon fuel derivatives and biofuel options – This alternative involves the use of fuels other than gas to fire a power plant. This is not a viable alternative in this case as the cost of generation is unfeasible even when considered in combination with renewables.

5. Waste heat recovery on existing production processes at AMSS – Steam options and lower temperature regimes were considered, but these technologies have low efficiencies and become uneconomical due to long payback periods. This option was therefore not considered viable.

Energy mix for this Project

With regard to the partial use of renewables for energy generation for this project, the following should be noted:

- Alternative renewable energy sources will not present economic benefits, rather environmental benefits. This proposed development has been

(1) Parasitic load refers to the load generated by activities at the power plant which consume electricity, such as the office buildings, workshops, water treatment plants, etc.

assessed to have very few significant associated impacts and therefore the consideration of alternatives to minimise the environmental impacts while significantly increasing the cost of electricity does not appear justified from an overall cost benefit analysis perspective;

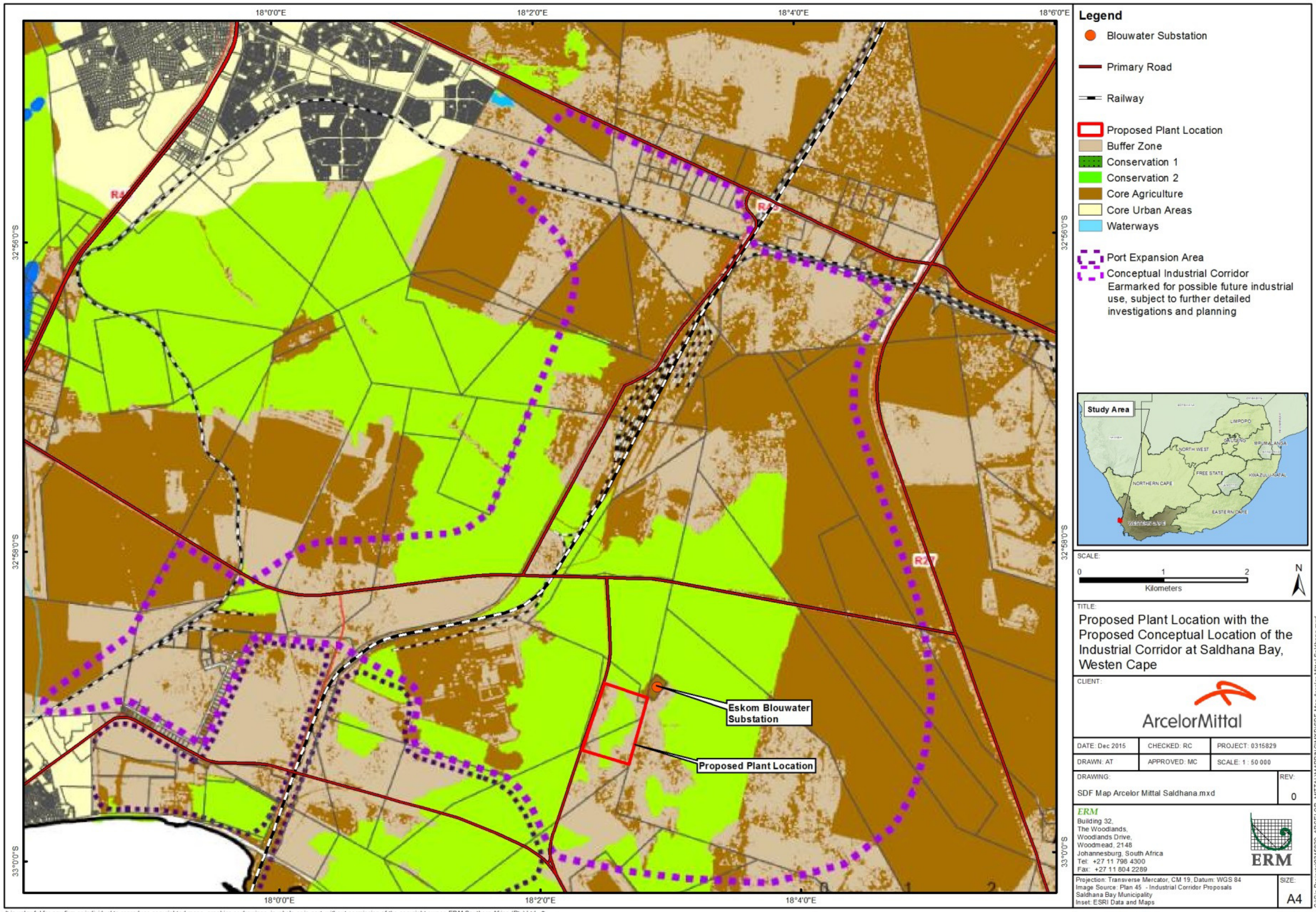
- If gas import volumes are reduced to make use of renewable sources, the gas cost advantage is diminished due to reduced economies of scale;
- The land currently proposed for the project is not sufficient to benefit from the economies of scale that an appropriately sized renewable energy project would provide. A further discussion on location alternatives is provided in *Section 4.1.2*;
- Power supply to AMSS would be unpredictable;
- There would be an unquantifiable annual load factor for the gas turbine consumption and therefore no contractual commitment for the import of natural gas would be possible, thus increasing the cost of gas-generated power for the project.

2.1.3 Compatibility with Local Development Planning

The proposed site for the development of the power plant is in close proximity to both the Port of Saldanha and Vredenburg, within an area referred to by the West Coast District Municipality Spatial Development Framework (SDF, 2014) as the 'growth engine' of the municipality. The SDF also states that the Port of Saldanha is the key economic catalyst within the district and its utilisation and potential should be optimised, through promotion of initiatives such as the Industrial Development Zone (IDZ), better use of the back of port areas and promotion of oil and gas industries.

The Saldanha Bay Local Municipality's SDF (2011) indicates that the proposed power plant site falls within what is referred to in the SDF as a 'planned industrial corridor' (see *Figure 2.1*). The location of the proposed facility therefore is in accordance with the current district and local municipal plans for development.

Figure 2.1 Saldanha Bay Municipality Conceptual Industrial Corridor



Source: Saldanha Bay Municipality SDF (2011)

2.1.4 *ArcelorMittal's Energy Needs*

The current Eskom electricity situation, which affects both the availability as well as the cost of electricity, has resulted in a particularly challenging situation for the manufacturing industry in the Saldanha area. The timing of the energy crisis within South Africa, in combination with the structural changes in the global commodity markets, has the potential to severely constrain the manufacturing industry and, specifically, the companies focused on the export market (where cost pressures cannot be given through to the customer).

AMSS has tried to negate the effect of rising electricity cost through actively engaging in energy efficiency programs run by the Department of Trade and Industry (DTI), United Nations Industrial Development Organization (UNIDO), National Cleaner Production Centre of South Africa (NCPC) and DoE. The plant made significant improvements and has been used as a case study to illustrate what is possible in an industrial environment with energy efficiency [(1)]. However, there is little opportunity for further improvement without significant capital investment in technology.

Electricity prices in South Africa started to rise steeply from 2007 and have increased by 328% up to 2015 / 16. The price escalation going forward is expected to be higher than the Consumer Price Index (CPI) for the next five years. This price path is unaffordable to AMSA (ArcelorMittal South Africa) and in particular AMSS (ArcelorMittal Saldanha Steel). AMSS is competing mainly on the export market and upward electricity cost pressure with high price competiveness in the international market has necessitated AMSS to actively control its cost drivers. From this viewpoint, AMSS has partnered with an IPP, International Power Consortium South Africa (IPCSA), to supply electricity at a particular price affordable to AMSS and with a definite fixed forward price curve.

IPCSA are investigating the option of developing the power plant as a solution to Saldanha Steel's urgent requirement for stable, economical electricity for the long term future. The proposed 1507 MW CCGT plant is to be erected on the AMSS site. Excess electricity will be made available to industries within the IDZ and/or Municipalities within the Western Cape Province.

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(1) ArcelorMittal implemented 15 energy projects which saw the plant reduce their LPR consumption by 40%. They were awarded an Eskom *eta* Award in 2013.

3 PROJECT DESCRIPTION

3.1 PROJECT OVERVIEW

3.1.1 Project Background

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 1507 MW (net capacity) Combined Cycle Gas Turbine (CCGT) power plant to be erected adjacent to the ArcelorMittal's Saldanha Steel site.

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 Bankable Feasibility Study (BFS) completion.

The Project is primarily a power supply project to the Saldanha Steel Plant. Additionally, the proposed power plant will tie into the Department of Energy's (DoE) Gas to Power (G2P) programme [(1)]. The project will support Liquefied Natural Gas (LNG) as its main fuel supply and will consume approximately 76 million Giga Joules of LNG per year. LNG will be supplied by ship to the Port of Saldanha, where it will be regasified and then offloaded via a submersible pipeline either from a mooring area located off shore or a berthing location in the Port in Saldanha. Initial discussions have been held with Transnet National Ports Authority (TNPA) in Saldanha in this regard.

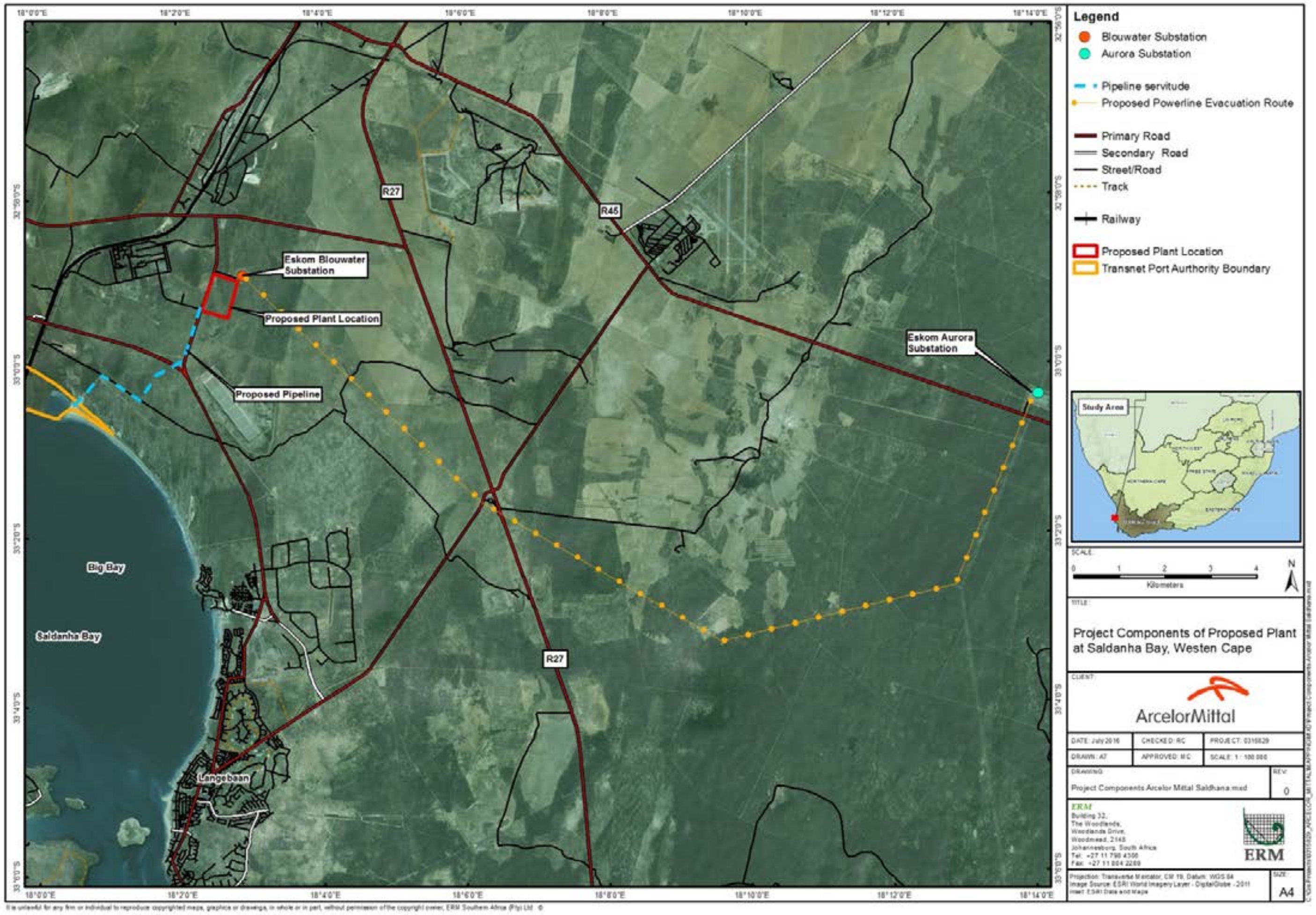
The Project will supply the power needs of ArcelorMittal Saldanha Steel (+/- 160MW of base load energy, peaking up to 250MW) and excess electricity will be made available to industries within the Saldanha Industrial Development Zone (IDZ) and/or Municipalities within the Western Cape Province.

3.1.2 Project Location

The Project is to be developed on a green field site owned by ArcelorMittal, approximately 5 km northeast of the Port of Saldanha (*Figure 3.1*). 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 (2011).

(1) In 2012, the Minister directed in her Determinations that new generation capacity should be procured from hydro, coal and gas sources to support the South Africa's base load energy mix and generation from gas and cogeneration as part of the medium-term risk mitigation project programme. The Determinations require that 3126MW of baseload and/or mid-merit energy generation capacity is needed from gas-fired power generation to contribute towards energy security. The gas required for such power generation will be from both imported and domestic gas resources. (https://www.ipp-gas.co.za/)

*Figure 3.1 Project location and key components**



*Note: 400kV transmission line is shown only for illustration purposes and is not included in the scope of this EIA.

3.1.3 *Land Ownership and Acquisition*

The two properties on which the proposed power plant site is located are detailed in *Table 3.1*.

Table 3.1 Properties which are intersected by the power plant footprint

Farm Name	Portion Number	Parcel Number	SG Code
Yzervarkensrug	129	Remaining Extent	W014C04600000000012900000
Jackels kloof	195	2	W014C04600000000019500002

The proposed pipeline corridor intersects with the properties as listed in *Table 3.2*.

Table 3.2 Properties which are intersected by the pipeline corridor

Farm Name	Portion Number	Parcel Number	SG Code
None	0	1185	W014C046000000001185000000
STATE LAND 196	0	196	W014C046000000000196000000
HOPEFIELD 195	195	0	W014C046000000000195000001
HOPEFIELD 195	7	195	W014C046000000000195000070
Farm 195	1	195	W014C046000000000195000010
Jackals Kloof 195	2	195	W014C046000000000195000020
None	0	1132	W014C046000000001132000000
YZERVARKENSRUG 129	0	129	W014C046000000000129000001

The proposed feeder transmission line from the power plant to ArcelorMittal Steel intersects with the properties as listed in *Table 3.3*.

Table 3.3 Properties which are intersected by proposed feeder transmission line from the power plant to ArcelorMittal Steel

Farm Name	Portion Number	Parcel Number	SG Code
YZERVARKENSRUG 129	0	129	W014C046000000000129000001
YZERVARKENSRUG 129	3	129	W015C046000000000129000030
None	0	1132	W014C046000000001132000000

3.2 PROJECT AREA OF INFLUENCE

For the purposes of this impact assessment, the definition of the Area of Influence (AoI) encompasses:

- *'The area likely to be affected by: (i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; (ii) impacts from unplanned but* *predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.*

- *Associated facilities are facilities that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.*

- *Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.'*

For the Project, the **direct** AOI is the spatial extent of the Project footprint and related facilities on the receiving environment. This encompasses:

- Power plant total surface area (area within the fence line);
- Pipeline construction (temporary) Right of Way (RoW); and
- 132kV feeder transmission line to ArcelorMittal RoW.

A breakdown of the surface areas for these components is provided in *Table 3.1* and is shown later in this section in *Figure 3.4*.

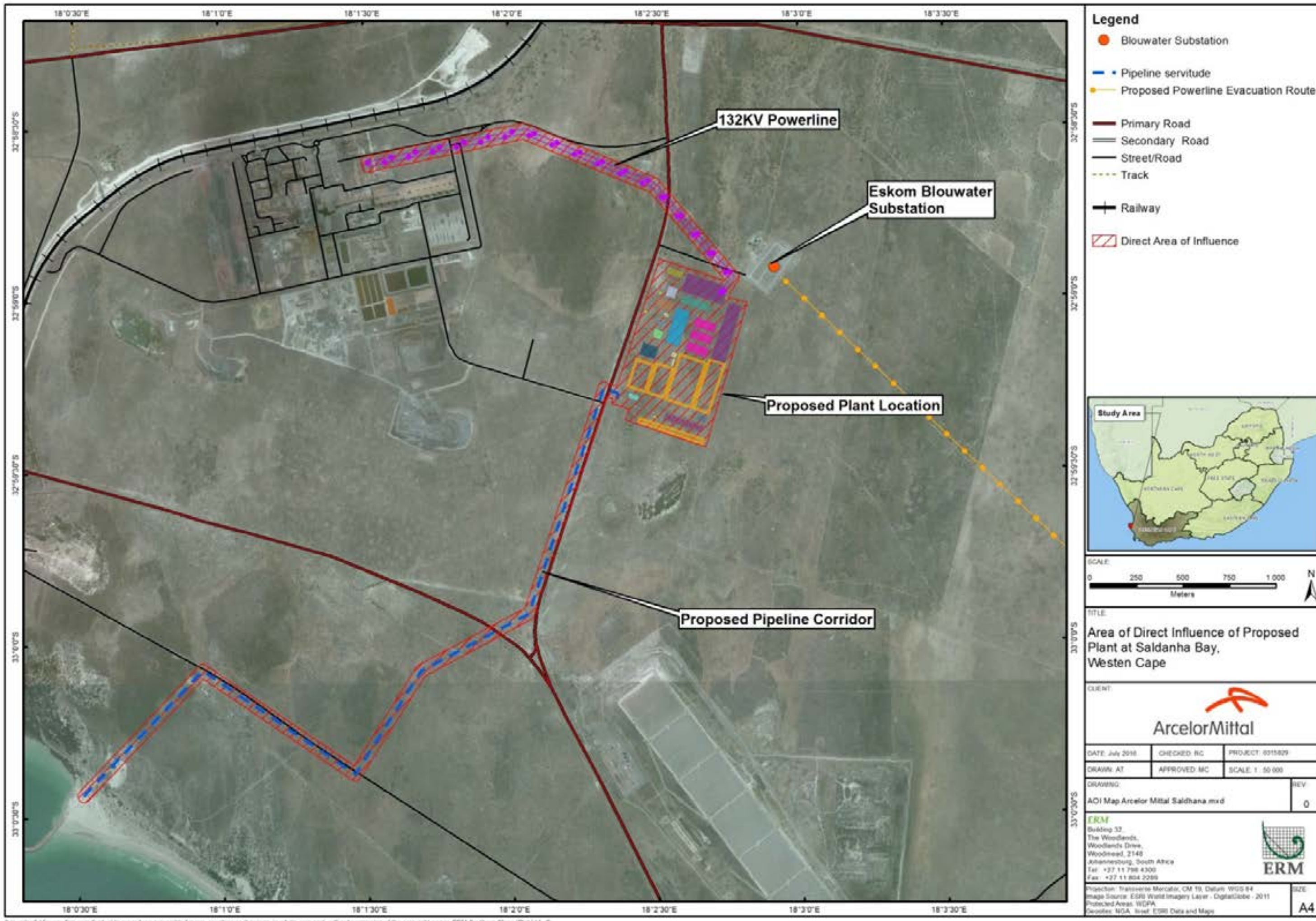
Table 3.4 Footprint of project components

Project Component	**Area (ha)**
Main Project Components	
Power plant total surface area (area within the fence line)	45.83
Pipeline construction (temporary) RoW	30.49
Pipeline permanent easement	2.76
132kV feeder transmission line to ArcelorMittal RoW	7.22
Components within the power plant site	
1.5 MW Generator	0.09
132KV Switchyard	2.40
440KV Switchyard	2.48
Admin, Control, Laboratory	0.25
Air-Cooled Condensers	1.56
Canteen, Changing Rooms, Ablutions	0.09
Clinic	0.01
Construction Changing Rooms & Ablution Block	0.18
Emergency Assembly Point	0.04
Gas Pipeline Receiving Area	0.18
Gas Turbine, Steam Turbine and HRSG Islands	1.89
Hard Standing Laydown Area	9.64
Laydown Area	0.69
Other	0.03
Pigging and Gas Metering Area	0.07
Reverse Osmosis, MSFD, Salt Residue	0.05
Sewerage Treatment Plant	0.12
Stormwater Collection Tanks	1.20
Trent Gas Turbines	0.73

Project Component	Area (ha)
Truck Staging & Laydown Area	0.36
Visitors and Training Centre	0.07
Water Filtration	0.02
Water Treatment, Raw Water Storage, Fire Fighting Water	0.59
Workshop Warehouse and Spares	0.33

The **indirect** AOI encompasses areas potentially affected by cumulative impacts as well as areas that could be impacted indirectly by Project activities. The indirect AOI will differ between various resources and receptors depending on the dependencies. For example, indirect impacts to soils would be likely limited to the immediate areas around the direct footprint. Indirect impact to social resources may however extend to nearby communities along the coast which may be affected by the Project.

Figure 3.2 Project Area of Influence (AoI)



3.3 PROJECT COMPONENTS

The key project components considered in this EIA are as follows:

- Pipeline;
- Power plant; and
- Power evacuation and connection to the grid (1).

These are discussed in detail in the sections below. The general surface areas for the project components are listed in *Table 3.5* below.

Table 3.5 Project components general surface areas and lengths

Project Component	Area / Length
Power Plant total surface area	45.83 ha
Length of pipeline	4.6km
Pipeline construction (temporary) RoW (36m width)	30.49 ha
Pipeline permanent easement (6m width)	2.76 ha
132kV feeder transmission line to ArcelorMittal length	2.4km
132kV feeder transmission line to ArcelorMittal RoW (30m width)	7.22 ha
Proximity to grid connection	150m

It is envisaged that LNG will be supplied by ship to the Port of Saldanha where it will likely be offloaded to a Floating Storage Regasification Unit (FSRU). The FSRU will regasify the LNG and pump it via a pipeline to the power plant. The supply of fuel and import facilities have not been considered in this EIA. The Department of Energy initiated a project in 2015 to permit the construction of an LNG import terminal at the Port of Saldanha, it was understood that individual developers were not required to undertake the EIA for this component. Should this information change, a separate EIA for the import of gas will be undertaken.

3.3.1 *Power Plant*

General Configuration

Figure 3.4 shows the proposed plant layout. Current plans include six Trent 60 DLE (low NOx) 50 MW (installed gross capacity, refer to *Box 3.1*) gas turbines in open cycle and three identical but independent 435MW SCC5 4000F (installed gross capacity) single shaft generating trains in combined cycle. *Figure 3.3* shows the equipment configuration in a combined cycle system. With reference to *Figure 3.4* the corner points of the proposed power plant boundary are listed in *Table 3.6.*

(1) Note: The transmission connection for Phase 1, i.e. the 132 kV connection to Saldanha Steel, is included in this EIA. The transmission connection for Phase 2, i.e. the 400 KV connection to Eskom's Aurora substation, will be considered in a separate EIA application. See Section 3.4 for details about the phases referred to here.

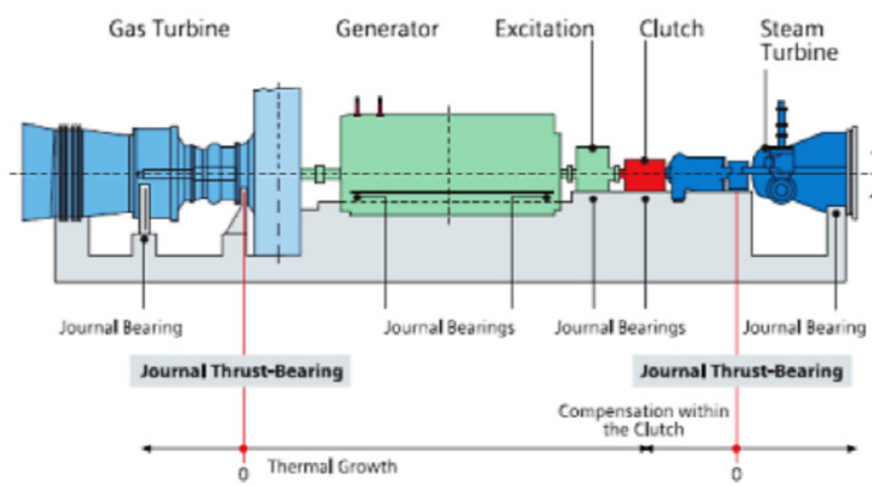
Box 3.1 *Installed Gross Capacity vs Operating Capacity of the Power Plant*

The Installed Gross Capacity is normally the plant generating capacity at 100% loading and ISO conditions. However, it is impossible to test ISO capacity performance in practice since the ISO conditions of temperature, humidity and pressure very seldom occur together for the purposes of testing. Installed gross capacity is the capacity at the generator terminals and is not the energy despatched from the plant.

In the project development environment, power plant engineers consider the power demand of the client and work backwards to design the plant with sufficient on-site capacity that will produce sufficient despatchable power that will fulfil demand. In addition, plant design will be based on site worst conditions, i.e. during summer at low barometric pressure and high humidity. This is known as the *Operating Capacity* of the power plant.

Therefore, a more meaningful expression of capacity is performance at site conditions. The Installed Gross Capacity of the proposed power plant is 1,605MW, and the Operating Capacity is 1,507MW. This report will thus refer to the *Operating capacity* of the power plant throughout, i.e. that of 1,507MW.

Figure 3.3 *Combined Cycle Equipment Configuration*



Source: Combined Cycle Process Description Flow, ArcelorMittal, 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.

Table 3.6 Co-ordinates of the corner points of the proposed power plant boundary.

Point	Longitude	Latitude
A	18° 2.521' E	32° 58.887' S
B	18° 2.755' E	32° 58.956' S
C	18° 2.765' E	32° 58.971' S
D	18° 2.759' E	32° 59.002' S
E	18° 2.823' E	32° 59.014' S
F	18° 2.675' E	32° 59.435' S
G	18° 2.398' E	32° 59.354' S
H	18° 2.410' E	32° 59.323' S
I	18° 2.350' E	32° 59.305' S

Figure 3.4   Power plant functional layout.

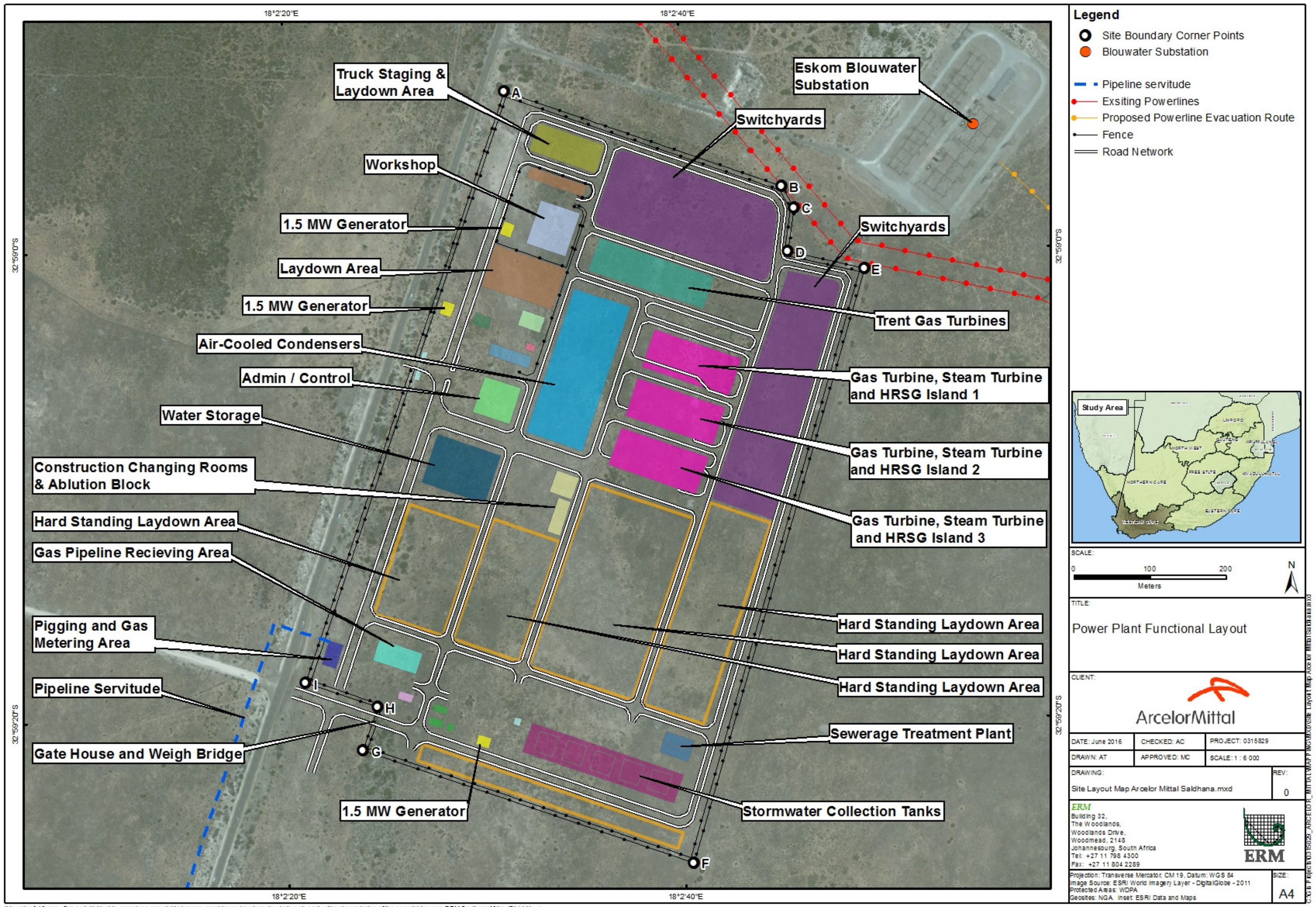


Table 3.7 Power Plant components and their respective footprint areas / lengths

Project Component	Area
1.5 MW Generator	0.09 ha
132KV Switchyard	2.4 ha
440KV Switchyard	2.48 ha
Admin, Control, Laboratory	0.25 ha
Air-Cooled Condensers	1.56 ha
Canteen, Changing Rooms, Ablutions	0.09 ha
Clinic	0.01 ha
Construction Changing Rooms & Ablution Block	0.18 ha
Emergency Assembly Point	0.04 ha
Gas Pipeline Receiving Area	0.18 ha
Gas Turbine, Steam Turbine and HRSG Island 1	1.89 ha
Hard Standing Laydown Area	9.64 ha
Laydown Area	0.69 ha
Other miscellaneous infrastructure	0.03 ha
Pigging and Gas Metering Area	0.07 ha
Reverse Osmosis, MSFD, Salt Residue	0.05 ha
Sewerage Treatment Plant	0.12 ha
Stormwater Collection Tanks	1.2 ha
Trent Gas Turbines	0.73 ha
Truck Staging & Laydown Area	0.36 ha
Visitors and Training Centre	0.07 ha
Water Filtration	0.02 ha
Water Treatment, Raw Water Storage, Fire Fighting Water	0.59 ha
Workshop Warehouse and Spares	0.33 ha
Road surface area (total)	6.9ha
Propane storage vessels	3
Propane storage volume on site (total)	30 m^2
Height of stacks	60m (max)

Project Component	**Area**
Capacity of on-site substation	132 KV substation for phase 1 400 KV substation for Phase 2
Type of perimeter fencing	ClearVu Reinforced
Perimeter fence length	2.8km
Perimeter fence height	3 m

Power generation equipment

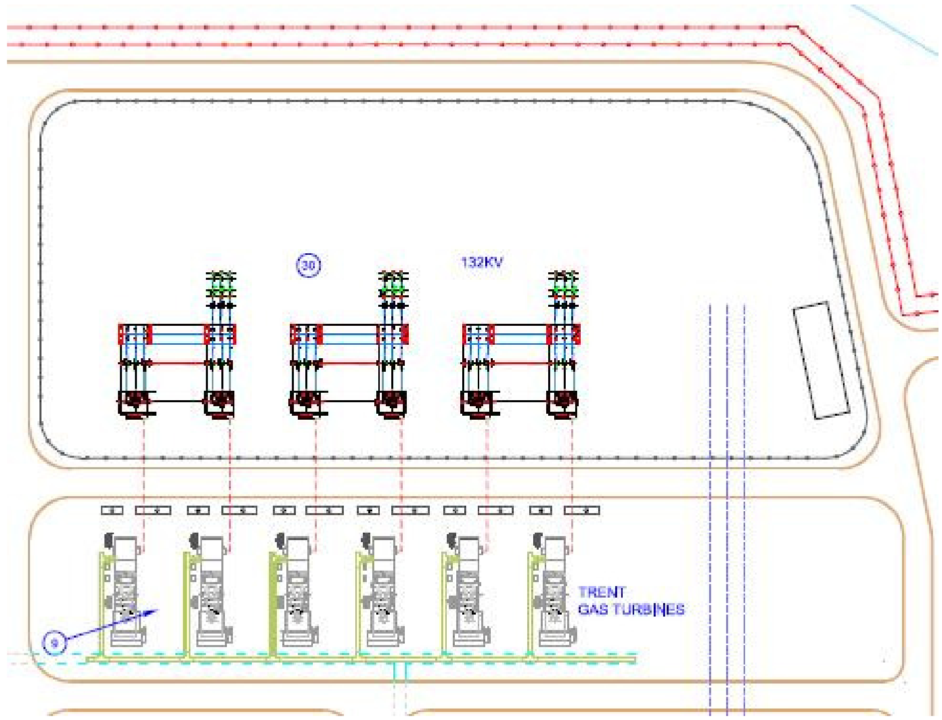
132 kV 300MWe Block

This consists of 6 x TRENT 60 DLE (low NOx) gas turbines. These will be the first units to be installed. They will operate on natural gas in open cycle and will be dedicated to supply ArcelorMittal. One gas turbine is a redundant unit to ensure continuous uninterrupted supply.

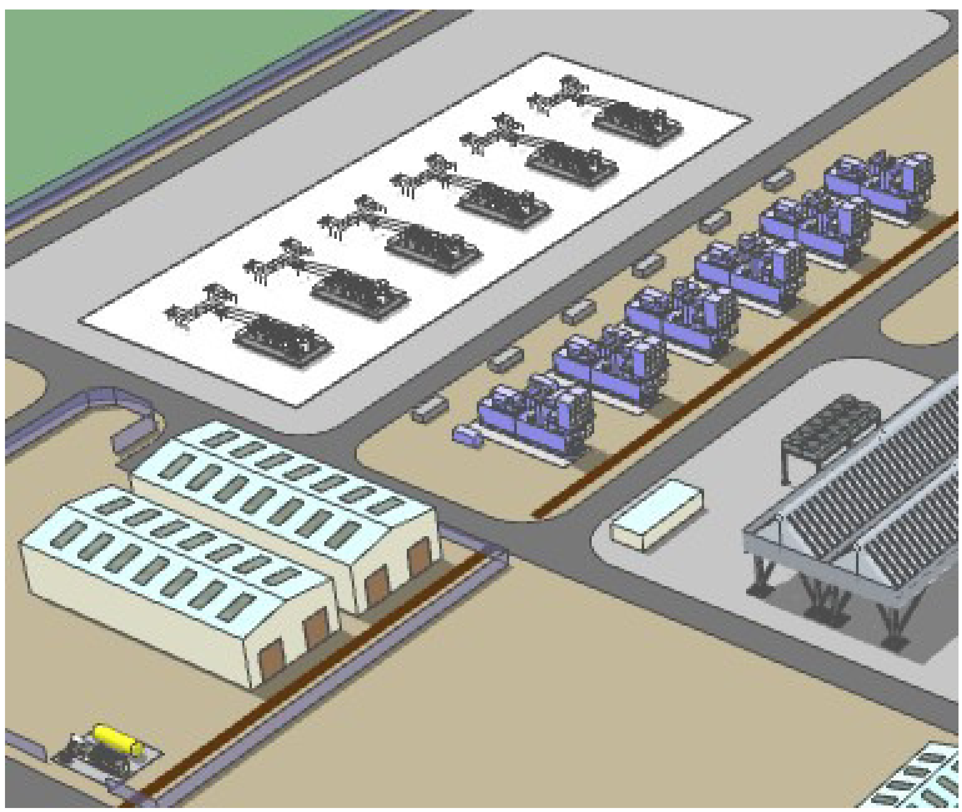
At a later stage, it would be possible to convert at least two units to combined cycle technology which would improve efficiency.

Figure 3.5 132kV, 300MWe Block layout (A) and 3D rendering (B)

A



B

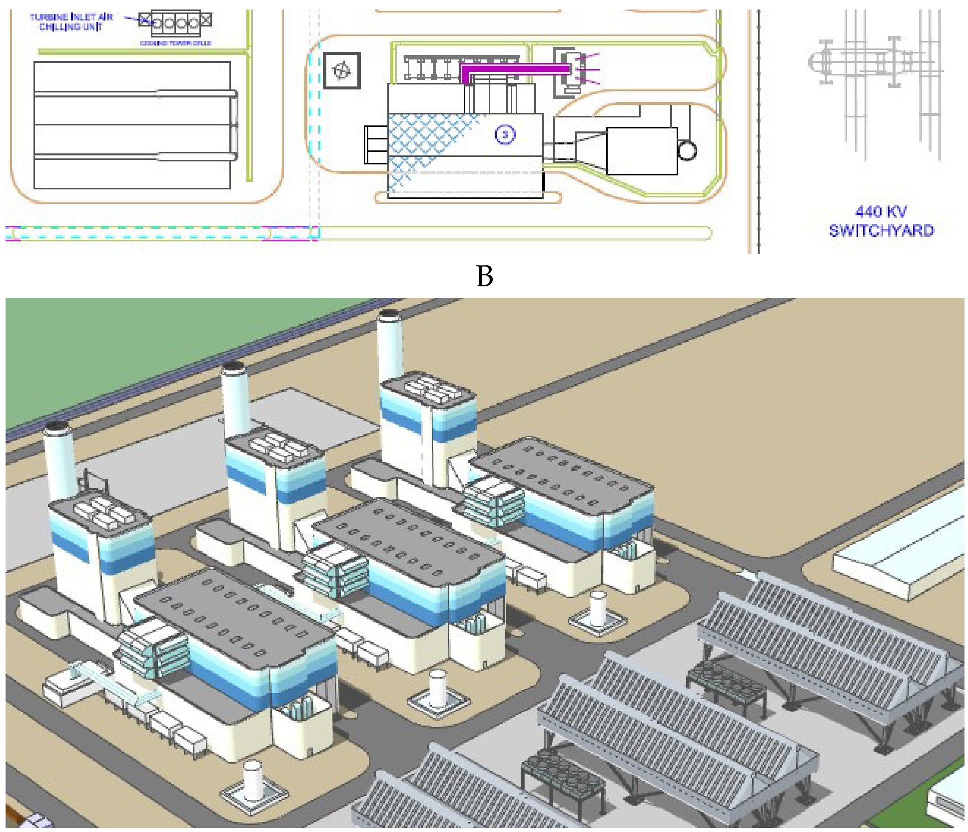


400kV 1200 MWe Block

This consists of three identical but independent, SCC5-4000F single-shaft generating trains, each providing 439 MWe net output capacity at 22kV net in combined cycle configuration [1]. The generated power will be stepped up to 400kV before being evacuated via the 400kV switchyard and through the national grid network. The steam turbine exhaust is condensed by ACCs and returned to the boiler feed storage tank in order to save on water consumption.

Figure 3.6 400kV 1200 MWe Block layout (A) and 3D rendering (B)

A



Fuel is natural gas which will be piped up to the plant site at sufficient pressure for feeding directly to the gas turbines by underground pipeline. Emissions of CO2, NOx and CO are much reduced compared to coal-fired power plants.

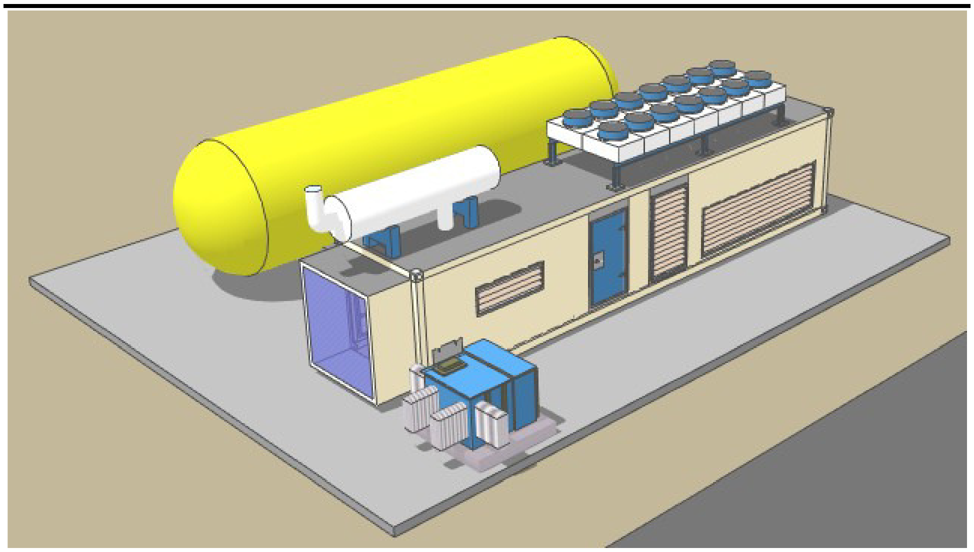
(1) Net gross capacity is 446 MW at ISO conditions 100% maximum continuous rating at average site conditions. The net power output, i.e. operational power at 100% loading is 439 MW at average site conditions.

Black-Start Power Generation

The construction phase will require electricity for security site lighting and for driving equipment such as air compressors, a cement batch plant, and lighting up site offices, water purification, isolation valves and safety instrumentation along the incoming sea-water and gas pipelines.

This initial electricity will be generated on site by three internal combustion generators running on liquid petroleum gas (LPG or propane) supplied by road tanker. The unit is shown in blue *Figure 3.7* below and the propane tanks are shown in yellow.

Figure 3.7 Black-start power generation



After the plant has been constructed, the same generators will play an important part in assisting in the start-up and commissioning of the main power plant units, TRENTS and SCC5-4000F trains. They will also be used as stand-by emergency black- start generators, or in the event that some balance-of- plant system, for example outdoor site lighting, or workshops and warehouse, become unserviceable due to a fault.

Other power generation

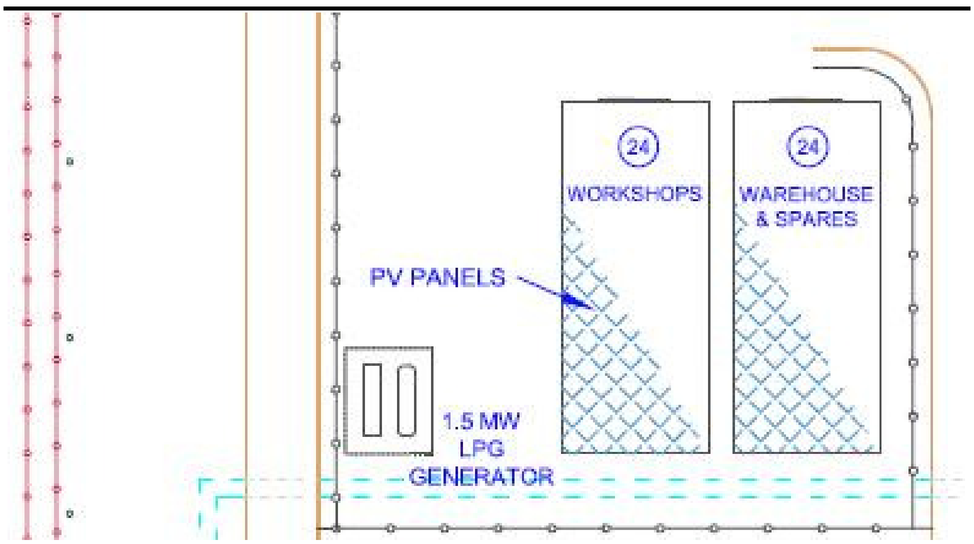
Buildings will be designed such that the roofs can be populated by solar PV panels. The integration of solar panels will be undertaken after the commissioning of the main plant. Available land area is limited for renewable power generation, as such the only viable option is a small capacity PV array. It is estimated that up to 500 kW of solar panels can be installed on building roofs, generating up to 800 MWh of solar power per year which will help dissipate the plant's parasitic loads [1] .

The excess solar power, not directly used on the plant, will be stored in the latest generation of vanadium redox flow batteries and will assist to keep the DC control and DC control back-up power system operational on a continuous basis.

Some of the renewable solar power generated will be utilised in the following facilities:

- Manufacture of hydrogen from sea water. Hydrogen is required on site for the cooling of the large SGT5 generators;
- Desalination of sea water;
- Powering of a site-wide local WiFi LAN system for information gathering and site- based communications;
- Powering of small local chemical dosing pumps;
- Main building LED lighting;
- Maintaining pressure of distributed potable water; and
- Charging the batteries of on-site electric personnel vehicles and cycles.

Figure 3.8 Example of the location of solar panels on building tops



Access routes and roads

The Project has accounted for certain road works, described below, deemed necessary for safety and compliance with regional legislative requirements. Permissions have not yet been sought for the proposed road works, the costs

(1) Parasitic load refers to the load generated by activities at the power plant which consume electricity, such as the office buildings, workshops, water treatment plants, etc.

of which will be borne by the project and executed according to local Council and/or Department of Roads and Traffic and/or Committee of Transport Officials (COTO) regulations, requirements and guidelines; in particular Road Infrastructure Strategic Framework for South Africa (RISFSA) of the South African Department of Transport (DOT, 2006)

Figure 3.9 below shows the main access to the ArcelorMittal site branching westwards off the R27. A secondary road crosses the access road and access to the power plant is then southwards proceeding under the HV powerlines from Blouwater substation to the southern entrance to the power plant site.

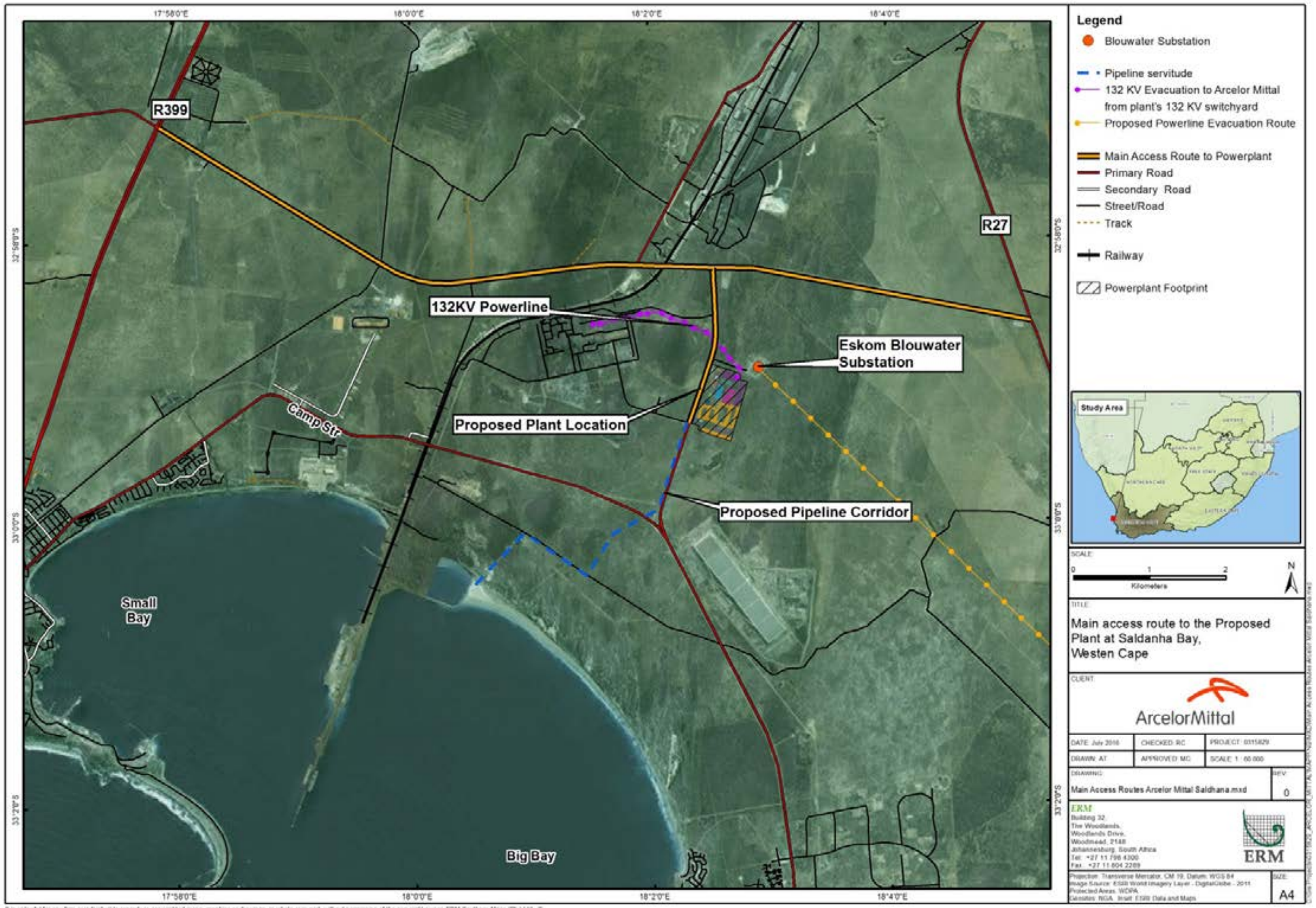
The access route indicated in *Figure 3.9* will be most affected by increased traffic, particularly from commencement of and during construction.

All of the approximately 6,900 m of road access on the 45.83 ha site will be concrete- paved. The total area of roads is 5.59 ha which represents approximately 12.4% of the fenced-in site area. Most roads are 8m width and others 12m. The 12m concrete-paved roads will be constructed early after commencement of construction works and will serve to carry heavy load traffic (mobile cranes, multi axle heavy equipment trailers, cement delivery trucks, etc.) during the early stages of construction.

All concreted roads will play an important role for rainwater harvesting, in addition to the concreted lay-down areas. The site's natural slope is towards the south where the raw water storage tanks will be situated. The east-west thoroughfares ('streets') will channel rainwater into the rain-water drains of the north-south thoroughfares ('avenues'). Rainwater will run southwards to the bulk water storage tanks.

The grid-like road system serves to provide a more precise local description as to the location of equipment, instrumentation or pipe-runs and a numbering system on the curb stones will aid in instrument position identification.

Figure 3.9　Main access to the power plant via the R27



Approach to the Power Plant

For road safety considerations and in light of the increased traffic (particularly during construction phase) the provincial road leading past the two power plant entrances will be widened from 11 m to a 20 m wide over-taking 4- lane section (*Figure 3.10*).

For the office and administration gate a wide entrance (12 m) and a 12 m radius bend into the power plant site and offices from the access road to the gate house is planned (*Figure 3.11*).

Figure 3.10 Illustration of widening of provincial road

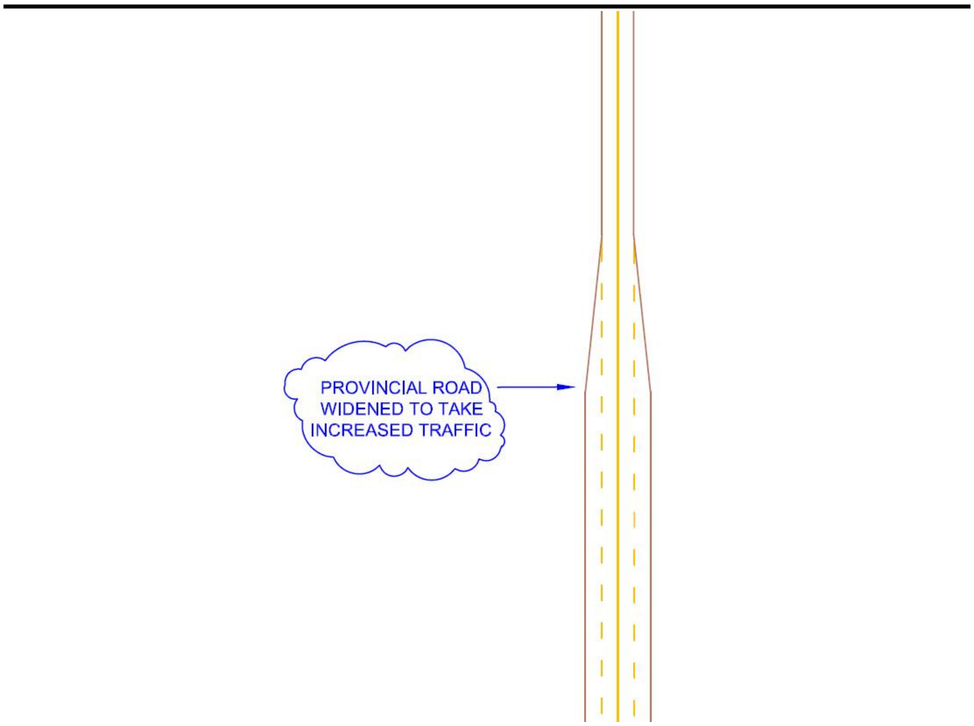
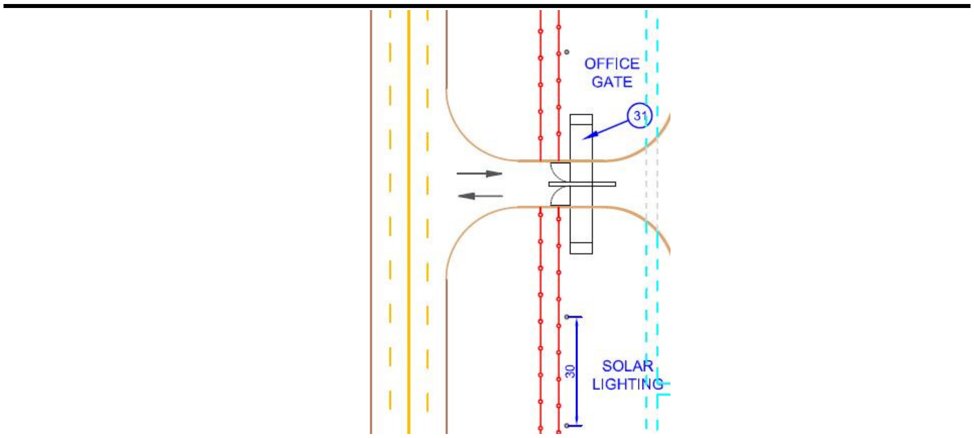


Figure 3.11 ***Illustration of office and administration entrance***

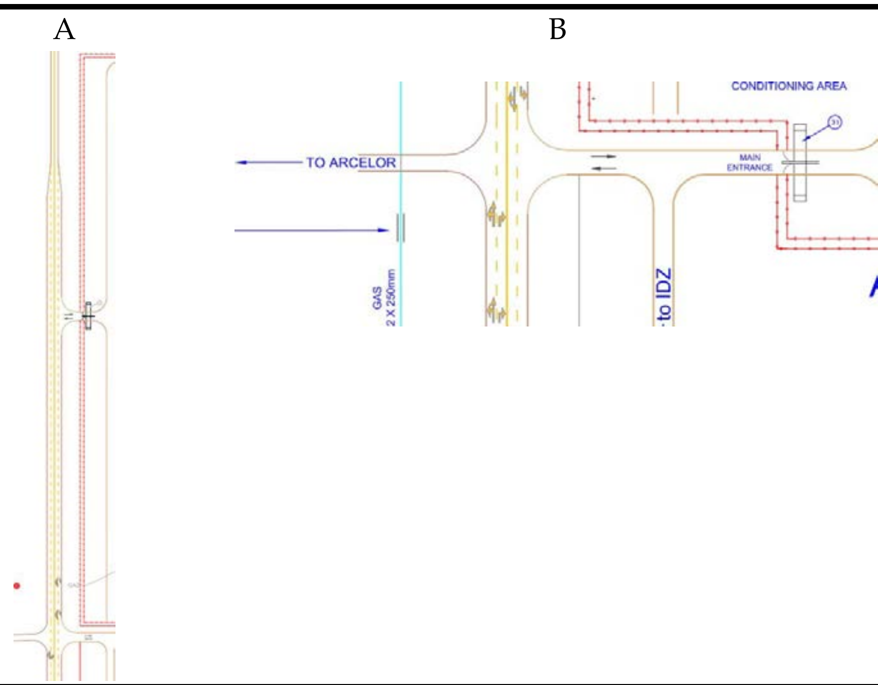


<u>Main Goods and Construction Personnel Entrance</u>

The widened provincial-road access approach, at full 12m width passes the administration office entrance and the southern main goods entrance, detailed below (*Figure 3.12 A*).

The drive-up from the main road to the site gate house is 135 m. A turnoff tees off southwards (*Figure 3.12 B*).

Figure 3.12 ***(A) Widened provincial-road access to the Power Plant and (B) Main entrance to Power Plant***



Incoming Goods Traffic

Incoming goods traffic will pass over a weigh-bridge and will then be directed to a temporary truck staging and laydown area for paper-work to be checked before being directed to area of installation or unloaded at temporary laydown area or in the event of electrical goods and instrumentation, transferred by site transport and conveyed to the warehouse or workshops at the north end of the site.

Admin /Office Building, DCS Control, Labs

With reference to *Figure 3.13*, plant administration offices housing (*Figure 3.14*), main Control Room, DCS marshalling panels, water laboratory, and two meeting rooms, will initially be used during construction to house the offices of construction managers and site engineers. Parking for up to 60 vehicles will be provided under shade.

Figure 3.13 Access to Admin /Office Building, DCS Control, and Labs

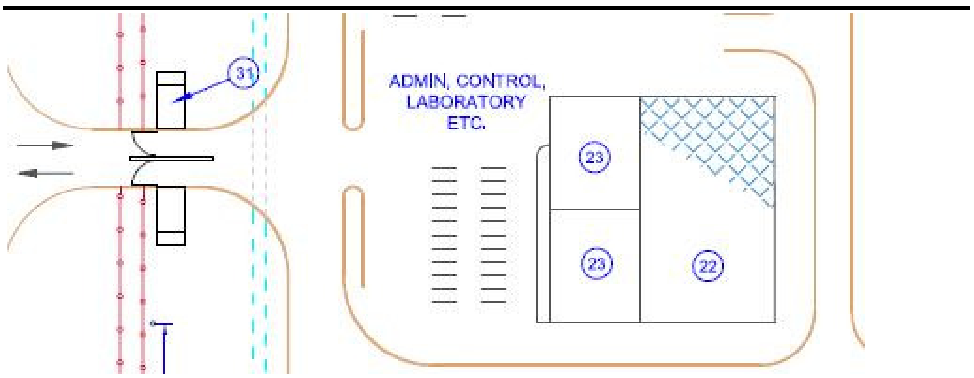


Figure 3.14 *3D rendering illustrating the administration and office entrance with the permanent staff canteen and ablution block*

Roads within the power plant complex

Within the power plant complex there are five different sizes of roads. This are listed in *Table 3.8* along with the cumulative length and surface area of each road type.

Table 3.8 *List of road types, lengths and surface areas within the power plant complex*

Roads within the Power Plant Complex	Length (m)	Surface Area (ha)
Road type: 8m wide	4652.2	3.7
Road type: 10m wide	148.5	0.1
Road type: 12m wide	1414.2	1.7
Road type: 20m wide	490.4	1.0
Road type: 32m wide	120.1	0.4

Ancillary Facilities

In addition, the project will include the following plant / machinery components:

- 132 KV Switchyard for 132 KV evacuation;
- 400KV Switchyard for 400 KV evacuation;
- Rain water treatment plant (Filtration);
- Sea-water treatment (filtration);
- Sea-water desalination / RO (Reverse Osmosis) plant, 50 m^3/hour;
- Post RO small –scale MSFD (Multi-Stage Flash Distillation) Fire Suppression system– water;
- Fire suppression - CO_2 gas storage Fire suppression – foam Instrument air compressors;

- Sewage treatment plant with water reclamation;
- Closed circuit air-cooling system (compressor-less);
- Miscellaneous treated and untreated water tanks:
    - o Rain water storage tanks, total: 15,000 m^3
    - o Demineralised water, total: 6,000 m^3
    - o Fire water storage (raw untreated water): 500 m^3
    - o Boiler water for demin polishing: 3 x 100 m^3
    - o Reclaimed water tank: 1 x 500 m^3
    - o Filtered sea-water buffer tank: 300 m^3
    - o RO-treated water tanks: 2 x 1,200 m^3
- Other tanks
    - o Concentrated sulphuric acid 98%: 1000 litres S/S
    - o Dilute sulphuric acid: 1000 litres CS
    - o Ethylene glycol: 50 m^3
    - o Ammonia: 20 m^3
- Site security, fencing (*Figure 3.15*), surveillance and communications.

Figure 3.15 Illustration of the fencing that will be used ('Clear Vu', 3m high)

Table 3.9 List of buildings associated with the power plant

Building	Dimensions
Power generation buildings x 3	55m L x 30m W x 25m H
Main office and control Centre	footprint 2500 m2 , floor space 4,000 m2
Gate house x 2	Total area 156 m^2 at each gate Permanent staff Canteen, Kitchen Ablutions: 825 m^2
Workshop	1,500 m^2
Spares & warehouse	1,500 m^2
Chemical storage	200 m^2
Various SSB rooms (system and switch-boards)	(pending)

Building	Dimensions
Site electric vehicle charge center	(pending)
Training and visitor's center	300 m^2
Site first aid and medical clinic	120 m^2
132 KV switchyard control and instrumentation room	(pending)
400 KV switchyard control and instrumentation room	(pending)

Gate house

The gate house will be set back approximately 135 m from the edge of the road. The gate-house will be manned 24 hrs/day. The gate house, covering 50 m^2 on each side of the road, is fitted with a restroom, ablutions and a surveillance office. The gate house will be is fully equipped with video surveillance for a team of four persons per shift. A gate alarm at 30 m from the gate office will alert the gate staff of a vehicle approach.

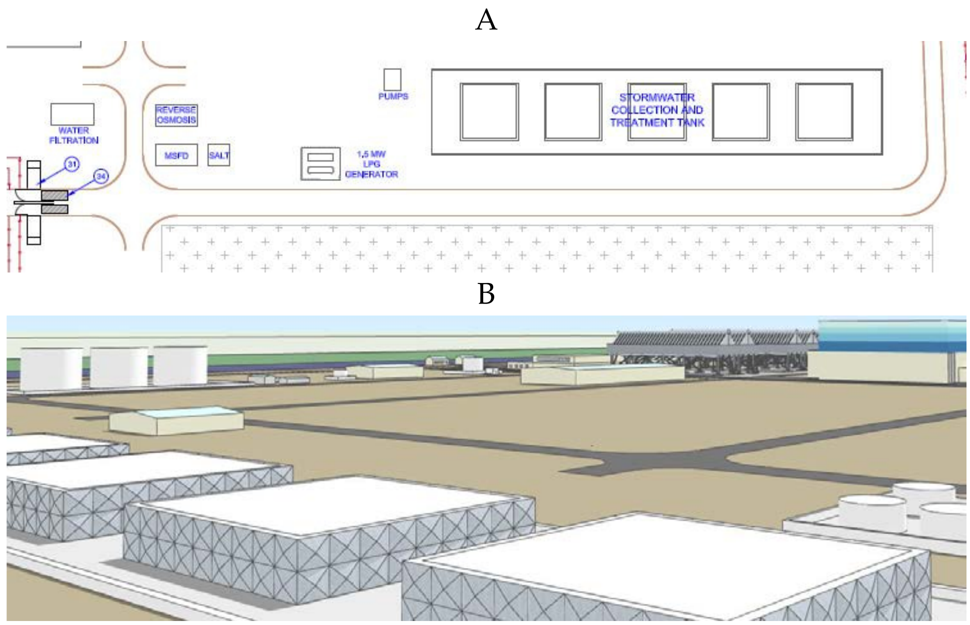
Water facilities

Water facilities will have a common source and consists of several discrete water systems. Two areas on the power plant site have been allocated to water treatment. The first area (*Figure 3.16*) is primarily for storage and treatment of raw rain water and is adjacent to the gas receiving station at the south end of the site.

This area receives:

- Surface rain water which is stored in a series of five 2 000 m^3 interconnected water tanks;
- Fresh water (not necessarily municipal) brought onto site by road tanker;
- Sea-water to be used in the zero liquid discharge (ZLD) desalination or other process; and
- Reclaimed water from the site sewage plant.

Figure 3.16 Water storage tank layout (A) and 3D rendering (B)



Storm water will be the main source of rain water to be stored in the interconnected water tanks. The site has a natural north to south gradient of approximately 1%. The site will be slightly graded to form a symmetrical V-shaped slope. *Figure 3.17* illustrates the drainage pattern of an imaginary sheet of water draining down the ungraded slope of the site.

Internal roads will be contoured to channel precipitation towards storm-water drainage points along the road curb. Storm water will flow into a single enclosed duct which will dump the water into a grit- pit. From the grit-pit dual submersible pumps (actuated by level controllers) will pump the water through coarse filters into the five interconnected steel water tanks situated at the most southern boundary of the property.

The pumps and drain ducts will be sized to cope with the maximum anticipated flow of rain water.

A stone-filled emergency soak-away channel will be constructed along the southern-most boundary to channel excess storm water (in case of an unusual rainfall event) away from the site. The soak-away channel will dissipate the energy of the water to prevent soil erosion.

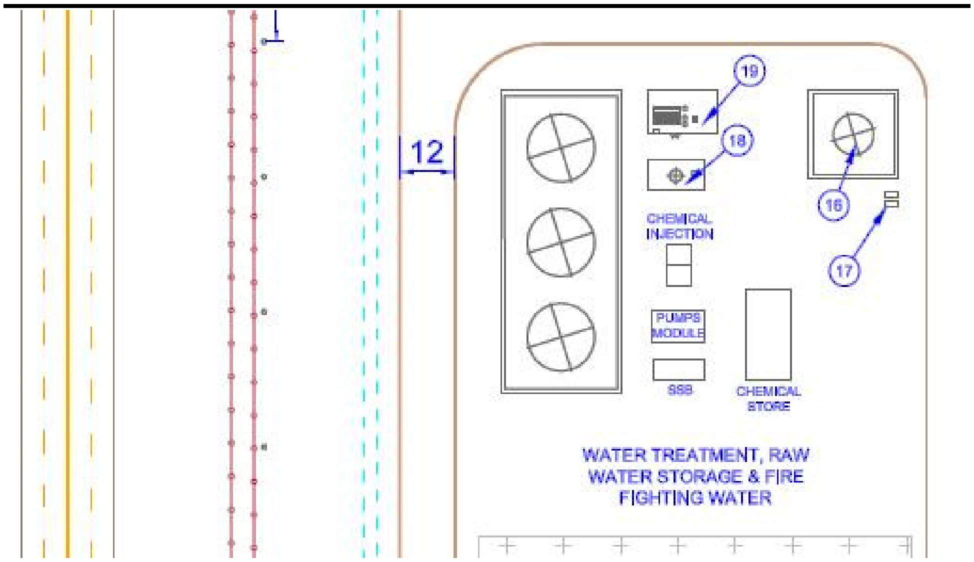
Figure 3.17 Surface Water Drainage

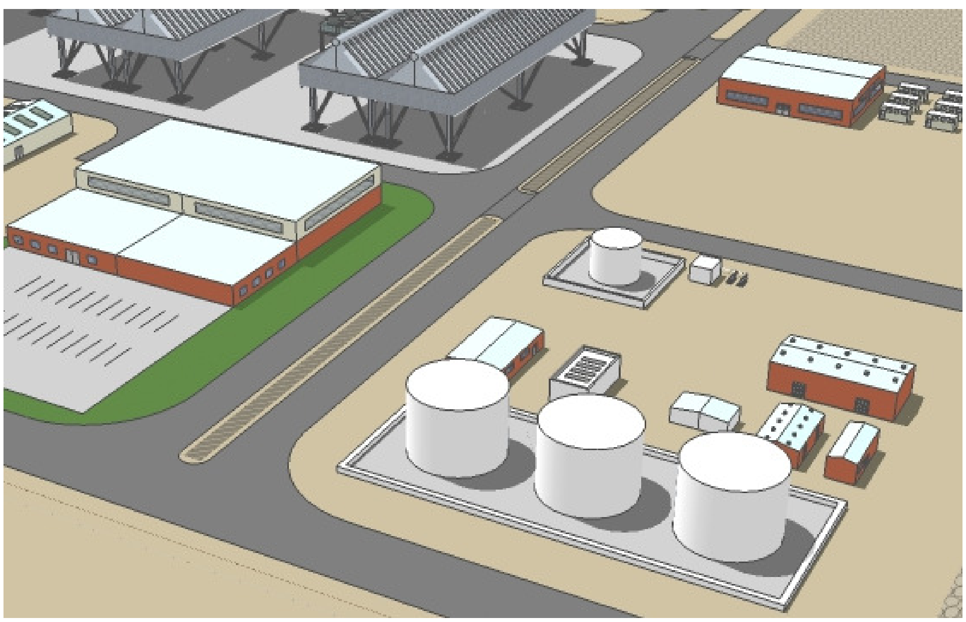
The second area is for final water treatment, demineralisation and storage of water for fire abatement. After being processed by reverse osmosis (RO), purified water is pumped to zone two (top left in *Figure 3.18*).

- In this area, water from RO is deionised, chemically treated and stored for boiler feed water condensed steam is deionised, re-treated, stored and reused as boiler feed;
- Deionised water is stored for the lube-oil cooling circuit;
- Deionised water is distributed to day tanks close to the boilers and generation plant;

- Water from the RO plant is stored as emergency fire water in the event of a fire outbreak; and
- Raw water can be pumped back along the sea-water pipeline to assist in extinguishing a veld-fire that has been initiated by a gas leak or pipe rupture.

Figure 3.18 Water treatment plant layout, zone 2

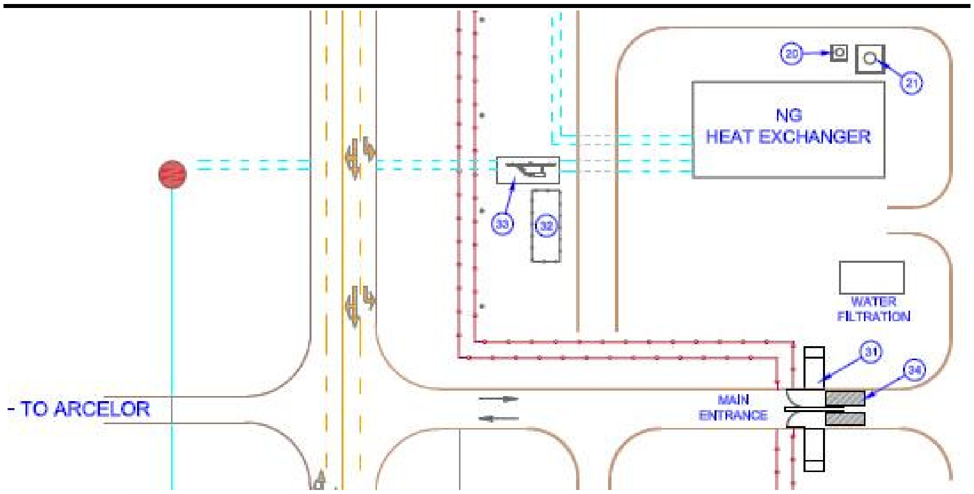




Natural Gas

This EIA is for the CCGT gas-fired power plant and gas pipeline only and does not include the import of gas and therefore a marine component [(1)]. The project operating company will take possession of the natural gas at the point where it comes on shore and enters the on-shore gas pipeline to the plant site. Natural gas will be piped to the power plant through a twin, 250 mm Ø nominal gaspipeline at entry gas pipeline-pressure of 90 barg and at a maximum rate of 60 kgs /sec and a temperature of -20ºC. The gas flow will follow the power demand load.

Figure 3.19 Gas pipeline entry to the power plant site



The red dot in the *Figure 3.19* indicates where the gas pipeline is diverted towards the plant site boundary. At a pressure ranging between 45 barg and 60 barg the gas traverses under the newly widened access road, passing under the double security fence and surfacing aboveground as it proceeds to the gas receiving area above the main entrance gate.

At about -20 °C, the gas is heated to near ambient by cooling a 30 % glycol solution to -15 °C before being piped to the gas turbines for combustion.

(1) It is anticipated that potential impact on the marine environment will be considered as part of the Department of Energy gas to power project. The Department of Energy (DoE) has developed a 20-year energy plan for South Africa, the Integrated Resources Plan 2010-2030 (IRP 2010), which encourages the participation of independent power producers (IPPs) in electricity generation in South Africa. The Independent Power Producers (IPP) Office was established by the DoE, the National Treasury and the Development Bank of Southern Africa (DBSA) to facilitate the involvement of IPPs in the generation of electricity. It is currently intended that 3126 MW of new generation capacity will be generated from natural gas. For the Gas IPP Procurement Programme, the DoE through the IPP Office has, in collaboration with Transnet, developed an approach to facilitate the import of LNG to allow for the development of medium- to long-term gas power plants outside of the port boundaries. This EIA therefore forms a separate application by a private company for gas power plants and related infrastructure near the Port.

Propane

As discussed above, three 1.5 MW gensets are proposed. These will be situated near the workshops in the north of the site, near the air condensers in the middle of the site and near the water storage facility near the south of the site. LPG (Propane) will be trucked on to site by road tanker and stored in three tanks cumulatively not exceeding 30 m^3 in volume.

3.3.2 Pipeline

General

The pipeline transport system from the point of arrival on-shore to the power plant site will consist of the following:

- A gas and sea-water forwarding station at the start of the land-based pipeline system;
- A dual, parallel gas pipeline for security of gas supply;
- A 120mm diameter sea water pipeline to provide the power plant with sea water for desalination (rated maximum flow rate will be 14 litres per second);
- A power cable to provide motive power for a projected air compressor and actuated isolation valves and instrumentation along the pipeline route; and
- A gas and sea-water receiving station at the power plant.

The LNG pipeline (regasified gas) and sea-water supply servitude will run from the pipeline entry point connecting to the power plant boundary. The gas pipeline will be buried to a depth of 3 to 4 m, cover a servitude width of approximately 15 – 20 m and be approximately 4600 m in length.

The gas and sea-water supply pipelines commence from the routing point #1, where the regasified LNG arrives on shore and enters the land-based servitude section of the supply line to the 1507 MW power plant.

The pipeline will run along the indicated servitude approximately 4600 m to the gas receiving station within the power plant boundary. Over the 4600 m the pipeline will not intersect with any water courses.

The gas-carrying capacity of the pipeline for the envisaged 1507 MW power plant will be designed for 75,100 Nm^3 /hr or approximately 65 Kg/sec of regasified LNG (regasification of LNG will take place offshore). The management and operation of the gas pipeline will be in accordance with ASME B31.BS code of practice. The proposed pipeline system will be buried underground with the pipeline servitude extending 6m on either side of the pipeline trench.

Where the pipeline passes through sensitive areas the temporary RoW will be kept to between 20-25m in order to minimise impacts.

Table 3.10 Co-ordinates of the proposed pipeline

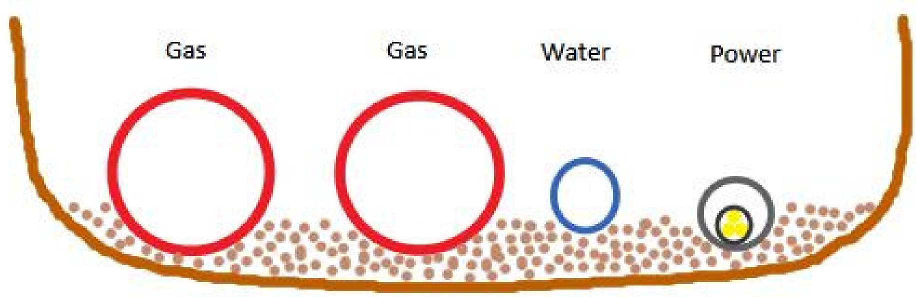
Point Number	South	East
#1	33° 0.075'S	18° 0.932'E
#2	33° 0.378'S	18° 1.457'E
#3	33° 0.379'S	18° 1.687'E
#4	33° 0.079'S	18° 1.687'E
#5	32° 59.912'S	18° 2.059'E
#6	32° 59.264'S	18° 2.325'E
#7	32° 59.278'S	18° 2.382'E

Pipeline arrangement concept

The pipeline arrangement (*Figure 3.20*) will consist of the following elements:

- Two steel gas pipelines with a clearance of 0.3m (as per EN 1594:2000);
- One steel water pipeline; and
- One electrical conduit (plastic compound).

Figure 3.20 Illustration of the pipeline arrangement concept



Design parameters

The main design parameters for the pipeline are listed in *Table 3.11* below.

Table 3.11 Gas pipeline main design parameters

Design Parameter	Specification
General safety rules	49CFR parts 191, 192, 193 and
General design code	ASME B31.8
Pipeline material	API 5L, ISO 3183, ISO 1208, (sch. 40) or EN equivalent
Pipeline nom. Diameter, D	2 x 300 mm
Wall-thickness	10.31 mm
Operating design press.	90 bar

Design Parameter	Specification
Pipe max. allowable stress	78,540 bar
No. of bends	5
Minimum pipe bend radius	6 x D (centreline)
No. of under-road crossings	4
Placement	Under-ground
Buried Depth	≥ 1.0 m (to be decided at detailed design stage)
Inner pipe coating	yes, to increase smoothness
External pipe coating	Yes, with fusion bonded epoxy, to prevent corrosion
No. of shut-off valves	min. 4, full bore
Overall location class	1
In-line inspection	According to NACE 35100 and RP0102-2002
Pipeline design working pressure	90 barg
Pipeline Design formula	CFR 192.105, ISO 13623:2000, EN 1594:2000
Pig launcher	1 off, design code ASME B31.8
Pig receiver	1 off, with drain lines, design code ASME B32.8
Gas/Liquid separator	1 off, design pressure 100 barg, ASME Class 600.
Pig Tracking equipment	YES, AGM type.
Width of pipeline servitude	30 m – 36 m
Cathodic protection	yes

Pipeline intersection with roads

There are four (4) road crossings, all of which will pass under the road through means of reinforced concrete road culvert. The co-ordinates of the road crossings are listed in *Table 3.12* and each of the road crossings are illustrated in *Figure 3.23.*

Table 3.12 Co-ordinates of where the pipeline intersects with roads

Road Crossings	South	East
Crossing 1	33° 00.375'S	18° 01.460'E
Crossing 2	32° 59.964'S	18° 01.947'E
Crossing 3	32° 59.300'S	18° 02.307'E
Crossing 4	32° 59.271'S	18° 02.344'E

At under-road crossings the gas pipelines will be encased in a second pipeline with maximum allowable stress at least equal to the gas pipeline itself.

Valves and pigging

A 'pig [1] launcher' and 'pig receiver' will be situated at each end of the pipeline as well as ATEX-rated remotely operable isolation valves ('plugs'). Location of the 'plugs' will be decided by the pipeline designer/contractor. Gas pipeline bends will be manufactured with a radius to the pipeline centreline of 6 x pipeline diameter (D) in order to facilitate 'pigging' and hence pipeline maintenance.

(1) Pigging in the context of pipelines refers to the practice of using devices known as "pigs" to perform various maintenance operations. This is done without stopping the flow of the product in the pipeline. These operations include but are not limited to cleaning and inspecting the pipeline.

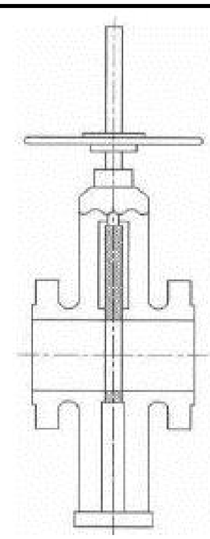
Isolation valves for the gas pipelines will be carefully selected from a range of appropriate through-conduit gate valves, wedge gate or parallel slide valves in order to accommodate and not obstruct the passage of the 'pig'. Check vales, if required in the gas pipeline, require that the flow area within the valve body be larger than the pipe inside diameter. The valves will be remotely actuated. Applicable standards are API, ASTM, ANSI/ASME, and in particular, for design and hazard analysis, API RP14J and API RP14C.

The gas pipeline being only 4600 m in length will have isolation valves positioned at the start of each pipeline, in the middle and at the receiving end (these are in addition to the isolation valves at the pigging stations). The valves will be automatically actuated as programmed by the pipeline designer/EPC contractor.

Valves and non-return valves for the sea-water pipeline will be manufactured from specialist alloys and will also be through-conduit. Valves for sea-water application will be in accordance with API, ANSI/ASME or ISO specifications. The sea-water pipeline will also be designed for 'pig' functionality.

On gas transmission pipelines, the pig design and all valves will be selected by the pipeline EPC contractor from main-stream renowned manufacturers in accordance with pipeline flow conditions, pressure, and velocity and pig functionality (*Figure 3.21*). There being two gas pipelines there will be two sets of pig launchers and pig receivers.

Figure 3.21 Example of a shut off valve



Pressure testing and water use

There are two testing procedures available in order to test how well the pipeline holds pressure. These are either hydraulic or pneumatic (ASME

Section B31.1). From a technical perspective the hydraulic method is preferred because it has a lower level of potential energy than the pneumatic method thus it is safer. However, hydraulic testing will require 2,100 m^3 of fresh water per pipeline. However, after use, this can be pumped to the power plant water reservoir through the sea-water pipeline.

The pneumatic test, while not requiring water, requires multiple compressors to pressurise the pipeline and a high power feed or considerable diesel fuel for the compressors. The method of pipeline pressure testing will be decided upon by the EPC contractors based upon an analysis of the pros and cons of each method.

Cathodic protection and corrosion monitoring

Cathodic Protection (CP) is a technique used to control the corrosion of a metal pipeline by making it the cathode of an electrochemical cell. A simple method of protection connects the metal to be protected to a more easily corroded "sacrificial metal" to act as the anode.

CP requires the highest priority and most appropriate protection system for gas pipelines. The guidelines for this protection are provided by NACE International, the worldwide Corrosion Authority and will be implemented by the pipeline EPC contractor who will be guided by specialised consultancies.

Along a pipeline the corrosion protection system will be monitored after the selected corrosion system has been installed in order to obtain early warning of corrosion issues and maintain pipeline integrity. Therefore, an online, real-time corrosion monitoring system will be installed. The online, real time corrosion monitoring data sensors and measurement devices will be installed at strategic points along the pipeline. These strategic points are in turn identified by ICDA (Internal Corrosion Direct Assessment) methods.

Because the natural gas that will be utilised by the power plant derives from regasification of LNG, water content in the gas is zero (regasified LNG does not contain any moisture). This is also evidenced by the analysis of the LNG that will be supplied under contract to the project (*Table 3.13*). Therefore the effects of corrosion on the inside of the pipe due to the presence of water in the gas stream can effectively be discounted. In addition, the Inner pipeline surface will be coated with a protective epoxy layer.

Table 3.13 Analysis of contracted gas supply

Component	**Mole %**			
	Original Dry		Normalised	
	Compn.	+ / -	Dry	Wet
Methane	96.109		96.109	95.53
Ethane	1.807		1.807	1.796

Component	Mole %			
Propane	0.164		0.164	0.163
iso-Butane	0.028		0.028	0.028
n-Butane	0.028		0.028	0.028
iso-Pentane	0.011		0.011	0.011
n-Pentane	0.007		0.007	0.007
n-Hexane	0.008		0.008	0.008
n-Heptane	0.013		0.013	0.013
Nitrogen	0.357		0.357	0.355
Carbon Dioxide	1.468		1.468	1.459
Water				0.603

Figure 3.22 Pipeline Route

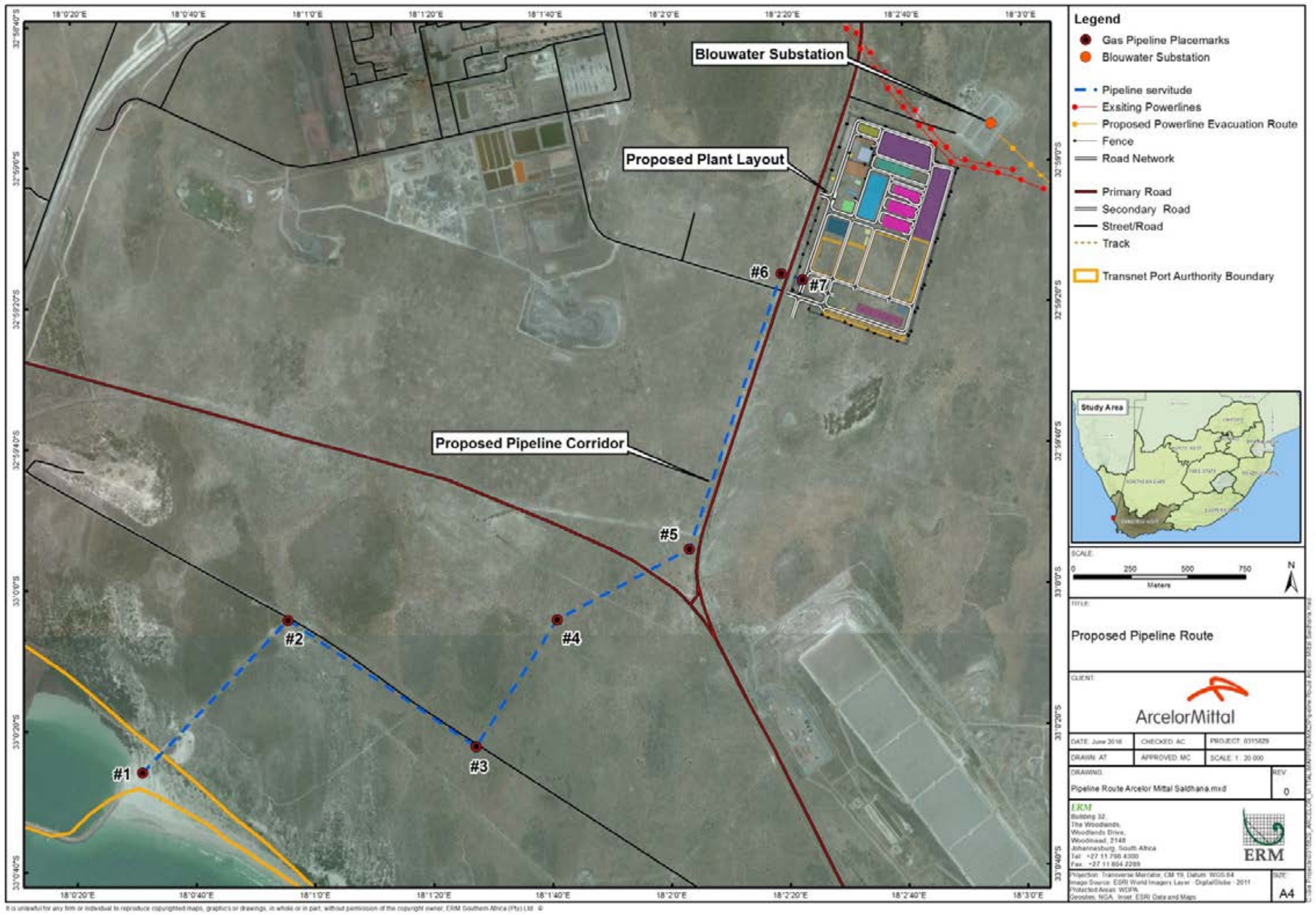
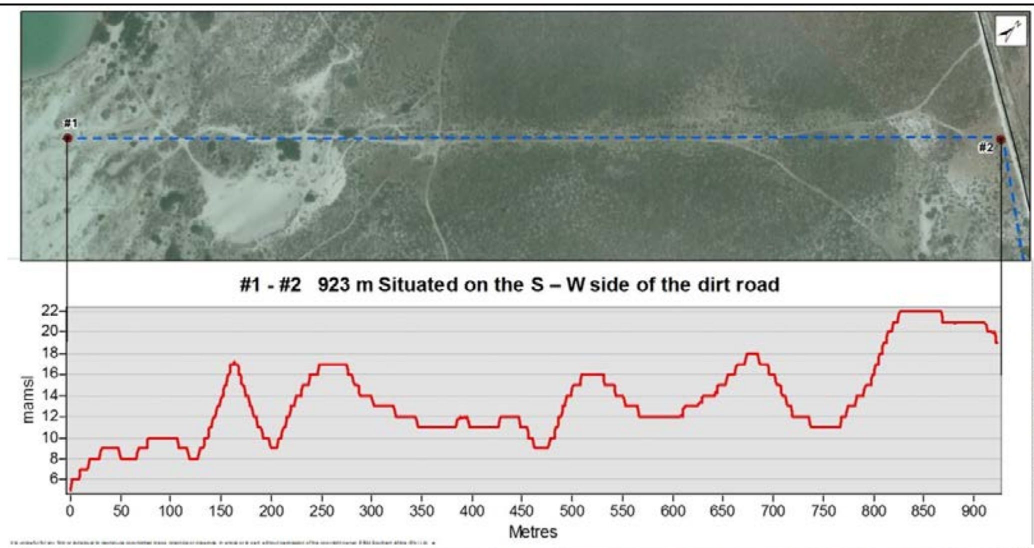
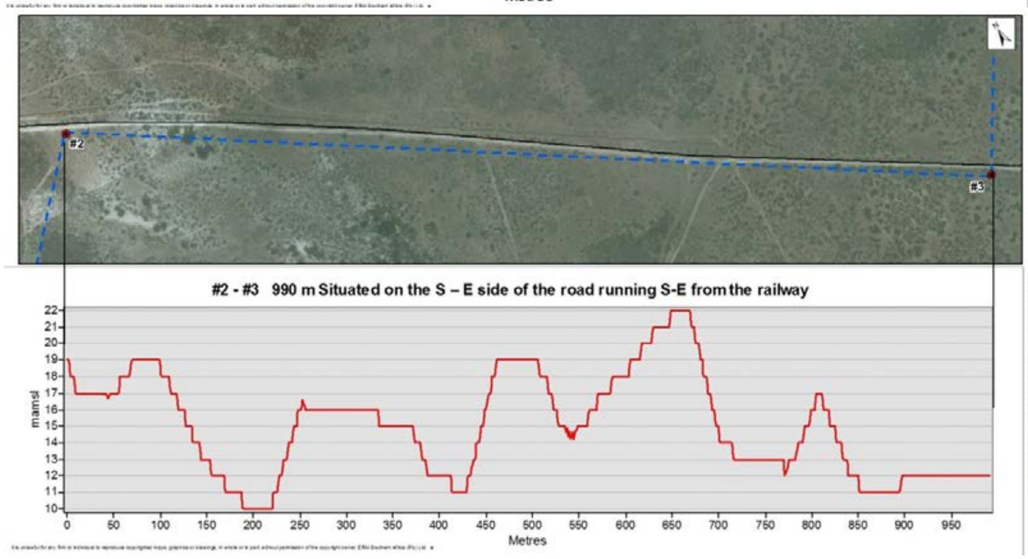
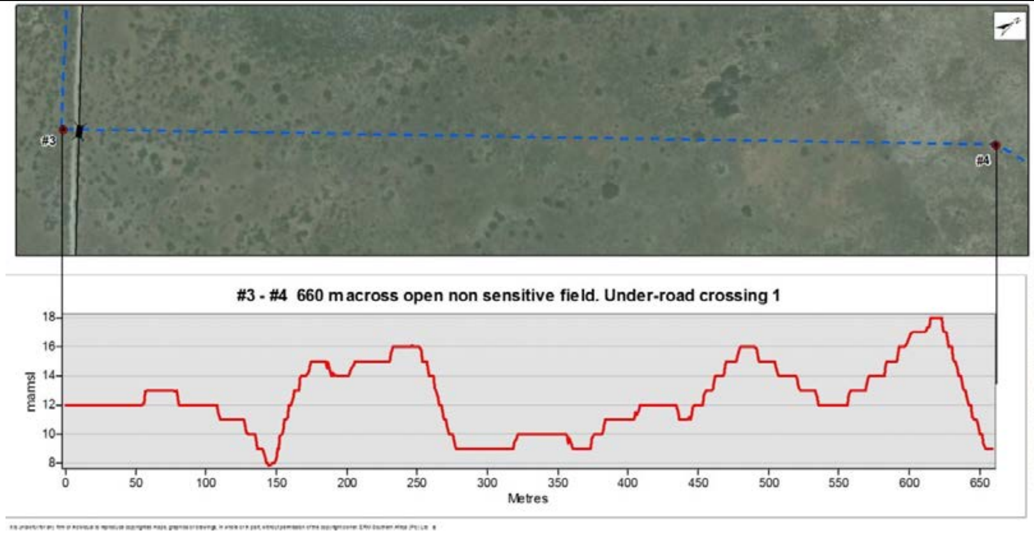
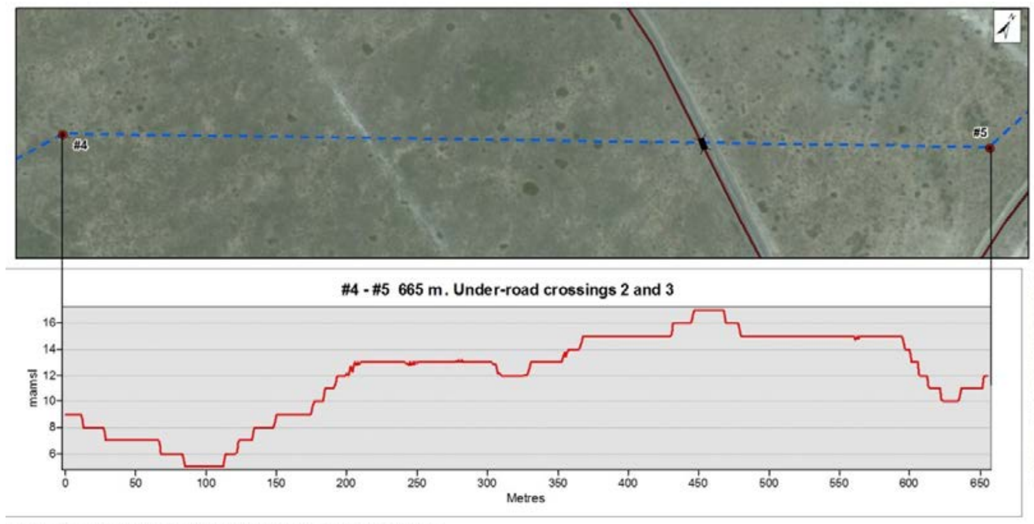


Table 3.14 Servitude sections and elevation profiles

Servitude Section Description	Servitude Section Illustration
#1 - #2: 923 m Situated on the S – W side of the dirt road. Pig-Launching station is located at point #1 *Note: that the LNG pipeline through Transnet land will be permitted separately. AMSS will liaise with Transnet to ensure that a coordinated approach will be followed.*	
#2 - #3: 990 m Situated on the S – E side of the road running S-E	

Servitude Section Description	Servitude Section Illustration
#3 - #4: 660 m across open non sensitive field. Under-road crossing 1	
#4 - #5: 665 m Under-road crossings 2 and 3.	

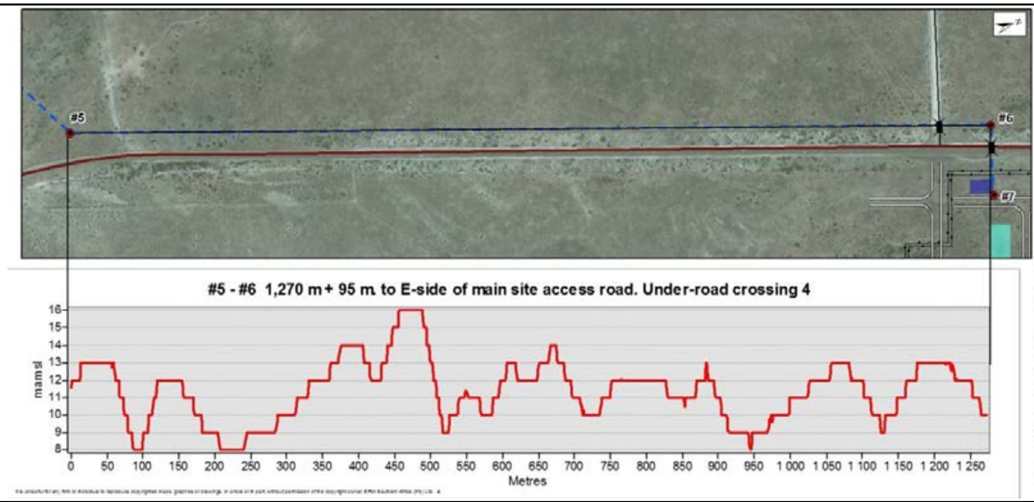
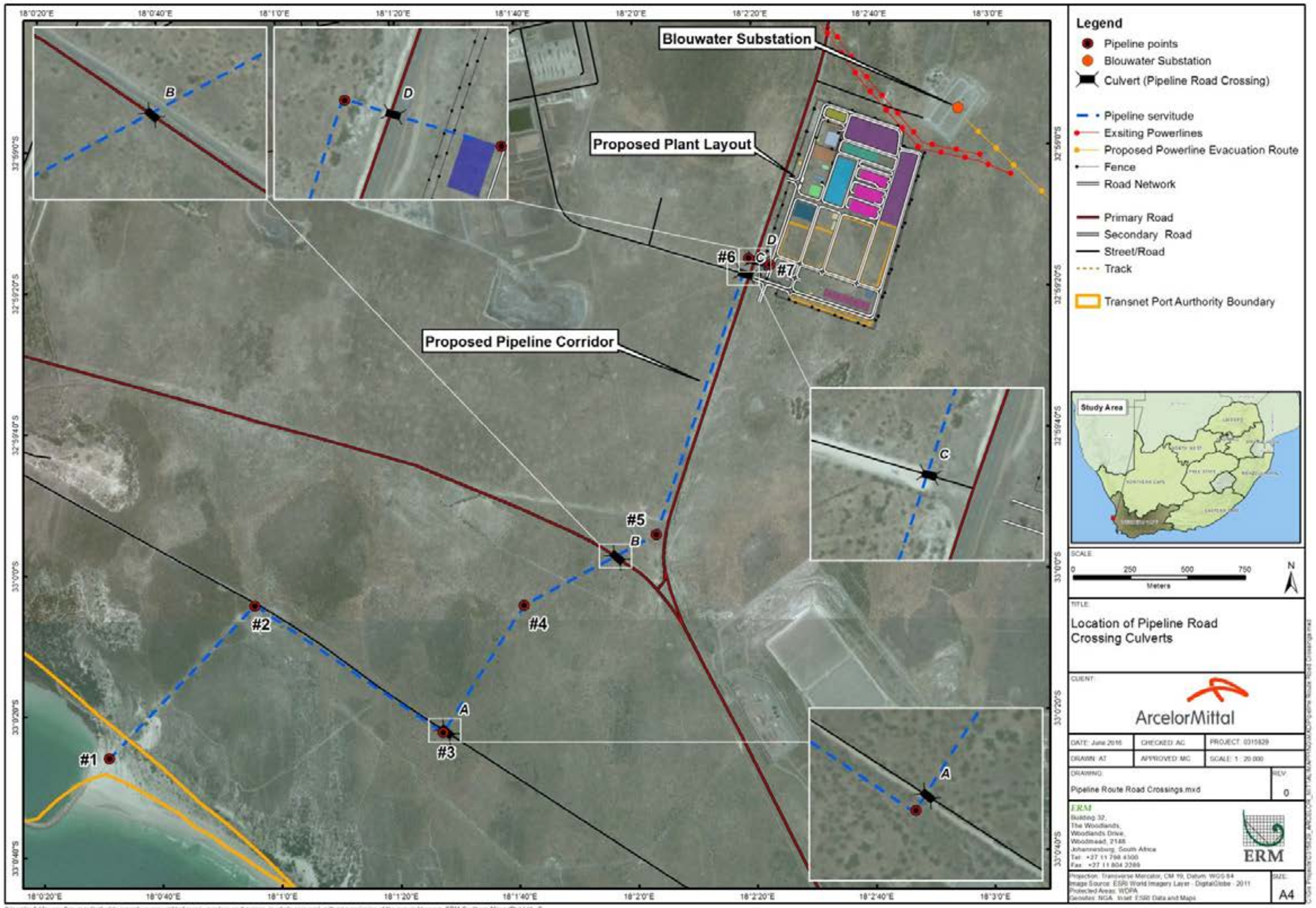
Servitude Section Description	Servitude Section Illustration
#5 - #6: 1,270 m + 95 m. to E-side of main site access road. Under-road crossing 4 Pig-receiving station is located at point #1	

Figure 3.23 Location of the pipeline road crossings



3.3.3 *Power Evacuation and Connection to the Grid*

132 kV Feeder line to ArcelorMittal Steel Works

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 proposed routing of the transmission line is illustrated in *Figure 3.24*, and the coordinates of the vertices for this transmission line are presented in ***Error! Reference source not found.***.

The proposed Project plans on utilising the existing 132 KV lines; towers and conductors. The 132 kV plant substation would join directly on to these existing lines. It is noted that there are currently no observed bird deterrent measures on the existing lines. This may need to be introduced; however this would need to be determined between IPCSA and Eskom.

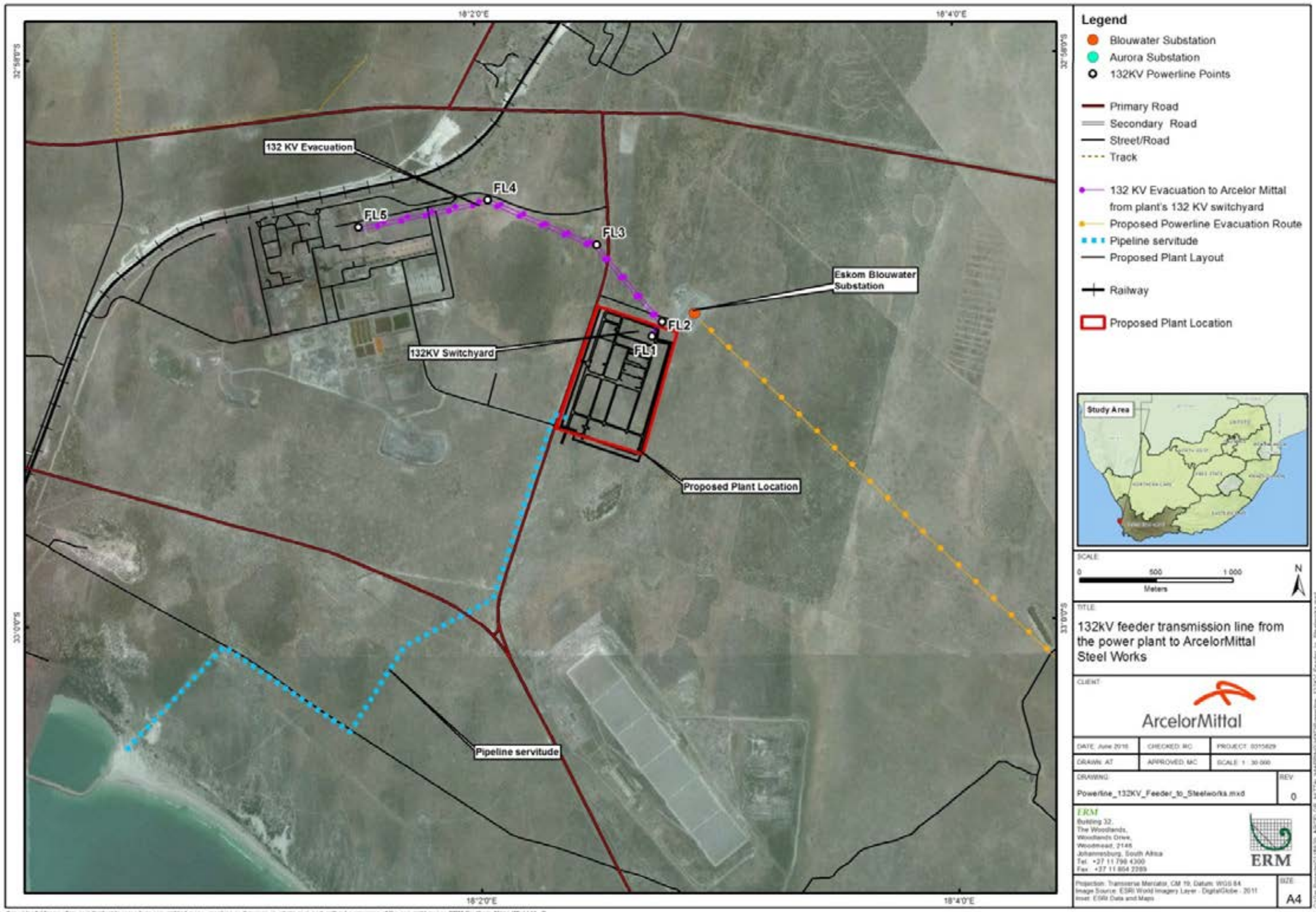
Table 3.15 Coordinates of the vertices for the proposed transmission line from the power plant to the ArcelorMittal Steel Plant

Point	Longitude	Latitude
FL1	18° 2.736' E	32° 58.992' S
FL2	18° 2.780' E	32° 58.943' S
FL3	18° 2.508' E	32° 58.667' S
FL4	18° 2.054' E	32° 58.506' S
FL5	18° 1.512' E	32° 58.598' S

400 kV Transmission line to Aurora Substation

The additional 1103MW (1400MVA) of power generated at the plant will be evacuated through the construction of a new 22 km High Voltage (HV) 400 kilo Volt (kV) line from the power plants own switch yard to the existing Aurora 400 kV substation, following the existing Aurora to Blouwater 132 kV feeder servitude. This transmission line in not considered as part of this EIA process and will be considered in a separate EIA process in coordination with Eskom.

Figure 3.24 *132kV feeder transmission line from the power plant to ArcelorMittal Steel Works*



3.4 *PROJECT PHASING AND SCHEDULE*

The proposed project will be implemented in two phases. Phase 1 and 2 combined will produce approximately 1500 MW net out-put.

Phase 1 and 2 will consist of six Siemens Trent60 50 MW nominal (Installed Gross capacity) gas turbines in open cycle (labelled T1 through to T6) and three Siemens SCC5-4000F 435 MW (Installed Gross capacity) nominal combined cycle plants, labelled UNIT 1, UNIT 2 and UNIT 3 respectively, and will be erected on three self-contained power 'islands' each approximately 150 m long x 60m wide.

3.4.1 *Phase 1*

Phase 1 of the project will constitute the following components:

- Site entrance with truck staging areas, hard standing areas;
- Offices and control room;
- Warehouse areas and workshops;
- Installation of six open cycle Siemens Industrial Trent 60 gas turbines (T1, T2, T3, T4, T5 and T6), one of which will be a redundant unit to ensure uninterrupted supply;
- Associated step-up transformers for every generating unit;
- 132KV and 400 kV switchyard;
- Site drainage;
- Gas receiving, conditioning and forwarding;
- Waste-Water treatment and water reclamation plant; and
- Storm water collection reservoir (25,000 m^3) and water treatment plant.

Construction period: 15 -18 months
On-site labour: 90 - 200
Completion Phase 1: September 2019 commercial operation

3.4.2 *Phase 2*

Construction of Phase 2 of the project will include the following components:

- Installation of complete UNIT 1, UNIT 2 and UNIT 3 open cycle Siemens SCC5-4000F gas turbine (total approx. 1,305 MW nominal (Installed Gross capacity) combined cycle plants);

- Associated step-up transformers, and station switchyard.

Construction period: 18 - 20 months
On-site labour: 200 - 600
Completion Phase 2: Mid- 2020 - Early 2021

3.5 *PROJECT IMPLEMENTATION*

The project will be undertaken in a number of stages, commencing with development (i.e. the work undertaken directly by IPCSA up to bankable feasibility which will also include a Front End Engineering Design) with up to-20 full-time staff at most. All other collaborators will be contracted third-party engineers, accountants and draughtsmen as well as various OEM staff and legal advisors. Thereafter the site preparation activities will be undertaken, as described below.

3.5.1 *Site Preparation*

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.

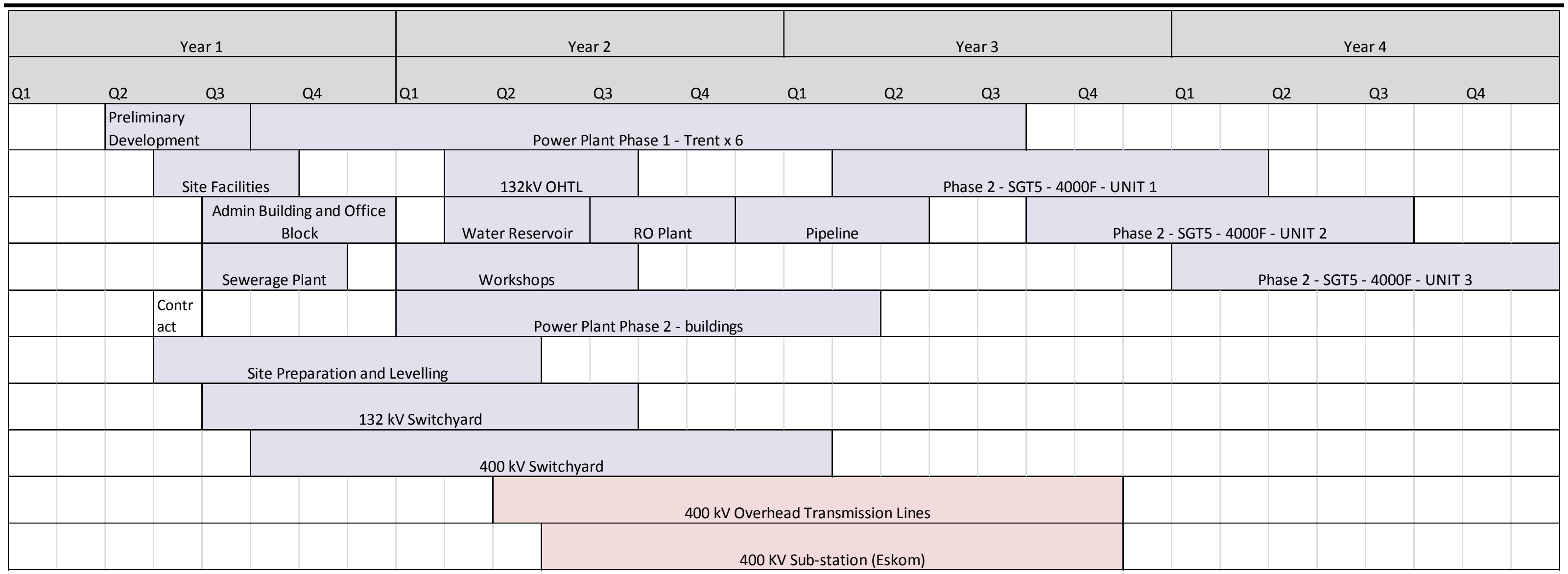
3.5.2 *Construction Phase*

Site roads constructed during the site preparation phase will be used to transport the heavy plant equipment required during the construction phase. In addition, earthworks will follow the site clearance earthworks and include the excavations necessary to achieve the works (e.g. for foundations) and the backfilling after completion of these works.

Construction schedule

The Project development will take approximately four years to complete. This is illustrated in *Figure 3.25* below.

Figure 3.25 High level Project development schedule



Water requirements

During the construction phase the main water requirement will be for the concrete batching plant. It is estimated that 30 000m^3 of water will be required for the concrete batching.

During the commissioning phase the following water will be required:

- 2,000 – 5,000 m^3 for blow-out of the steam piping (Testing/commissioning);
- 2,000 – 5,000 $m^3$for blow out and chemical clean of the Benson boilers; and
- 23 000m^3 (approximately) for pipeline cleaning and hydraulic pressure testing.

Initially water will be trucked in 30m^3 loads from local farms (ground and surface water sources) (1). It will be transferred to a temporary stainless-steel tank for immediate use in preparing concrete for a small lay-down area and foundations for the first permanent raw-water storage tanks.

Power plant

Foundations and Piling

Piling of the foundations (if required) for the first six Siemens Industrial Trent 60 gas turbines (T1 through to T6), the other gas turbines (Siemens SCC5-4000F, UNIT 1 to 3) and large main equipment items, will last for approximately 10 months until the foundations for the last item of equipment have been completed. Once the piles are in place, concrete slabs will be constructed and turbine pedestals constructed which will involve some large pours of concrete. At this stage the gas turbine main building will be constructed which will be the first visible building associated with the power plant. The Siemens Industrial Trent 60 gas turbines will not be enclosed in buildings.

Site hard standing

The construction phase will require substantial laydown hard-standing area for temporary placement of equipment and materials delivered to site. Several areas are demarcated as 'laydown areas' (Figure 3.4) but will used as such only during the construction phase. Laydown areas will be concreted to aid in rain-water harvesting.

After commissioning is completed, the hard-standing areas will be rehabilitated and available for any plant expansion which may be subject to additional EIA application.

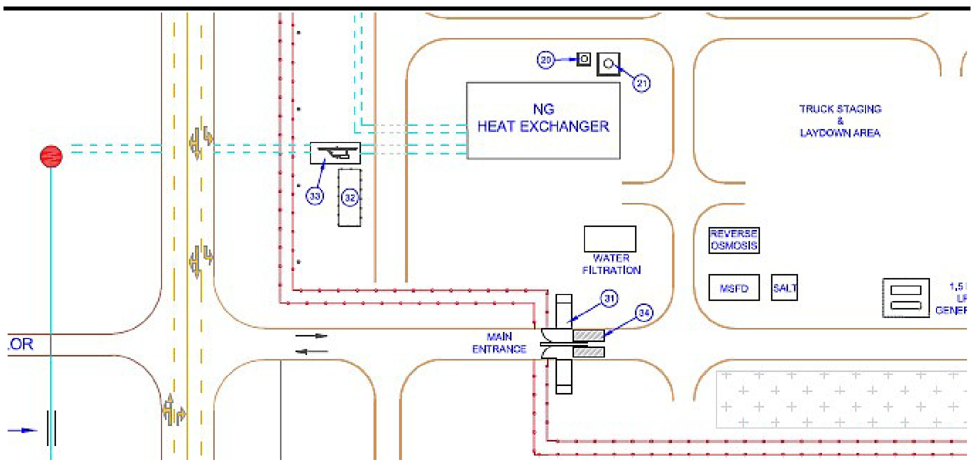
(1) Agreements with land owners are currently in the process of being developed.

Total hardstanding area is approximately 10.7 ha representing approximately 23.6 percent of the total site area. All hard-standing areas will drain into the rain-water collection system. Concreting over the hard-standing area will reduce dust especially during construction and will play a major role in rain water harvesting after the plant is in commercial operation.

Traffic

Approximately 35,000 tons of bulk cement and concrete aggregate, 800 tons re-bar steel, and 6,500 tons equipment and structural steel will need to be transported to the construction site.

Figure 3.26 Access during construction period

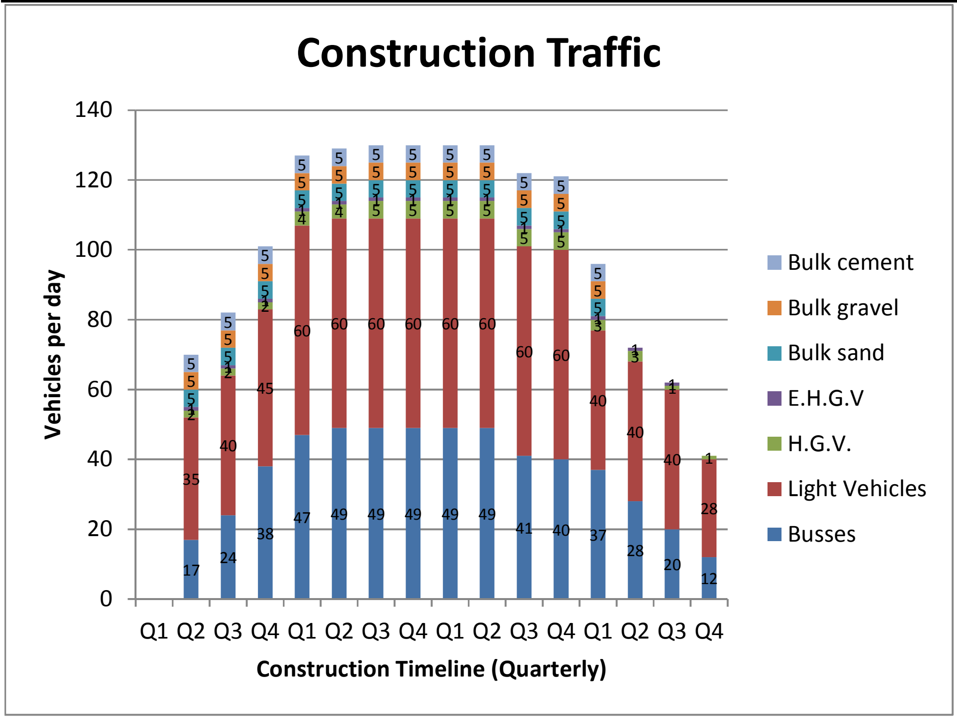


It is envisaged that construction staff, up to a maximum of 350 persons, would be bussed to site in 8-seater or 10- seater mini busses and pass through this gate; about 40 - 50 busses per day, twice a day. Light vehicle traffic due to construction will start at around 35 vehicles per day and increase rapidly to 60 per day where it will remain for the bulk of the construction period.

There will be an expected 5 vehicles per day of HGV's, bulk gravel, bulk sand, and bulk cement respectively for the duration of the construction phase right up to Q1 of year 4, after which it tails off rapidly.

The gas turbines and other heavy equipment will be delivered via truck. This will involve some abnormal loads being moved on the roads during this time.

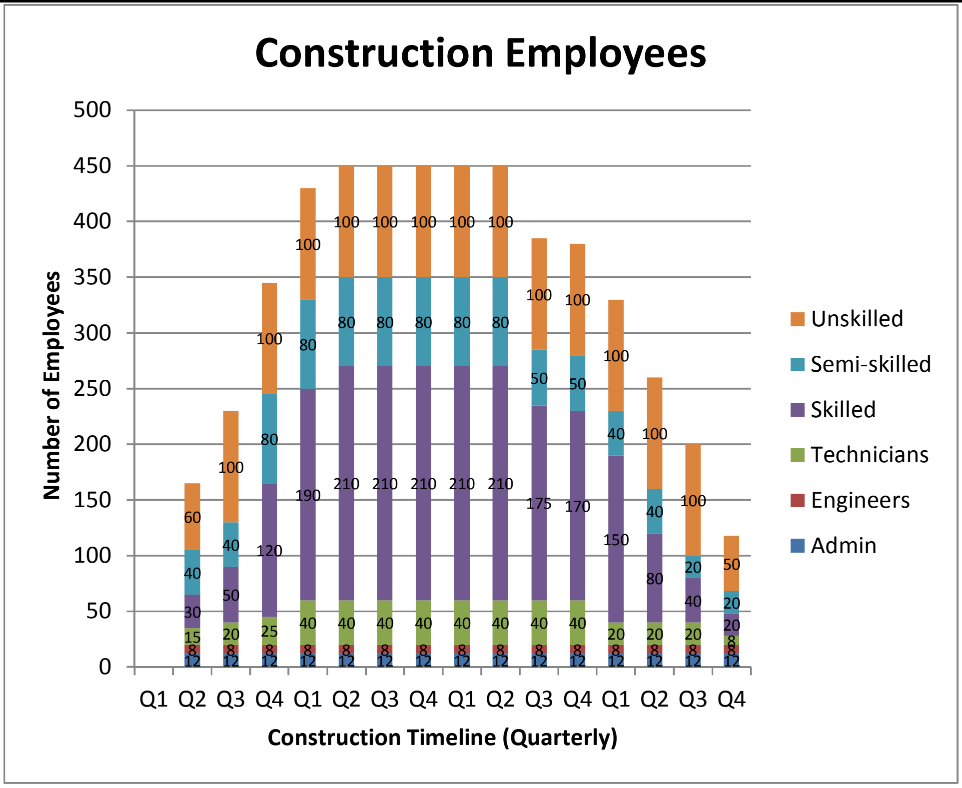
Figure 3.27   Predicted traffic loads during the construction phase



<u>Employment</u>

During peak construction activity, it is expected that up to approximately 450 workers will be directly employed (*Figure 3.28*). Most of this workforce will be employed by the engineering, procurement and construction (EPC) contractor and will consist in semi-skilled to skilled workforce.

Figure 3.28 Employment requirements during the construction phase



<u>Commissioning</u>

After approximately 28 month's general site activity will decrease as the project moves into full commissioning where there will be a relatively small group of highly skilled engineers and technicians checking, testing, starting-up and finally commissioning the power plant.

Phase 1:

- The first Siemens Industrial Trent 60 gas turbine units (300 MW) will be commissioned within twelve to fourteen months from financial close.

Phase 2:

- The three Siemens SCC5-4000F units (UNIT 1, UNIT 2 and UNIT 3) will be commissioned twelve to fourteen months after Phase 1.

The current timeline estimates 48 months construction for Phase 1 and Phase 2 combined.

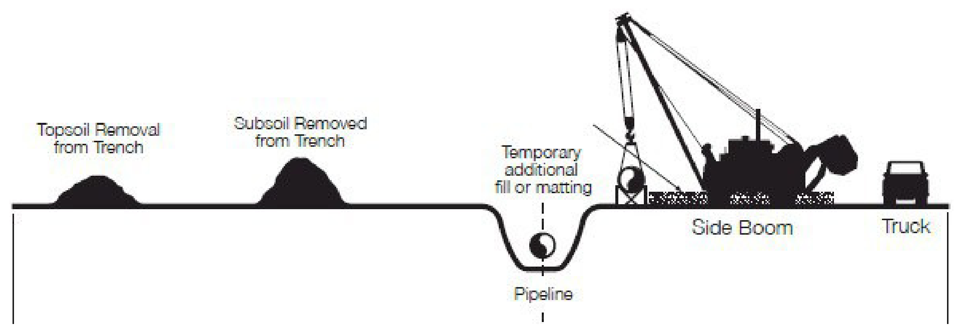
Pipeline Installation

Pipelines will be installed underground, and this implies the opening of a working strip along the right of way of the pipeline. During construction, the excavated trench will be clearly indicated and access and passage through the area will be restricted. The servitude is expected to 36 m in width [1] (including width of the pipe trench itself). *Figure 3.29* provides an overview of an indicative working strip for pipe laying.

The centreline of the trench need not coincide with the centreline of the servitude space requirement during construction, but may be situated closer to one side or the other of the servitude, depending on traffic and access, excavation programme and volume of topsoil and excavated soil. The pipeline trench is likely to have a width of 2 meters and a depth of between 1.5 m – 2 m [2]. Generally speaking the deeper the trench, the more work space will be required.

The boundaries of the servitude route will be clearly marked, flagged, or posted, such that each mark will be clearly visible from each mark on either side of it along the route. Markings on each flag or post along the route will be consistent with best management practice and may emphasise specific location warnings or conditions. Traffic through active work areas along the route will be strictly controlled.

Figure 3.29 ***Indicative working strip***



Source: ERM (2015) (drawing not to scale)

Table 3.16 provides a step by step description and illustration of the pipeline construction process. Prior to construction of the pipeline commencing surveying of the pipeline route will take place. Based on the information gathered during the surveying process which takes into account, amongst other things, environmental, developmental and local issues, a final route is developed.

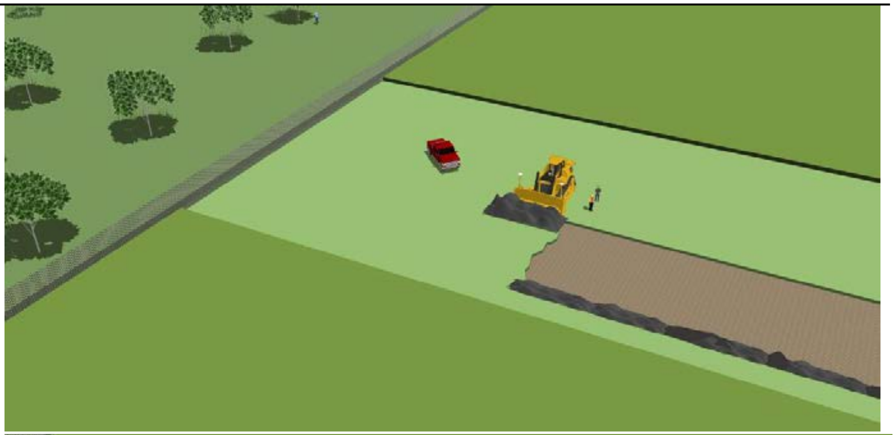
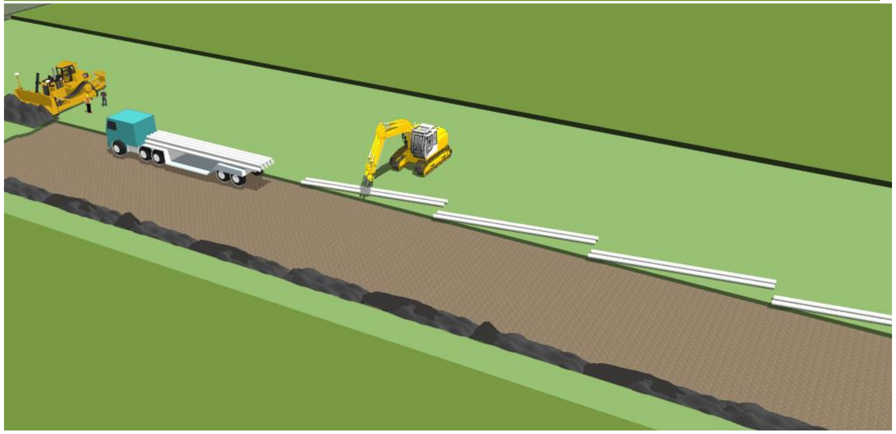
The EPC contractor will ultimately decide on the construction method to be used and is typically dependant on subsurface ground characteristics. Excavated sub-surface soil will be stored separately from the top-soil and large rocks, if any, may be removed and added later during the padding and back-fill stage. The slope and depth of the ditch will be in accordance with

(1) The precise width will be determined by the EPC contractor after taking into account local ground and flora conditions and his projected site traffic estimates during construction
(2) Exact dimensions will be determined by the EPC contractor after geotechnical investigations.

stipulated safety requirements which the EPC contractor will be acquainted with. From preliminary charting studies, blasting will not be required.

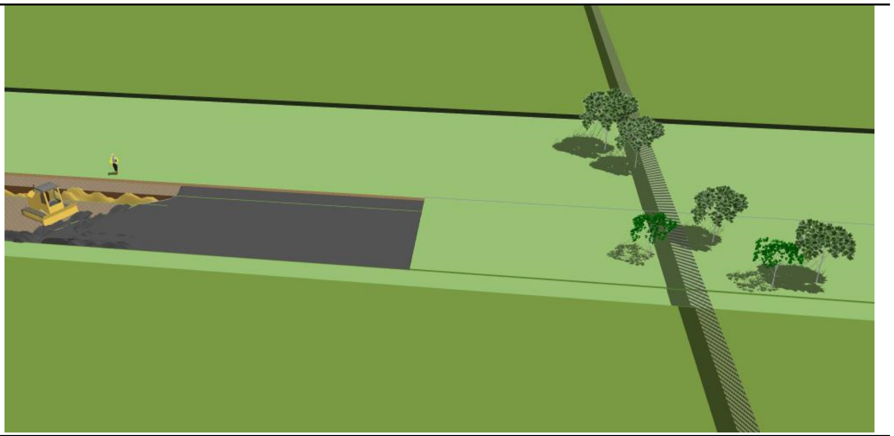
Road crossings will be designed by the EPC contractor according to ASME B31.4 and API RP 1102 or EN equivalent or as dictated by the Roads Authority. However, asphalt road crossings are usually carried out by a 'boring' method and crossings of gravel roads are typically by an 'open cut' method depending on traffic conditions and local regulations. Separate boring will be required for the sea-water pipeline and for the electrical cable conduit.

Table 3.16 Illustration of the pipeline construction process

Process Description	Illustration
Grading of the Right-of-Way: The topsoil along the right-of-way is stripped and stored for replacement following the installation of the pipeline.	
Laying out the pipe: Crews then re-stake the centre of the trench area and lay-out sections of the pipe along the right-of-way.	

Process Description	Illustration
Pipe preparation: Crews weld the sections of pipe into longer sections that follow the planned route. Individual sections have already been coated to prevent corrosion. Crews weld the sections of the pipe in mobile welding cabins to prevent wind and dust from compromising weld integrity. Each weld is inspected by X-ray and then coated again.	
Trench digging & soil separation: Once this process is complete, a trench is dug for the pipe run. The topsoil and subsoil are stored separately.	

Process Description	Illustration
Lowering the pipe: The pipe coating is inspected one more time before the pipe is lowered into the trench onto padding (sifted subsoil or sand).	
Backfilling, Grading & Testing: The trench is then carefully backfilled with sand, subsoil and preserved topsoil after the pipeline has been hydraulically pressure-tested.	

Process Description	Illustration
Clean-up & Restoration: The right-of-way and work area is regraded and vegetation is restored according to local requirements. A narrow compacted gravel track may be maintained along the pipeline route for access to monitoring equipment.	

Note: The above pictures are for illustration purposes only and do not take into account specific construction and restoration techniques which may differ depending on the area of operations.

Source: Client document: #1026.1.5 PCSA EIA/Gas Pipeline

Welding of the pipeline requires electric power. Power for the welding of the gas pipeline sections will be provided by a mobile diesel generator deployed to the pipeline construction site. The diesel will be supplied by mobile tankers on a daily basis. The interred power cable will eventually serve to operate seawater pumping and filtration plant at the coastline and located close to the "pigging" send-out station.

3.5.3 *Operational Phase*

Power Plant

The power plant will be operated on a 24 hour, 7 days a week basis. The number of workers on site during operations will be about 107 operational employees and up to 70 part-time employees. These will include plant management and maintenance staff, skilled mechanical and electrical technicians, drivers, medical, quality control, and cleaning staff and a number of experienced plant operators who will operate and maintain the plant, and who are expected to be a mix of expatriate and local staff.

During commercial operations there will be some traffic bringing supplies and spares to the power plant. This will increase during shutdowns and periods of major maintenance.

Maintenance activities will be undertaken by an Operations and Maintenance (O&M) contractor.

Water requirements

Water requirements during the operational phase are estimated as follows:

- Combined Cycle circuit, replacement feed water: 1 500 m^3/y
- Potable water: 200 m^3/y
- Water for ablutions during construction 25 m^3/day: 1 250 m^3/y
- Vacuum system and steam seal evaporative water loss: 500 m^3/y
- Sundry cooling system evaporative losses: 250 m^3/y
- Water/glycol cooling circuit losses: 1 500 m^3/y
- Other evaporative losses PV system washing):1,500 m^3/y Water will be produced by at least two methods:
    - Harvesting of rain water climate change dependent: 5 000 m^3/y
    - Desalination of sea water, 20 - 45 m^3/day, potable, up to 14 000 m^3/y. Sea-water to be pumped up to plant along gas servitude. This intended to be a ZLD (zero liquid discharge) process.
    - A third patented process currently being assessed: Recovery by vapour condensation in gas turbine exhaust.

It has been estimated that a provision of 25 000 m^3/year of water would be sufficient for operation of Phase 1 and Phase 2 of the power plant, this water would be sourced as follows:

- Trucking from local farms during the construction phase;
- Collection of annual precipitation in 5 x 2000m^3 storage tanks;
- A Reverse Osmosis plant on site using sea water that will be pumped up from the coast along the gas pipeline servitude. The RO process will be a zero discharge process; and
- Water recovery by condensation from the gas turbine exhaust.

Water during construction will be required for the following activities:

- Off-site dust control: Post treatment recycled water will be used for dust control on unsurfaced roads where required during high traffic periods and during construction. Estimated temporary provision of 5,000 m^3 per annum in 2017 and 2018.

- Domestic purposes by on site workers: Maximum water usage during peak construction period (600 site personnel) is estimated to be 60 m^3/day. This peak requirement is estimated to be needed for approximately 2 years – 2017 and/ 2019.

- Construction and on-site dust control: Water is required for the manufacture of concrete during construction. The power plant will require approximately 80,000 – 90,000 m^3 of concrete for foundations, road works, hard standing and other site works. Estimated temporary provision of 5,800 m^3 per annum - 2017 and/ 2019.

Water during operation of Phase 1 and Phase 2 will be required for the following activities:

Motive steam for the combined cycle (1): Estimated annual provision 1500 m^3.

- Annual Cooling water for condensation of steam from steam turbine seals and vacuum plant seals: Estimated annual provision of 500 m^3 (Phase 1 and Phase 2).

- Cooling of lubrication oil for gas turbine, alternators and steam turbine generator, gas compressor air: Estimated annual provision of 500 m^3per year.

- As water/glycol for combustion air inlet cooling: A cooled water closed-loop is used to cool down the inlet combustion air to as close to 15 °C as possible. Estimated annual provision of 1500 m^3 per year.

(1) The Benson boiler does not consume water, in that there is no water discharge to out of battery limits, the quantity indicated here is a provision over and above what may be used for startup

- Make-up water for treated water replacement in event of any boiler blow-down requirement: Estimated annual provision of 1000 m^3 per year.

- Fire abatement: Estimated storage provision of 3000 m^3.

Table 3.17 ***Summary Total Water Usage excluding Fire Contingency***

Project Stage	**Year 1**	**Year 2**	**Year 3**	**Year 4 Operation Phase 1 and 2**	**Year 5 Operation Phase 1 and 2**
Construction (m3)	20,000	20,500	16,500	0	16,500
Operation (m3)	3,000	3,000	5,000	12,000	12,000

This will be confirmed as the design details for the plant are progressed through the BFS.

Utilities and materials

Table 3.18 presents a preliminary list of the incoming utilities and materials to the power plant site.

Table 3.18 ***Preliminary list of incoming utilities and materials***

Utility	**Notes**
Natural Gas	Brought in by pipeline
LPG	Brought in by truck
Sea water	Brought in by pipeline
Process Materials	Brought in by truck
Hydrogen	Brought in cylinders for generator cooling
Ethylene Glycol	Brought in in steel drums for cooling water treatment & process chemicals
Ammonia	Brought in drums, by truck
Water treatment & process chemicals	
Ammonia	Brought in drums, by truck
Sulphuric acid	Brought in drums, by truck
Demineralizing resins	Brought in drums, by truck
Carbon dioxide,	Gas cylinders, brought in by truck
Sewage treatment chemicals (Organic)	
Workshop consumables	Fluxes, welding rods, gaskets, etc.
Maintenance consumables	
Paint	Brought in metal cans
Lubricating greases	Brought in metal cans
Fire-extinguishing foam	Standard gas/foam cylinders
Canteen food	Brought in by truck
Office consumables	
Construction Aggregates	Sand, gravel, cement, brought in by truck

Table 3.19 provides a preliminary list of the outgoing utilities and materials form the power plant.

Table 3.19 Preliminary list of outgoing utilities and materials

Outgoing Utility / Material	Estimated Quantity
Electricity	max. 34,800 MWhe/day
Potable water	max. 30,000 l/d
Waste lube oil	max. 15 tons/year
Solid desalination salt residue:	approximately 900 kg/day
Canteen waste -food products	100 kgs/day
Dewatered solids from waste water treatment	max. 50 Kg/day
Spent anti-fire agent cylinders	
Waste, non-oil maintenance materials	est. max. 5 tons/y
Spent consumables and cleaning products.	est. max. 5 tons/y

Services

The following services will be provided by the project itself, managed by a services department on site or contracted to a third party:

- Electricity;
- Gas;
- Raw water treatment, including filtration RO and demineralisation;
- Water recovery from waste water;
- Sewage treatment;
- Boiler feed water;
- Boiler blow-down recovery;
- Condensate;
- Fire water;
- Cooling water;
- Hydrogen generator cooling system;
- CO2 fire abatement system; and
- Compressed air.

Emissions

Emissions from the plant will result from a number of sources and depend on the fuel used to generate power. It should be noted that propane will only be used for emergency black starts.

Phase 1

The likely emissions, at maximum continuous rating (MCR)(1), that can be expected during Phase 1 of the Project are shown in *Table 3.1.*

(1) Maximum continuous rating (MCR) is defined as the maximum output (MW) that an electric power generating station is capable of producing continuously under normal conditions over a year.

*Table 3.20 Estimated Emissions from the Project – Phase 1***

Emitter	UNIT NUMBER	Capacity MWe at MCR	Stack Flow Kgs/sec	SOx	CO Mg/Nm³	NOx Mg/Nm³	CO² Kg/hr
Trent 60 DLE *	T1	48	152		46	50	27.161
Trent 60 DLE *	T2	48	152		46	50	27.161
Trent 60 DLE *	T3	48	152		46	50	27.161
Trent 60 DLE *	T4	48	152		46	50	27.161
Trent 60 DLE *	T5	48	152		46	50	27.161

*Open Cycle at site conditions 25°C, 20m, 65%RH
#Open cycle, nominal rating
**The 6th Trent 60 DLE unit is not included in this table as it is redundant.

Table 3.21 Exhaust Gas Emission Rate and Temperature

Emitter	UNIT NUMBER	Stack Height	Rate Kg/sec	Temperatur e °C
Trent 60 DLE *	T1 through T6	40 m	152	439

*Open Cycle at site conditions 25°C, 20m, 65%RH
#Open cycle, nominal rating

Phase 2

The likely emissions, at maximum continuous rating (MCR)(1), that can be expected during Phase 2 of the project are shown in *Table 3.1.*

Table 3.22 Estimated Emissions from the Project – Phase 2

Emitter	UNIT NUMBER	Capacity MWe at MCR	Stack Flow Kgs/sec	SOx	CO Mg/Nm³	NOx Mg/Nm³	CO² Kg/hr
SCC5-4000F 1S	UNIT 2	435	680	0	35	<20	152,200
SCC5-4000F 1S	UNIT 3	435	680	0	35	<20	152,200
SCC5-4000F 1S	UNIT 1	435	680	0	35	<20	152,200

*Combined Cycle at site conditions 25°C, 20m, 65%RH

Table 3.23 Exhaust Gas Emission Rate and Temperature

Emitter	UNIT NUMBER	Stack Height	Rate Kg/sec	Temperature °C
SCC5-4000F 1S	UNIT 2	60 m	675	90 - 110
SCC5-4000F 1S	UNIT 3	60 m	675	90 - 110
SCC5-4000F 1S	UNIT 1	60 m	675	90 - 110

*Combined Cycle

(1) Maximum continuous rating (MCR) is defined as the maximum output (MW) that an electric power generating station is capable of producing continuously under normal conditions over a year.

Waste Generation

Construction wastes will comprise general domestic waste including sanitary and food waste, office waste, organic material, small volumes of wastes arising from mobile plant, chiefly waste lubricating oil and packing materials (e.g. crates).

Operational phase waste streams are as follows:

- Used generator and turbine lube oil (collected in a tank on site and then removed off-site in drums for controlled disposal);
- Occasional oily sludge recovered from on-site collected road surface or hard-standing surface water treatment;
- Spent gas turbine fabric air filter cartridges;
- Spent gas turbine lube-oil filter cartridges;
- Dried powdered sludge from sewerage treatment and ablution and canteen washing areas;
- Spent office consumables (paper, printer cartridges etc.);
- Organic waste food from canteen operations and organic cooking oil waste from canteen operations;
- Glass waste and metal can waste from canteen operations;
- Scrap steel and copper from irreparable mechanical equipment;
- Scrap plastics from equipment packaging;
- Dry solids (mineral salts) recovered from zero discharge reverse osmosis process;
- Spent resins from water demineralisation;
- Waste solvents and grease from workshop equipment cleaning operations; and
- Spent laboratory chemicals from water testing and water treatment.

No waste material will remain on site.

Potentially hazardous chemicals will be neutralised (if acidic) and then separately hermetically packed and labelled prior to disposal.

The disposal of waste will be carried out in accordance with the relevant legislation. All solid wastes generated will be disposed of at licensed landfill sites, for general and/ or hazardous waste streams.

The combined cycle circuit will generate steam through a Benson type boiler. This is a drum-less boiler that although there is a much diminished blow-down, compared to a conventional drum boiler, the blowdown water is recuperated and re-used.

Pipeline

<u>Pipeline operation, marking and monitoring</u>

The position and location of the buried gas pipeline will be indicated above-ground by special marker beacons laid above the pipeline in line-of-sight of each other along the pipeline servitude route (*Figure 3.30*). The markers will be able to collect and transmit essential pipeline information by means of telemetry, as described below.

Figure 3.30 Example of a marker indicating pipeline below ground

The pipeline is expected to operate continuously, for 8760 hours per year, only the flow rate will vary. The pipeline operating conditions are listed in *Table 3.24.*

Table 3.24 Pipeline operating conditions

Parameter	Operating Condition
Gas temperature	20 C (insulated pipeline)
Flow rate	25 – 65 kg/sec
Working pressure	max. 90 barg, min 45 barg, average 67 barg

Parameter	Operating Condition
Pipeline maximum allowable stress	78,500 barg (7854 Mpa)

Solar-powered data collection nodes along the pipeline route will constantly collect and retransmit pipeline operational statistics, cathodic or anodic protection performance or alarms to the power plant's control room. Pipeline gas flow interruption during maintenance interventions could also interrupt power generation, thus sophisticated measures will be put in place to pre-empt the need to shut off gas flow at any time.

Several leak detection technologies are available and will be incorporated by EPC contractor. Those currently available are as follows:

- In – pipeline instrumentation based on acoustic sensors
- In – pipeline condition assessment with pigging.
- Above-ground air sampling along the pipeline route (Unmanned Aerial Vehicle UAV or manually operated);
- Detection of tracer chemical introduced into the gas pipeline and detected above ground;
- Automatic solar-powered leak detection sensors capable to trigger control room alarm;
- Radio/WiFi instrumentation information transmitted to control room/pipeline operator; and
- Pipeline monitoring data collected regularly by plant operated security Unmanned Aerial Vehicle (UAV).

Emergency shut-down and emergency response

Whilst the emphasis for pipeline operation is continuous operability, the pipeline can be shut down in case of emergency. The pipeline can be isolated at three locations, namely at the LNG degasifier that feeds the pipeline with gas, and closing the two pipeline isolation valves either from the plant control room or manually. These valves are located at the despatch pigging station at the beginning of the land-based pipeline. The pipeline will be allowed to depressurise via a small gas flare at the pig-receiving station and residual gas will be expelled by a spherical 'pig'.

The prime risk associated with the pipeline emanates from undetected gas leaks from:

- Pipeline or valve rupture due to excessive pressure and failed welds;
- Pipeline or valve rupture due to sub-surface geological or subsoil instability; and
- Pipeline or valve rupture plus break-down of all leak detection and alarm systems.

The impact of an undetected gas leak can result in:

- Fire, or in the worst case, a high energy explosion of the ruptured gas pipeline;
- Setting alight surrounding flora and any habitation; and
- Hydrocarbon contamination of the natural environment.

Emergency response measures in the event of a sudden catastrophic rupture of the pipeline will be put in place, including:

- Reliable and immediate shut-off capability of all valves along the pipe-line route, including sea-water feed-valve and mid-route water isolation valve. Where the automatic valve actuators have been incapacitated, the pipeline will be isolated manually by a trained rapid response team;
- The underground power-cable will have been isolated automatically through loss of gas pipeline pressure;
- Immediate shut-down of the regasification facility;
- Immediate start-up of fresh water fire pump feeding the water pipeline;
- Rapid response fire response team;
- Shutting off all roads that have a pipeline crossing;
- Controlled shutdown of the power plant;
- Dissemination of information and knowledge of the pipeline location and hazards to local fire authorities; and
- Being a Class 1 location installation, personnel or habitation or buildings close to the pipeline will be minimal/non-existent. Nevertheless the plant medical team and fire response team will have access along the pipeline route.

3.5.4 Decommissioning Phase

Decommissioning is the term used to describe all stages involved in the closure and rehabilitation of the power plant site. The process can generally be categorised into the three key phases as follows:

- Pre decommissioning activities: includes the detailed planning (development of a Decommissioning Plan, Site Closure and Restoration Plan) and approval facilities;

- Decommissioning activities: removal of all infrastructure (including the cables and pylons for the connection to the existing transmission line). Machinery, steel and dismantled materials will be recycled where possible and disposed of at licensed disposal sites; and

- Post decommissioning activities: site survey, close out report and field monitoring as necessary.

It is likely that the project facilities will only be decommissioned once the gas supply has been exhausted, when it is no longer economical to continue operation, or the plant is rendered redundant or is no longer required for various reasons, or is unsafe to operate. As the development process of the site is yet to fully begin, detailed decommissioning plans have not yet been formulated; however, the initial plant life will be designed for 25 to 30 years. Upgrades during the life of the plant can increase the design life to 50 years.

A Decommissioning Plan will only be developed during the latter stages of the production life of the facilities. The assessment of the significance of the environmental and social impacts associated with decommissioning will need to be conducted once the Decommissioning Plan is finalised.

3.6 ASSUMPTIONS

The following assumptions have been made with respect to the project description chapter:

1. There will be a permanent easement above the pipeline of 3m either side of the centre line;
2. There will be a temporary Right of Way (RoW) of 36m (18m either side of the centre line) of the pipeline during the construction phase;
3. There will be a permanent 30m servitude for the feeder 132kV power line from the power plant to the ArcelorMittal Steel Works (15m either side if the centre line)
4. The site access arrangements illustrated in this section are conceptual and have been engineered and costed as they are represented using generic data from various contractors with past experience. Special requirements that may be requested in addition to the to-date assumptions and findings have not been taken into account in this report.

4 PROJECT ALTERNATIVES

4.1 PROCESS FOLLOWED TO REACH THE PREFERRED PROJECT ALTERNATIVES

One of the objectives of an EIA is to investigate alternatives to the Project. In relation to a proposed activity **"alternatives"** means different ways of meeting the general purposes and requirements of the proposed activity. This section presents the alternatives considered as part of the development plans for the Project and describes the process followed to reach the preferred alternative.

Chapter 3 of the Scoping Report presented the process followed to reach the preferred alternative, including as required in terms of Appendix 2 of the EIA Regulations 2014, the identification and assessment of impacts and risks associated with alternative locations and technologies. For the sake of completeness, the assessments done at the Scoping Stage have been included here in *Section 4.1.2* and *Section 4.1.3*. As indicated in the Scoping Report the result of the Scoping alternatives assessment was that the **preferred alternative** for the generation of power for use by AMSS is an air-cooled, CCGT gas-fired power plant (with OCGT in Phase 1) located at Site B. This is the alternative that has been assessed in this EIA report. For the sake of completeness the description of how this preferred alternative was reached is included below. Additional information regarding the selection of Saldanha as the preferred location in South Africa and the water source alternatives is also provided.

4.1.1 Activity Alternatives

Alternative power generation options are discussed in *Section 2, Need and desirability of the Project, Section 2.12* and assessed in this Section of the Report.

Criteria that were considered in the assessment were:

- Cost per MW hour;
- Baseload power requirement;
- Time to first power;
- Difficultly of obtaining regulatory approval.

The results thereof are detailed in *Table 4.1.*

Table 4.1 Comparative Assessment of Power Generation Options against Four Key Criteria

	Generation type					
Assessment Criteria	Nuclear	Coal	Renewables	Liquid fuels	Heat recovery	Gas
Cost per MW hour;	High	Medium	Medium	High	Low	Low
Baseload power requirement;	Low	Low	High	Medium	Medium	Low
Time to first power;	High	High	Low	Medium	Medium	Low
Difficulty of obtaining regulatory approval.	High	High	Low	Medium	Low	Low

High
Medium
Low

When assessed against the four criteria and compared to the other power generation options, it is apparent that a gas-fired power plant meets all the required criteria. While renewable options can be implemented in a similar time frame as gas options, and are similar in terms of regulatory approval processes, renewables cannot offer a baseload option that is required without being outside of the cost parameters that make the project viable.

4.1.2 *Location Alternatives*

Arcelor Mittal has considered the placement of the power plant in Saldanha Bay for the following reasons:

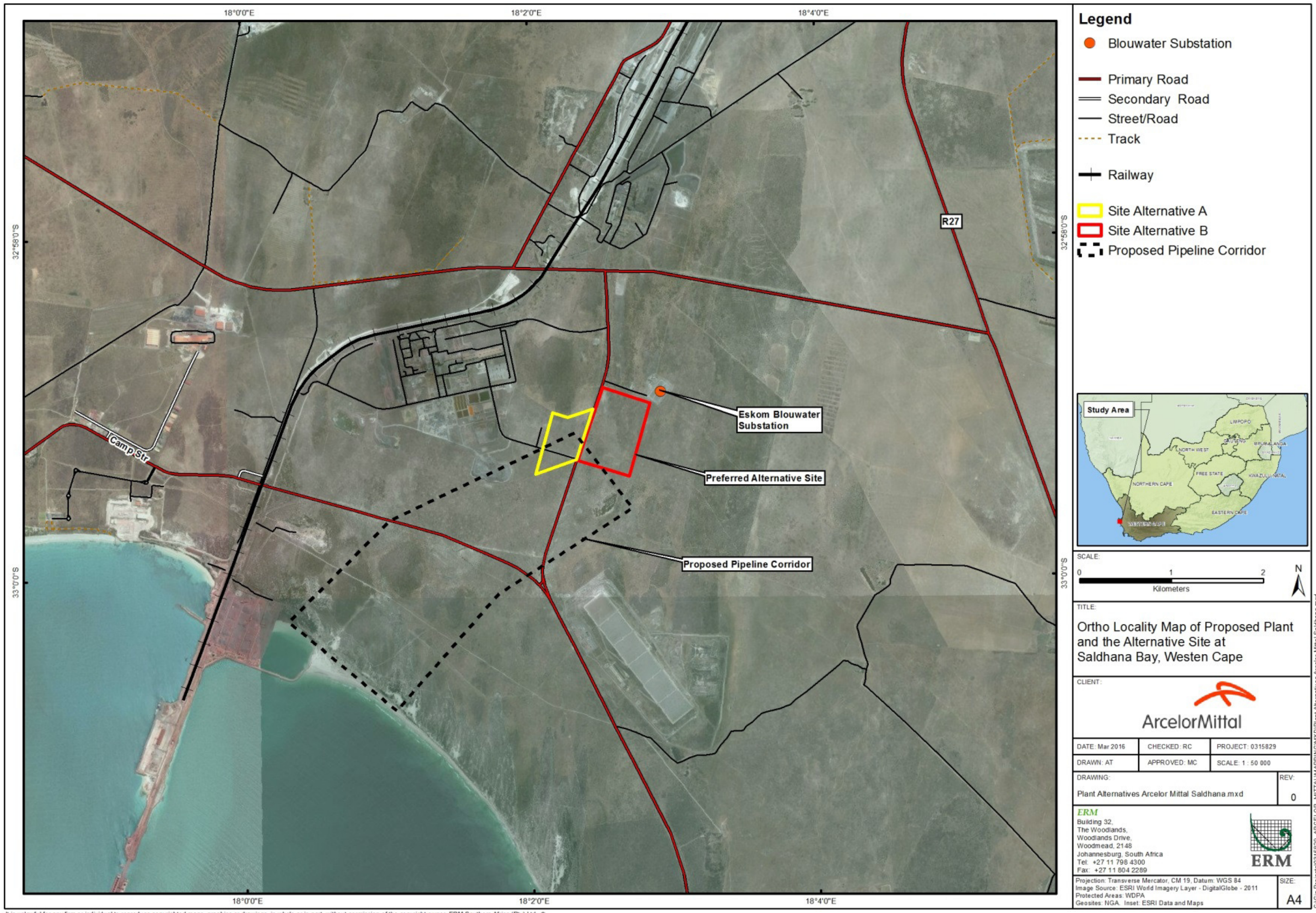
- The current Saldanha Steel Plant is in Saldanha and requires a more cost effective power to continue its operations;
- Need to reduce transmission line distance between the plant and Saldanha Steel;
- Proximity to the Port of Saldanha and anticipated link up to the LNG Import Facility which may be developed there by the Department of Energy and Transnet [(1)] ; and
- Demand from other industrial developments in the area for power.

In Saldanha Bay specifically, ArcelorMittal considered two alternative sites for the development of the gas-fired power plant based on proximity to the existing ArcelorMittal Steel Works site. Other considerations included land availability and zoning status, distance from the existing power transmission infrastructure, vegetation sensitivity, access to the site and proximity to residential areas.

The alternative sites considered are shown in *Figure 4.1*.

(1) Should this not be the case a separate EIA will be undertaken for the import of LNG into the Port of Saldanha.

Figure 4.1   Alternative Sites Considered by ArcelorMittal



A risk identification process was undertaken by AMSA in order to identify the preferred location. A summarised version of this assessment is provided below.

Table 4.2 *Risk Identification*

Topic	Site A (AMSS Site, adjacent to Saldanha Steel Facility)	Site B (AMSA-owned Land, across the road from AMSS)
Legal		
Rezoning	This site is zoned as industrial, so re-zoning is not required. Potential consent use is required from the municipality.	Rezoning of previously agricultural land will be required. This could add an additional 6 months to the permit and approvals phase of the project (prior to commencement of construction).
Access to site	Existing access to the site is available, however with some potential complications particularly during construction.	Site B has no existing access and an application to the provincial roads engineer for approval will be required. This will also include a traffic impact study. Land use approval will only be obtained after approval from Roads engineer. The additional approval can impact on time line.
Permitting complications	Risk of complications arising in the Atmospheric Emission License process due to existing AEL for AMSS and additional license requirement for this facility.	No permitting complications as power plant located off the AMSS facility site.
Location		
Proximity to substation	Marginally further away from Aurora substation.	Directly adjacent to Blouwater substation and marginally closer to Aurora substation.
Potential for expansion	The 1500MW facility fits onto the proposed Site A on AMSS site, however this does not allow for any future expansion which would then not be possible.	Space available for future expansion.
Proximity to AMSS facility for provision of power	Located adjacent to the AMSS facility so easier connection for power generation.	Located further away from the AMSS facility so connection more difficult.
Additional revenue streams		
Use of waste gas from AMSS operations	This is possible and would potential reduce carbon emissions and carbon tax.	Remains possible but additional cost associated with this option over Site A.
Use of LNG in AMSS operations	This is possible and would reduce costs as the currently used LPG is significantly more expensive than the LNG proposed.	Remains possible but additional cost associated with this option over Site A.

Topic	Site A (AMSS Site, adjacent to Saldanha Steel Facility)	Site B (AMSA-owned Land, across the road from AMSS)
Environmental Considerations [1]		
Botanical/CBA	Both sites have disturbed indigenous vegetation on site. Botanical survey showed sites have similar low botanical sensitivities. Despite the low sensitivity of the flora on site the entire site is a declared CBA.	During the botanical site survey a portion of the original Site B was identified as being highly sensitive from a botanical perspective. This portion has subsequently been excluded for this reason from the proposed site. Despite the low sensitivity of the flora on site, approximately 43 percent of the site is a declared CBA.
Visual	The visual impact associated with this site is likely to be less than that of Site B given the backdrop of the AMSS facility.	The visual impact of the site is potentially greater given as it is located on the other side of the road to the AMSS facility. However it remains in very close proximity to the facility which is very dominant in the landscape and is unlikely to significantly change the character or sense of place of the area.

*Key

	Definition
(green)	Low risk to project development.
(orange)	Medium risk to project development.
(red)	High risk to project development.

Impacts Associated with the Viable Location Alternatives Identified

As required in terms of the EIA Regulations, 2014 impacts associated with the viable alternatives have been identified and the nature, significance, consequence, extent, duration and probability thereof investigated. Identification of mitigation measures and the ease with which these can be implemented is also indicated, along with a preliminary rating of significance post mitigation.

A shortened version of ERM's EIA methodology was used to establish these criteria and ratings. Please see *Chapter 9* for a more detailed description of the methodology.

Please note that the table below was developed during the Scoping Phase to assess the location alternatives (Site A and Site B). Site B was selected as the preferred alternative location and as such the Impact Assessment in *Chapter 10* of this report focuses on Site B.

(1) More detail is provided in Section 7 with regards to the potential environmental impacts associated with Sites A and B.

Table 4.3 Location Alternatives: Environmental Impact Identification and Preliminary Assessment

Key Environmental Impacts Identified	Alternative	Nature	Description of Preliminary Assessment	Mitigation
Air Quality	This impact is consistent between Site A and Site B.	This will include construction related impacts such as dust, as well as the release of pollutants during operation of the power plant.	This impact is likely to occur, is considered regional in extent and long-term in duration. The significance of this impact is likely to be moderate without mitigation given the sensitivity of the airshed.	Standard mitigation measures are available to reduce emissions. Specialist input is required in order to confirm the mitigation measures and ratings.
Noise	This impact is consistent between Site A and Site B.	Noise from construction of power plant, pipeline and transmission line may have an impact on sensitive receptors. Noise from power plant operation may have an impact on sensitive receptors. Noise and vibration from construction and operation traffic along main transport/access routes.	This impact is likely to occur, is considered local in extent and long-term in duration. The significance of this impact is likely to be moderate without mitigation given the existing noise in the area and the minimal sensitive receptors.	Standard and inbuilt mitigation measures are available to reduce emissions. Specialist input is required in order to confirm the mitigation measures and ratings.
Flora and Fauna	Site A	Clearance of vegetation for the construction of the power plant and associated infrastructure will lead to an impact on terrestrial ecosystems. Site A is classified as a Critical Biodiversity Area (CBA), although a botanical site screening undertaken on the site has shown that the vegetation on site is in fact of low sensitivity as it has been previously disturbed.	The impact rating is likely to be the same for both sites. This impact is likely to occur, is considered national in extent (due to the loss of CBA) and permanent in duration. Based on the sensitivity of the environment the impact is likely to be moderate in significance.	Mitigation including minimising the area required to be cleared, avoidance and demarcation of particularly sensitive vegetation is possible and may reduce the significance of the impact, however given the loss of CBA the significance of the impact may not be able to be reduced. Additional specialist input is required in order to confirm the mitigation measures and ratings.

Key Environmental Impacts Identified	Alternative	Nature	Description of Preliminary Assessment	Mitigation
	Site B	Clearance of vegetation for the construction of the power plant and associated infrastructure will lead to an impact on terrestrial ecosystems. During the botanical site survey a portion of the original Site B was identified as being highly sensitive from a botanical perspective. This portion has subsequently been excluded for this reason from the proposed site. Despite the low sensitivity of the flora on site, approximately 43percent of the site is a declared CBA.		
Socio-economic	This impact is consistent between Site A and Site B.	***Community Health Safety and Security*** Equipment and activities will create noise and vibration and changes to air quality during construction, operations and demolition that could impact human health; Movement of materials and workers during construction, operation and demolition could impact public safety; and The presence of workers and opportunistic workers in the project area could result in a change in the disease profile of the local population in particular vector borne diseases, communicable diseases and sexually transmitted infections.	This impact is likely to occur, will be regional in scale and long-term in duration. The significance of the impact is likely to be moderate without mitigation.	Adhere to the national/ and provincial noise regulations. Adherence to national/ and provincial air quality regulations and standards. Additional specialist input is required in order to confirm the mitigation measures and ratings. This is a stakeholder perceived impact and it's not anticipated to actually occur; however, should it occur, the project proponent, should, in collaborate with local/ and provincial health services to monitor changes in health outbreaks. Should such be observed – disease or illness specific measures will be developed and implemented.

Key Environmental Impacts Identified	Alternative	Nature	Description of Preliminary Assessment	Mitigation
	This impact is consistent between Site A and Site B.	***Worker Health & Safety*** Hazardous construction operational or decommissioning activities could impact worker health and safety; and Handling of hazardous materials could impact worker health and safety.	The impact is unlikely to occur, would be local in scale and temporary in duration should they occur. Significance prior to mitigation is likely to be moderate.	Standard mitigation measures are available for the prevention of health and safety incidents. Adherence to the Occupational Health and Safety Act (Act No. 85 of 1993) will be required. Additional specialist input is required in order to confirm the mitigation measures and ratings.
	This impact is consistent between Site A and Site B.	***Local Community Demographics*** Influx of workers looking for opportunities and the presence of a construction workforce from outside of the local Project area will result in a change in demographics of the local communities.	This impact is likely to occur, will be regional in scale and long-term in duration. The significance of the impact is likely to be moderate without mitigation.	Working with local government (specifically Ward Councilors), the project proponent will carry out monitoring of settlements to determine patterns of in-migration, understand the origins, characteristics and motivations of in-migrants, and identify the impacts of in-migration, and will use the results to develop an in-migration management plan should it be required. Additional specialist input is required in order to confirm the mitigation measures and ratings.
	This impact is consistent between Site A and Site B.	***Local and Macro Economy*** Procurement of goods and services required by the Project during construction, operation and decommissioning of the Project and the presence of workers in the area may enhance the local economy both directly and indirectly.	This positive impact will occur, will be regional in scale and long-term.	Mitigation measures include utilisation of local labour and sourcing of local materials as far as possible. Additional specialist input is required in order to confirm the mitigation measures and ratings.
	This impact is consistent between Site A and Site B.	*Traffic* Transport of materials and equipment and waste during the construction, operation and decommissioning stages could impact traffic patterns.	This impact is likely to occur, will be local in scale and long-term in duration. The impact is likely to be minor without mitigation.	Large construction vehicles to not utilise public roads during peak hours. Damage to public roads caused by large construction vehicles must be repaired immediately.

Key Environmental Impacts Identified	Alternative	Nature	Description of Preliminary Assessment	Mitigation
	This impact is consistent between Site A and Site B.	*Cultural/Heritage Resources* Construction activities could have an impact on local cultural sites (paleontological); and The presence of workers in the Project area, transportation of materials and equipment to the construction sites may impact on cultural areas.	This impact is possible, would be regional in extent should finds occur and permanent in duration should they be damaged. Significance prior to mitigation is likely to be minor/moderate.	Standard mitigation measures such as chance finds procedures, demarcation of heritage sites are easily implementable and will be identified during the specialist study.
Waste and waste-water	This impact is consistent between Site A and Site B.	Non-hazardous and hazardous wastes will be generated that will require to be transported and disposed of in a manner protective of the natural and human environment. Improper storage, handling and transport of solid and liquid wastes at the power plant can lead to loss of containment and spillages which could give rise to soil and ground water contamination.	This impact will occur, would be local in scale and long-term in duration. Significance prior to mitigation is likely to be minor.	Standard, easily implementable, mitigation measures are available for the management of wastes.
Climate Change	This impact is consistent between Site A and Site B.	The greenhouse effect causes a change to the global climate regime on a continuous basis.	This impact will occur, but would be felt at a global scale in the longer term. Significance is considered minor prior to mitigation.	Considerations of alternative fuels and the development and implementation of a GHG management plan.

Key Environmental Impacts Identified	Alternative	Nature	Description of Preliminary Assessment	Mitigation
Risk (Non-Routine Impacts)	This impact is consistent between Site A and Site B.	The power plant will be fuelled by natural gas, which will be supplied as required via pipeline. Only a small quantity of natural gas will be stored on site. Additional storage of dangerous goods on site will include diesel for construction and operation related activities. Leaks or accidental releases of diesel or chemicals during construction and operation activities could impact on soil and groundwater. Accidental release of natural gas during transportation via pipeline could be a risk to surrounding receptors.	The impact is unlikely to occur, would be local in scale and temporary in duration should they occur. Significance prior to mitigation is likely to be moderate.	Standard mitigation measures are available for the prevention of accidental releases during transportation and storage of dangerous goods. An emergency response plan will be required for the project.

Selection of the Preferred Alternative Site Location

Based on the risks and opportunities identified in *Table 4.2* and the fact that there are very limited differences in environmental and social impact between Site A and B, Site B was selected by the Project team as the preferred site alternative. The potential permitting risks combined with the risk of being unable to expand the facility in future linked to Site A outweighed the potential time delays and increased costs associated with infrastructure development to access additional revenue streams/benefits linked to Site B. As such Site B was selected as the preferred alternative.

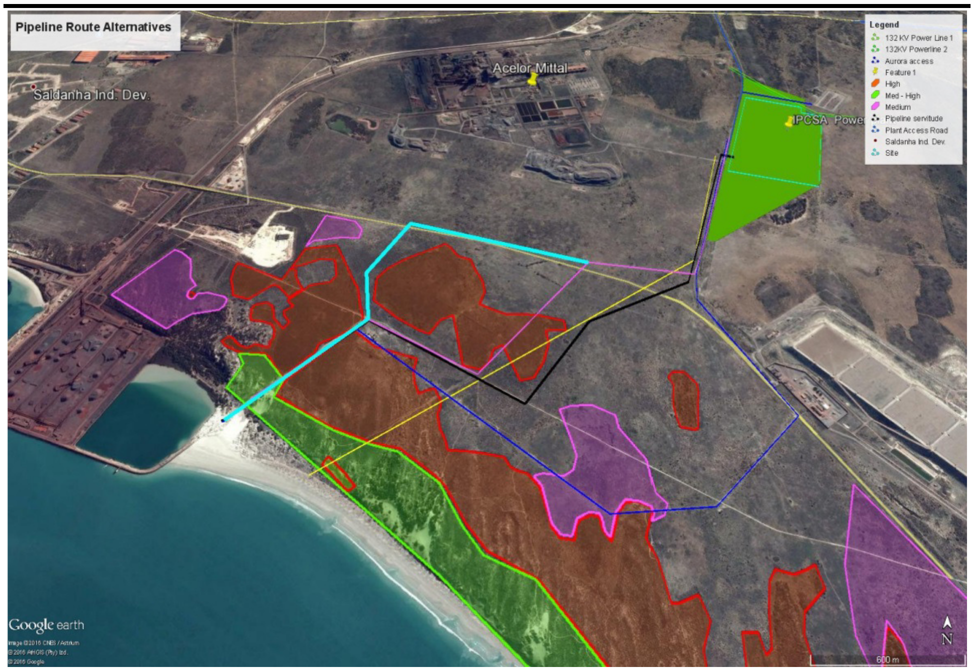
Location of the Facility within the preferred Site Alternative

As indicated, Site B was chosen as the preferred site alternative. The facility has been located within this site based on a number of factors including botanical sensitivity (see discussion in *Table 4.3*), proximity to the Blouwater substation and proximity to the road. The layout plans can be seen in *Chapter 3* and *Annex C*.

Pipeline Routing

A number of alternative pipeline routes were considered for the supply of natural gas to the power plant. A number of factors were considered, including the likely starting point of the pipeline linked to the import facility, land ownership, technical feasibility and botanical sensitivity. The preferred pipeline route was largely selected to avoid sensitive areas from a botanical perspective, with technical feasibility taken into consideration. See *Figure 4.2*.

Figure 4.2 *Alternative Pipeline Routes Considered. Preferred Alternative shown in Black.*



Source: Google Earth with input from Nick Helme, 2015

4.1.3 *Technology Alternatives*

Power generation technology alternatives are related to the available fuels, site location and ambient conditions. Different makes of similar equipment categories were not considered as alternative technologies. At an early stage it was decided that renewable energy sources were not viable and that the plant would be fuelled by natural gas as described above. This selection established the technology type. The next step was the selection of the equipment mix that utilised natural gas and best suited the overall power demand profile of the combined mix of power off-takers.

Open-cycle vs Combined-cycle Gas Turbines

There are two types of gas-fired power plants, open-cycle gas turbine (OCGT) plants and combined-cycle gas turbine (CCGT) plants.

<u>Open-cycle Gas Turbine (OCGT)</u>
OCGT plants consist of a single compressor/gas turbine that is connected to an electricity generator via a shaft. They are generally used to meet peak-load demand and offer moderate electrical efficiency of between 35% and 42% (lower heating value, LHV) at full load. (1) OCGT plants can be constructed significantly faster than CCGT plants.

(1) Sourced from: http://www.iea-etsap.org/web/e-techds/pdf/e02-gas_fired_power-gs-ad-gct.pdf

Combined-cycle Gas Turbine (CCGT)
CCGT plants have basic components the same as the OCGT plants but the heat associated to the gas turbine exhaust is used in a heat recovery steam generator (HRSG) to produce steam that drives a steam turbine and generates additional electric power. Large CCGT plants may have more than one gas turbine. In mature natural gas markets which are endowed with vast natural gas infrastructure systems, CCGT is the dominant technology for flexible and base-load power generation. The CCGT thermodynamic efficiency is currently approximately 52–60% (LHV). CCGT plants have the potential to offer flexible operation, depending on natural gas supply and gas infrastructure assumptions. They are designed to respond relatively quickly to changes in electricity demand and may be operated at 50% of the nominal capacity with a moderate reduction in efficiency.

It is intended to develop a gas-fired power plant operating as an OCGT only initially (in order to obtain power to supply AMSS in the fastest possible time), followed by the addition of a three CCGT turbines in Phase 2 (to take advantage of the efficiencies this technology offers).

Other activity alternatives were not assessed any further by AMSS since they were considered unviable for this Project.

Cooling system

A key consideration for thermal power plants is the method of cooling to be utilised. The alternative cooling options include:

- Once through system;
- Wet cooling; and
- Dry/Air cooling.

Each of these alternatives is discussed in the table below and the environmental impact assessed.

Table 4.4 Cooling Technology Options

Cooling Method	Description	Advantages	Key Impacts/Risks	Rating	Mitigation
Once-through system	Once-through systems take water from nearby sources (e.g., rivers, lakes, aquifers, or the ocean), circulates it through pipes to absorb heat from the steam in systems called condensers, and discharge the now warmer water to the local source.	Advantages include simplicity and low cost. Disadvantages include disruptions to local ecosystems from the significant water withdrawals involved and the release of warmer water back into the ecosystem.	• Impact to marine ecology due to water abstraction and release of heated water into the environment. • Distance and cost of pipeline from the shoreline to the power plant.	A likely, regional impact would occur for the duration of the operation of the facility. The impact is likely to be of high significance (given the sensitivity of the marine environment) without mitigation but further specialist work would be required in order to provide a quantification of this.	Mitigation measures are available for the dispersion of released heated water include pipeline diffusers and longer pipeline releasing the water further out into the ocean. Should hot water be released into Saldanha Bay, the impact is likely to remain medium-high even with mitigation. If it is feasible to build a pipeline to release the water into the open ocean, then the marine impacts are likely to be low. However, this would need to be balanced with the additional terrestrial impacts as a result of the longer pipeline. Based on the sensitivity of the terrestrial environment in the greater Saldanha Bay area, the impact on terrestrial habitat is likely to the moderate to high.

Cooling Method	Description	Advantages	Key Impacts/Risks	Rating	Mitigation
Wet-cooling	Wet-recirculating or closed-loop systems reuse cooling water in a second cycle rather than immediately discharging it back to the original water source. Most commonly, wet-recirculating systems use cooling towers to expose water to ambient air. Some of the water evaporates; the rest is then sent back to the condenser in the power plant. Large quantities of desalinated water would be required for this alternative due to scarce water resources available in the area.	Advantages include lower water withdrawal than once-through system (water only withdrawn to replace any water that is lost through evaporation in the cooling tower).	• Impact to marine ecology due to the release of saline water into the marine environment. • Difficulty of sourcing water in a water scarce area.	A likely, regional impact would occur for the duration of the operation of the facility. The impact is likely to be of high significance (given the sensitivity of the marine environment) without mitigation but further specialist work would be required in order to provide a quantification of this.	Mitigation measures are available for the dispersion of released saline water include pipeline diffusers and longer pipeline releasing the water further out into the ocean. Should saline water be released into Saldanha Bay, the impact is likely to remain medium-high even with mitigation. If it is feasible to build a pipeline to release the water into the open ocean, then the marine impacts are likely to be low. However, this would need to be balanced with the additional terrestrial impacts as a result of the longer pipeline. Based on the sensitivity of the terrestrial environment in the greater Saldanha Bay area, the impact on terrestrial habitat is likely to the moderate to high.

Cooling Method	Description	Advantages	Key Impacts/Risks	Rating	Mitigation
Dry/Air Cooling	Dry-cooling systems use air instead of water to cool the steam exiting a turbine.	Advantages include no water use for cooling and can decrease total power plant water consumption by more than 90 percent.	Disadvantages include higher costs and lower efficiencies. In power plants, lower efficiencies mean more fuel is needed per unit of electricity. Impacts related to this can include: • Increased air pollution; and • Environmental impacts from mining, processing, and transporting the additional fuel.	The increase in impact to air quality associated with this option is unlikely to be significant, however specialist input is required in order to quantify the impact.	Additional potential mitigation may be required to reduce air pollution, however specialist input is required in order to identify these measures.

Due to the large quantities of water required for both once-through and water cooling options coupled with the water scarce nature of the Saldanha area and the impacts associated with emissions of heated or saline water into the Saldanha Bay, dry/air-cooling is the preferred technology and will be carried through into the more detail design of the Project.

Water Supply

Although the preferred cooling alternative selected (air cooling) requires less water than the other alternatives, water is still required during construction and operation activities. Annually it is estimated that a maximum of approximately 25 000 m^3/year of water will be required during operation.

The Project has indicated that the bulk of water required will be sourced from rainwater, however given the water scarce nature of the area and the unpredictability of rainfall, other options for water sources have been investigated, including:

- Ground and surface water abstraction. Due to the lack of surface water in proximity to the Project and limited groundwater resources, water abstraction is not considered feasible.
- Municipal water. It is understood that currently municipal supply is insufficient for the additional industrial facilities proposed in the area. The Municipality is therefore investigating options to increase municipal supply, including a large scale desalination plant; and an additional waste-water treatment facility purifying grey water. To our knowledge these Projects have not as yet commenced.
- Desalination. This involves a small, project specific, seawater pipeline following the same servitude as the natural gas pipelines. A zero liquid discharge reverse osmosis process (where effluent will be evaporated until the dissolved solids precipitate as crystals) is proposed for the supply of up to 14 000 m^3/year of water to the power plant.
- Recovery by vapour condensation in gas turbine exhaust. This is an additional patented process currently being assessed by the Project which could decrease the demand for external water.

Based on the above it is anticipated that the majority of water required will be supplied by rainwater harvesting. In order to supplement the rain water a small sea-water pipeline and onsite desalination facility is considered to be the preferred option for additional water supply. Should the municipal supply and vapour recovery become feasible options during the Project development these will be considered.

4.1.4 *No-go Alternative*

The no-go alternative would mean that the project does not go ahead. In this case there would not be any impact associated with the Project (air, noise, flora, fauna and others), however, in this case the no-go alternative would almost certainly mean that Saldanha Steel would no longer be financially viable and would have to shut down. Saldanha Steel shutting down would have major negative socio-economic consequences to both the Saldanha area and the wider Western Cape and South Africa.

4.1.5 Summary

In summary and as described, the **preferred alternative** for the generation of power for use by AMSS is an air-cooled, CCGT gas-fired power plant (with OCGT in Phase 1) located at Site B.

5 *ADMINISTRATIVE AND LEGAL FRAMEWORK*

5.1 *INTRODUCTION*

This section provides an overview of legislation, policies, guidelines and information documents that have informed the scope and content of this report and the approach to the EIA process.

5.2 *ENVIRONMENTAL AUTHORISATION LEGISLATIVE PROCESS*

The Environmental Authorisation process in South Africa is governed by the National Environmental Management Act (No. 107 of 1998) (NEMA), as amended, and the Environmental Impact Assessment (EIA) Regulations of 2014 promulgated under NEMA. The relevance of this legislation is summarised below.

5.2.1 *NEMA Environmental Authorisation*

Chapter 5 of NEMA, as amended, outlines the general objectives and implementation of Integrated Environmental Management. This provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals that are likely to have a detrimental effect on the environment. Whilst Section 23 sets out the basic objectives and principles of the IEM procedure, Section 24 sets out how these objectives and principles are to be accomplished.

Regulations governing the environmental authorisation process have been promulgated in terms of NEMA and include the following:

- Environmental Impact Assessment Regulations (GNR R982/2014);
- Environmental Impact Assessment Regulations Listing Notice 1 (GNR 983/2014);
- Environmental Impact Assessment Regulations Listing Notice 2 (GNR 984/2014); and
- Environmental Impact Assessment Regulations Listing Notice 3 (GNR 985/2014).

Activities that trigger GNR 983 and GNR 985 require a Basic Assessment Report (BAR) process to be undertaken, whereas activities identified in terms of GNR 984 will require a full Scoping and Environmental Impact Report (S&EIR) process. GNR 982 sets out the general procedure to follow when conducting either a BAR or S&EIR process.

Numerous trigger activities have been identified for this Project in terms of all the listing notices (refer to *Table 5.1*). In such instances where all the listing notices are triggered, GNR 984 requirements will take precedent and the Project will be subject to a full S&EIR process prior to commencement of any of the associated activities.

The Project location falls within the Western Cape Province and the competent authority would therefore generally be the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP), however, the National Department of Environmental Affairs (DEA) has been identified as the competent authority because this power generation project could be considered of national interest and it could also have implications for other provinces if power is evacuated in future. ArcelorMittal Saldanha Steel will be required to obtain a positive environmental authorisation from the DEA prior to commencement of any of these proposed activities.

Table 5.1 lists the potential permitting requirements for the Environmental Impact Assessment Regulations Listing Notices 1, 2, and 3 of 2014 from NEMA.

Table 5.1 Environmental Permit Requirements from NEMA Listing Notices

Permit	Listed Activity	Project Trigger
Basic Assessment EIA Regulations Listing Notice 1 of 2014 (GNR R983 of 2014)	11) The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts. (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.	The development/upgrade of existing 132 kV transmission lines currently supplying ArcelorMittal Saldanha Steel with electricity from Blouwater substation. It should be noted here that the 400 kV line required for Phase 2 of the Project to connect the power plant to Eskom's Aurora substation will be permitted separately based on discussions with Eskom.
Basic Assessment EIA Regulations Listing Notice 1 of 2014 (GNR R983 of 2014)	14) The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	The development/construction of steel fuel tanks for the storage of up to 50 m^3 of diesel for use during construction and operation activities. A maximum of 30 m^3 of LPG (Propane) will be stored on site to fuel three generators. Waste (change-out) lube oil and hydraulic oil will be held temporarily in steel holding tanks (5 m^3 each). The oils will be transported by tanker for proper disposal.
Basic Assessment EIA Regulations Listing Notice 1 of 2014 (GNR R983 of 2014)	15) The development of structures in the coastal public property where the development footprint is bigger than 50 square metres, excluding (i) the development of structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (ii) the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (iii) the development of temporary structures within the beach zone where such structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared; or (iv) activities listed in activity 14 in Listing Notice 2 of 2014, in which case that activity applies.	The development of the terrestrial natural gas pipeline within the coastal public property.

Permit	Listed Activity	Project Trigger
Basic Assessment EIA Regulations Listing Notice 1 of 2014 (GNR R983 of 2014)	24) The development of- (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;	Construction of onsite roads as well as access off and upgrading of the existing road OP7644. Access roads would be required to be more than 8 metres wide.
Basic Assessment EIA Regulations Listing Notice 1 of 2014 (GNR R983 of 2014)	28) Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	Development of the CCGT Power Plant will be considered an industrial development with a footprint of approximately 45 ha. The development will occur on land previously used for agriculture (grazing).
Full Scoping and EIR EIA Regulations Listing Notice 2 of 2014 (GNR 984 of 2014)	2) The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where the electricity output is 20 megawatts or more.	The proposed CCGT Power Plant will consist of the construction and operation of an approximately 1507 MW gas-fired power plant. The power plant will be fuelled by natural gas.
Full Scoping and EIR	6) The development of facilities and infrastructure for an process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent,	Development of a 1507 MW gas-fired power plant which will require and Atmospheric Emission Licence for the release of atmospheric emissions related to the use of natural gas in the power generation process.
Full Scoping and EIR EIA Regulations Listing Notice 2 of 2014 (GNR 984 of 2014)	7) The development and related operation of facilities or infrastructure for the bulk transportation of dangerous goods- (i) in gas form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more than 700 tons per day; (ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more than 50 cubic metres per day; or (iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons day.	Development and operation of natural gas pipelines (approximately 4600 m in length) from the shore (or border of Transnet's land) to the power plant site. .
Full Scoping and EIR EIA Regulations Listing Notice 2 of 2014 (GNR 984 of 2014)	15) The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	Clearance of 45 ha of disturbed indigenous vegetation for the construction of the power plant and associated infrastructure and laydown areas.

Permit	Listed Activity	Project Trigger
Full Scoping and EIR EIA Regulations Listing Notice 2 of 2014 (GNR 984 of 2014)	28) Commencing of an activity, which requires an atmospheric emission license in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), excluding - (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or (iii) the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less.	The development of the 1507 MW CCGT gas-fired power plant and potentially the storage of LPG will require an Air Emission Licence (AEL) in terms of the National Environmental Management: Air Quality Act. The likely listed activities in terms of NEM: AQA are Liquid Fuel Combustion Installations' (Subcategory 1.2), 'Gas Combustion Installations' (Subcategory 1.4), as well as the storage and handling of petroleum products (Subcategory 2.4).
Basic Assessment EIA Regulations Listing Notice 3 of 2014 (GNR 985 of 2014)	2) The development of reservoirs for bulk water supply with a capacity of more than 250 cubic metres. (f) In Western Cape: I. All areas outside urban areas; or ii. Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, or zoned for a conservation purpose, within urban areas.	Development of modular bulk water storage reservoirs with a capacity of 25,000 cubic metres per module. Five modules are envisaged for collection of rain water. No water supply from the local municipality is envisaged.
Basic Assessment EIA Regulations Listing Notice 3 of 2014 (GNR 985 of 2014)	4) The development of a road wider than 4 metres with a reserve less than 13, 5 metres. (f) In Western Cape: i. Areas outside urban areas; (aa) Areas containing indigenous vegetation; (bb) Areas on the estuary side of the development setback line or in an estuarine functional zone where no such setback line has been determined; or ii. In urban areas: (cc) Areas zoned for conservation use; or (dd) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority.	Upgrading of access road OP7644 to the site. Details are provided in Chapter 3, Project Description.

The following listed activities have been removed subsequent to the Scoping Report submission. A revised application will be submitted to the DEA.

EIA Regulations Listing Notice 2 of 2014 (GNR 984 of 2014)

9) The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.

This has been removed as the 400 kV transmission line to Aurora will be permitted separately based on discussions with Eskom.

EIA Regulations Listing Notice 3 of 2014 (GNR 985 of 2014)

12) The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.

(a) In Western Cape:
i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;
ii. Within critical biodiversity areas identified in bioregional plans;
iii. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas; or
iv. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.

As confirmed by the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) in their comments on the draft Scoping Report the proposed development is not mapped as having any critically endangered or endangered ecosystems listed in terms of Section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004): National List of Ecosystems that are threatened and in need of protection (Government Gazette No. 34809 of 9 December 2011). As such this listed activity has been removed.

5.2.2 *Consolidated Permitting Requirements*

Due to nature of the Project, a suite of environmental legislation other than that derived from NEMA is also applicable. In order to meet the various legislative requirements, ERM has run a single integrated EIA process, which has met the requirements in terms of the following laws:

- National Environmental Management: Waste Act (No. 59 of 2008) (NEMWA);

- National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEMBA);
- National Environmental Management: Air Quality Act (No. 39 of 2004) (NEMAQA);
- National Environmental Management: Integrated Coastal Management Act (No. 24 of 2008) (NEMICMA);
- National Water Act (No. 36 of 1998); and
- National Heritage Resources Act (No. 25 of 1999).

Details of the permitting requirements from these laws are provided in *Table 5.2*.

Table 5.2 Consolidated Permitting Requirements

Law	Requirements	Project Relevance	Competent Authority
National Environmental Management Waste Act (No. 59 of 2008)	Section 19 of NEMWA provides for the listing of waste management activities that have, or are likely to have a detrimental effect on the environment. In accordance with this, GN 921 of 29 November 2013 lists waste management activities for which a waste management licence (WML) is required in terms of Section 20 of the Act. Furthermore, it classifies each of the waste management activities into different categories, with more onerous provisions assigned for activities that are regarding as being more detrimental to the environment. In this regard, 'Category A' activities require a NEMA BAR process to be conducted prior to commencement. 'Category B' activities require a full S&EIR process to be conducted, while 'Category C' activities are wholly exempt from the WML permitting process, as long as they show compliance with a set of prescribed standards.	A Waste Management Licence (WML) is not expected to be applicable for this Project given the small quantities of waste generated, the fact that only temporary storage of general waste and hazardous waste is expected and the fact that no general or hazardous waste is expected to be treated on site.	The Provincial MEC is the competent authority for all applications involving general waste, while the National DEA administers applications involving hazardous waste.
National Environmental Management Biodiversity Act (10 of 2004)	Part 1 of Chapter 4 of NEMBA discusses the protection of threatened or protected ecosystems. In this section, the Minister or the provincial environmental MEC may publish a national or provincial list of ecosystems that are threatened and in need of protection. Subsequently, the Minister can identify by notice in the Gazette, any process or activity in a listed ecosystem as a 'threatening process'. Once so identified, the threatening process is regarded as an activity requiring an EIA to be carried out in terms of section 24(2) (b) of NEMA. Only a draft national list of threatened ecosystems has been published as of yet. As such, these provisions are not yet in effect and will not apply.	The proposed development is not mapped as having any critically endangered or endangered ecosystems listed in terms of Section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004): National List of Ecosystems that are threatened and in need of protection (Government Gazette No. 34809 of 9 December 2011).	Not applicable.

Law	Requirements	Project Relevance	Competent Authority
National Environmental Management Air Quality Act (No. 39 of 2004)	Chapter 5 of NEMAQA deals with the control and management of emissions relates to the listing of activities that are sources of emissions and the issuing of emission licences in respect of these activities. These activities are listed in terms of GN 893 of 22 November 2013 and are broken up into 10 categories and associated sub-categories, including 'Liquid Fuel Combustion Installations' (Subcategory 1.2), 'Gas Combustion Installations' (Subcategory 1.4), as well as the storage and handling of petroleum products (Subcategory 2.4).	An Air Emissions Licence (AEL) is required for the generation of more than 50 MW of power. Application for an AEL can be made during the EIA process and will be granted within 60 days of Environmental Authorisation. Information gathered during the EIA phase will be used in this application process.	The issuing of emission licences for 'power sector' projects is the responsibility of the National DEA.
National Environmental Management Integrated Coastal Management Act (No. 24 of 2008)	Any discharge of land-based effluent to the coastal environment from an activity triggering any of the Listing Notices in the Environmental Authorisation Regulations under the NEMA, is subject to the applicable environmental authorisation issued under the NEMA EA Regulations (2014) administered by the DEA and /or a Coastal Waters Discharge Permit (CWDP) or a General Authorisation (GA) in terms of Section 69 of the ICMA, unless the activity conforms to a standard as prescribed in section 24 of the NEMA and in terms of the ICMA. In addition to this, both the general authorisation and coastal waters discharge permit for the discharge of effluent into estuarine waters require the Minister to consult with, and issue the authorisation or permit in concurrence with the Minister responsible for water affairs [s. 69(2)].	No effluent discharge into the marine environment is planned for this development.	Not applicable

Law	Requirements	Project Relevance	Competent Authority
National Water Act (No. 36 of 1998)	Section 21 of NWA sets out general principles for regulating water use. Water use is defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation (refer to 'WULA Listed Activities' in permitting plan). In general a water use must be licensed unless it is listed in schedule I, as an existing lawful use, is permissible under a general authorisation (as listed in GNR 399), or if a responsible authority waives the need for a licence (Section 22).	A Water Use Licence is not anticipated to be required as the proposed Project is not planning to abstract water and will not affect any watercourse, wetland, pan or drainage line.	The Regional Department of Water and Sanitation (DWS) will be the competent authority to engage with on this application.
National Heritage Resources Act (No. 25 of 1999)	Section 38 (1) of the NHRA requires any person who intends to undertake a development which exceeds 5000 m² in extent or 300 m in length to notify the responsible heritage resources authority, viz. the South African Heritage Resources Agency (SAHRA) or the relevant provincial heritage agency. The applicable authority will in turn indicate whether or not a full Heritage Impact Assessment (HIA) would need to be undertaken.	Before undertaking the development the South African Heritage Resources Agency (SAHRA)/Heritage Western Cape (HWC) has to be informed of the planned construction activities (via submission of a Notice of Intent to Develop (NID)), as the development exceeds standard SAHRA thresholds. A NID was submitted to HWC on 25 April 2016 and a response received on 6 May 2016 indicating that a Heritage Impact Assessment (including an assessment of both archaeological and paleontological resources) would be required for the Project. A Heritage Impact Assessment has been undertaken and is attached in *Annex D* of this report. This will be submitted to HWC with the Draft EIA Report.	Heritage Western Cape

5.3 *OTHER APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES*

5.3.1 *National Legislation*

National legislation relevant for the Project (in addition to those presented in preceding sections) is listed below.

- **Constitution of the Republic of South Africa (108 of 1996)**: South African law, including environmental law, is underpinned by the Constitution (No. 108 of 1996) which promotes specific moral, social and political values. The Constitution is the highest law of the land, and all South African law has to follow in the spirit of the Constitution. The Constitution commits to the establishment of a society based on democratic values, social justice and fundamental human rights through improving the quality of life of all citizens and realising the potential of each person. Sections 7, 8 and 24 of the Bill of Rights give constitutional force to sustainable development and provide that all people in South Africa have the right to a clean and healthy environment. These sections oblige government to pass reasonable legislation to protect the environment, prevent pollution and ecological degradation, and secure sustainable development.

- **National Environmental Management: Protected Areas Act (57 of 2003)**: There are no protected areas directly impacted by the proposed Project.

- **Occupational Health and Safety Act (73 of 1989):** In terms of the Major Hazard Installation (MHI) Regulations (GNR.692 of 30 July 2001), enacted under Section 43 of the Occupational Health and Safety Act (73 of 1989), the proposed pipelines are considered an MHI. In terms of these regulations, the Project will be required to notify the chief inspector, the provincial director and the relevant local government, in writing, prior to erecting, altering or modifying the proposed facility. Following this, a risk assessment will need to be undertaken by a certified entity in order to quantify the risks that the proposed MHI facility poses to employees and the general public. This process will be undertaken outside of the environmental assessment process.

- **Gas Act (48 of 2001):** The Gas Act seeks to promote the efficient, effective, sustainable and orderly development and operation of gas facilities in South Africa. Section 15 of the Act sets out activities that require licencing, issued by the Gas Regulator, prior to commencement. Specific activities that require licencing include the construction and operation of gas transmission, storage, and distribution facilities. The requirements of the Gas Act will be met outside of the environmental assessment process.

- **Noise Control Regulations under the Environmental Conservation Act (73 of 1989):** The control of noise in the Western Cape is legislated in the form of the Noise Control Regulations of the Environment Conservation

Act No. 73 of 1989 applicable to the Province of the Western Cape, Provincial Notice 627 of 20 November 1998.

- **Hazardous Substances Act (56 of 1973):** License required for the use, handling and storage of Group I, II and II Hazardous Substances. The requirements of the Gas Act will be met outside of the environmental assessment process.

- **Explosives Act (15 of 2003):** This would only be applicable to the proposed Project should blasting be required for construction activities. This is not currently anticipated.

- **Conservation of Agricultural Resources Act (43 of 1983):** The Conservation of Agricultural Resources Act, as amended defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. This would have relevance if farming activities were to change dramatically due to the proposed Project or if alien species were used for re-vegetation of areas, neither of which is intended for this Project.

- **Electricity Regulation Act (4 of 2006):** The requirements of this Act will be met outside of the environmental assessment process.

- **Subdivision of Agricultural Land Act (70 of 1970):** This Act is applicable to the rezoning application for the land parcel identified for this proposed Project. The requirements of this Act will be met outside of the environmental assessment process.

- **Western Cape Nature and Environmental Conservation Ordinance 19 of 1974 as amended by the Western Cape Nature Conservation Laws Amendment.**

- **National Ports Act (12 of 2005)**: This Act provides for the establishment of the National Ports Authority and the Ports Regulator. In terms of the Act, all ports fall under the jurisdiction of the National Ports Authority, which must own, manage, control and administer ports to ensure their efficient and economic functioning. Part of this control includes the exercise of licensing and controlling functions in respect of port services and port facilities. The proposed site is located within the Saldanha 'back of port' area and as such will need to adhere to the controlling Ports Authority and any orders or notices it may be issued in this respect. The specific Ports Authority requirements will be met outside of the environmental assessment process.

Applicable provisions from these laws and regulations will be and have been incorporated into the design and implementation of the Project.

5.3.2 *Guideline Documents*

Noise Guidelines

South African national standards (SANS) relevant to noise from mines, industry and roads are:

- SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication';
- SANS 10210:2004. 'Calculating and predicting road traffic noise';
- SANS 10328:2008. 'Methods for environmental noise impact assessments'.
- SANS 10357:2004. 'The calculation of sound propagation by the Concave method'.

6 BIOPHYSICAL BASELINE

This Chapter presents the biophysical baseline conditions in the Project's Areas of Influence (AoI) (described in Chapter 3: Project Description). The baseline was determined through review of existing information and observations and interviews conducted during site visits.

The objective of the biophysical baseline is to establish the characteristics of the existing biophysical conditions in the Project's AoI. The baseline serves as the reference point against which changes (impacts) can be predicted and monitored.

6.1 TERRESTRIAL ENVIRONMENT

6.1.1 *Climatic Conditions*

Saldanha falls within the Mediterranean climate zone which is characterised by warm, dry summers and cold, wet winters. The rainfall in the project area occurs most primarily between the months of April and September, with precipitation intensity highest in the months of June and July. The periods of lowest rainfall occur in the months of January and February, where average monthly precipitation is approximately 3 mm. Mean annual precipitation has been recorded at 320 mm. The maximum and minimum temperatures in Saldanha Bay do not exhibit stark variations due to its proximity to the ocean and the cold Benguela current and the incursion of summer fog which acts to temper summer temperatures. Thus average temperatures over the summer season seldom exceed 25 °C. Winter temperatures seldom drop below 10 °C. *Table 6.1* shows monthly temperatures for towns within the Saldanha Bay Municipality.

Table 6.1 Monthly Temperatures (°C) in the Saldanha Bay Municipality

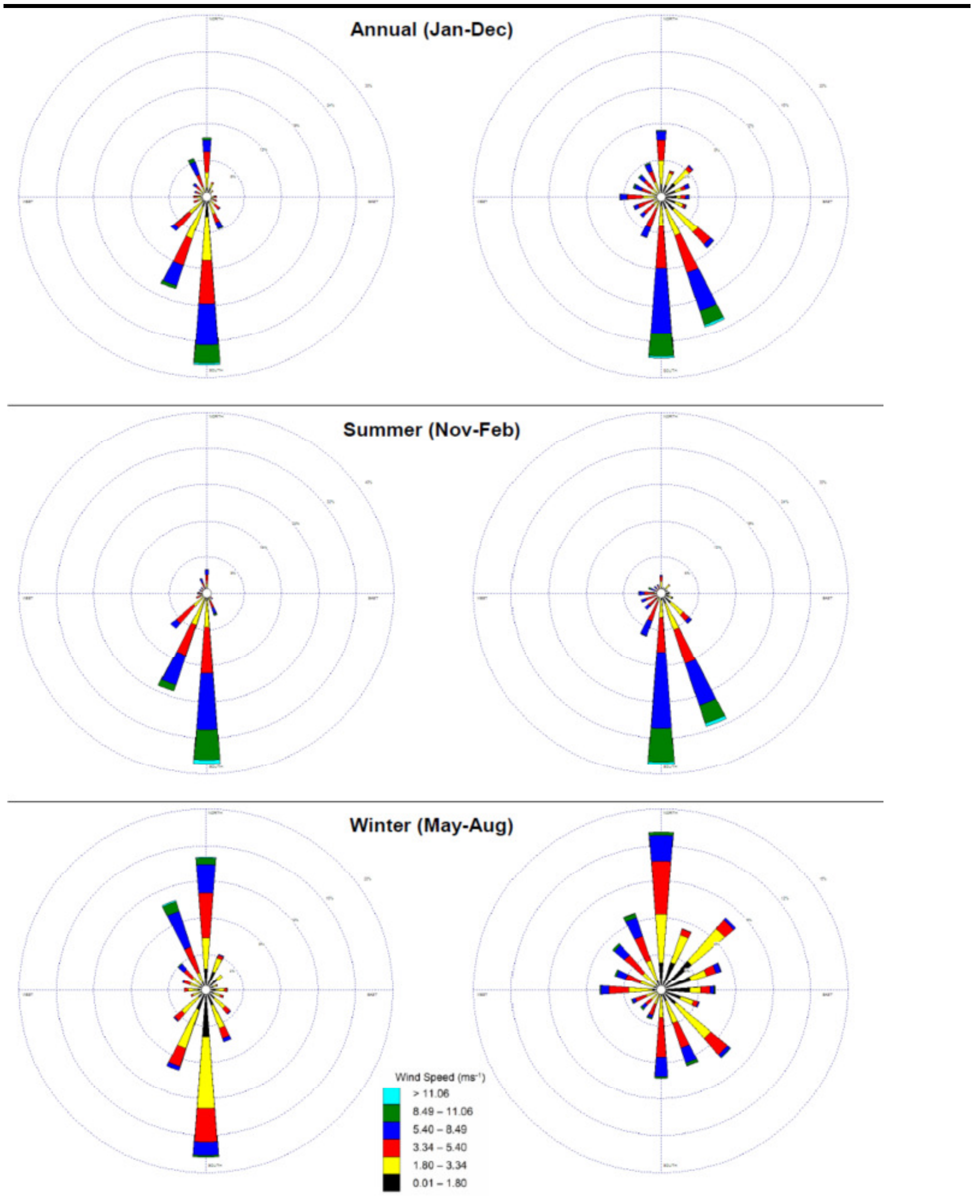
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cape Columbine	17.2	17.9	17.1	16.1	15.4	14.6	13.9	13.6	14	15.7	16.1	17.2
Geelbek	19.3	19.4	18.1	16.3	14.7	12.8	11.8	12	12.9	15.8	16.7	18.5
Langebaan	21.8	21.9	21	18.0	15.3	13.2	12.3	12.4	13.6	17	18.2	20.4
Vredenburg	18.5	20.4	19.9	17.1	14.8	13.7	14.1	12.9	13.5	15.9	17	18.4

Source: Aurecon (2014)

The release of atmospheric pollutants results in the dilution of pollutants during unstable atmospheric conditions (conditions of free convection and atmospheric mixing). These conditions occur most frequently in summer during the daytime. This dilution effect can however be inhibited under stable atmospheric conditions in the boundary layer where surface pollution is trapped under a surface inversion (Tyson & Preston-Whyte, 2000). This occurs in Saldanha during the winter months when temperature inversion layers 'trap' air pollution. Under these conditions an inversion can occur when a layer of warm air lies directly above a layer of cool air. This layer prevents a pollutant from mixing. Inversion layers tend to occur in calm and dry conditions during winter.

Winds in the Saldanha Bay area are dominated by the seasonal migration of the South Atlantic Anticyclone (high pressure cell). In the austral summer the high pressure cell moves into its southernmost position and strong southerly and south westerly winds prevail. During the winter months the South Atlantic Anticyclone is situated further north and the Western Cape coastline is exposed to frequent mid latitude cyclones (commonly referred to as cold fronts), which are associated with north and north westerly winds (*Figure 6.1*). The wind roses in *Figure 6.1* below depict the seasonal variances of the measured wind speeds. In the summer months, the wind blows predominantly from the south-west with wind speeds of greater than 5.6 m/s occurring frequently. During the winter months, the percentage of calm periods increase to 11.5 percent and wind blows at low speeds (frequently less than 3.5 m/s) from the south and higher wind speeds from the north and north westerly direction.

Figure 6.1 *Wind roses for Langebaanweg (left panels) and Geelbek (right panels), with annual (top), summer (centre) and winter (bottom)*



Source: SAWS, 2012

6.1.2 *Air Quality*

Particulate emissions within Saldanha Bay arise mostly from industry, although dust emissions from agricultural areas are also high. The main industrial sources of air pollution in Saldanha include (Burger and Krause, 2011):

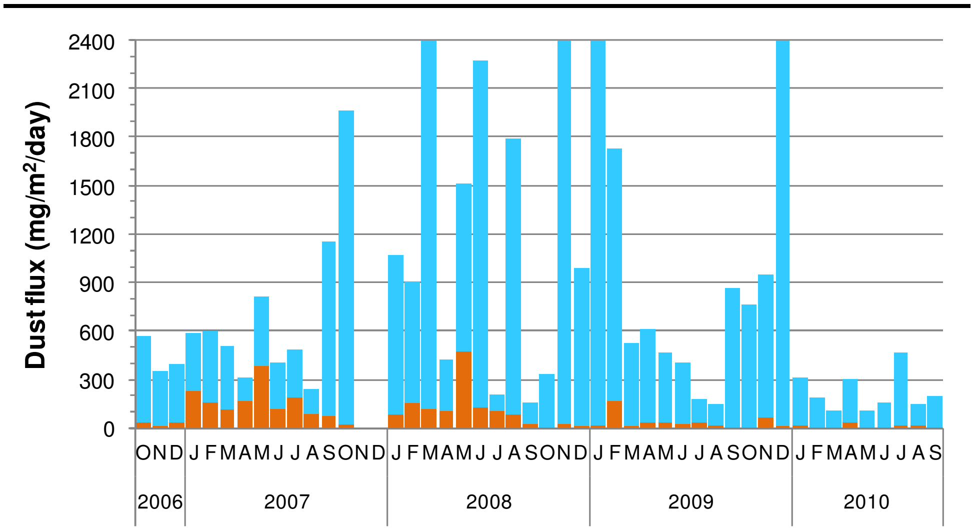
- ArcelorMittal Saldanha Works;
- Tronox (previously Exxaro) Namakwa Sands;
- Duferco Steel Processing;
- Saldanha Iron Ore Terminal;

- SFF Saldanha Bay Oil Storage;
- St Helena Bay Fishmeal Industries (Oceana, Oranjevis, Hannasbaai, West Point); and
- Limestone and Aggregate Quarries.

Emissions originating from these sources may include combustion products, such as SO_2, NOx, CO, Particulate Matter [1](PM $_{10}$ and PM $_{2.5}$, fugitive dust (TSP, PM $_{10}$ and PM $_{2.5}$), trace amounts of organic compounds and heavy metals, and odorous compounds (Burger and Bird, 2014).

Particular hot spots in terms of particulate levels (PM_{10}) are found in the vicinity of the iron ore handling facility (at the Port of Saldanha) and in the vicinity of the large industry complex (mainly comprising ArcelorMittal and Exarro facilities) (EMF, 2015). Iron ore dust levels are also significant (See *Figure 6.2* below for dust levels in Bluewater Saldanha Bay). Other emission source 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).

Figure 6.2 *Dust Monitoring Data in Bluewater Bay (Saldanha Bay)*



Source: uMoya-Nilu (2011)

***Blue bars equal other dust and the Orange bars equal Fe oxide*

(1) Particulate matter is the term for solid or liquid particles found in the air. Some particles are large or dark enough to be seen as soot or smoke. Others are so small they can be detected only with an electron microscope. Particles originate from a variety of sources and as a result their chemical and physical compositions vary widely (EPA, 2015). PM10 particles are <10 µm in size and PM2.5 particles are less than <2.5 µm in size.

6.1.3 *Surface and Groundwater*

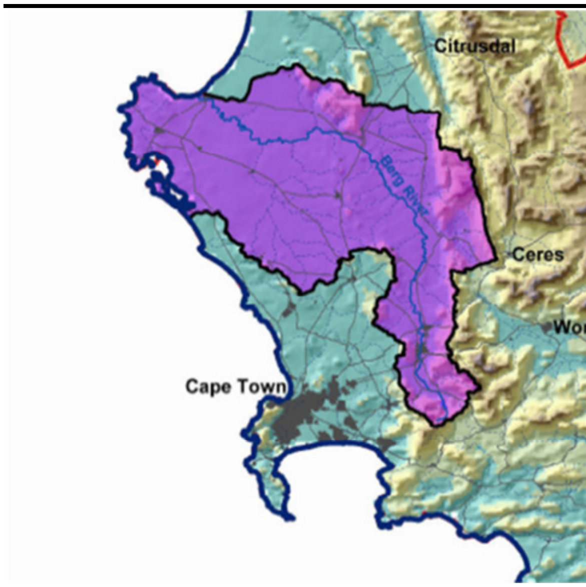
Surface water

The West Coast is a water scarce area with the region receiving on average 300 mm of rain annually (EMF, 2015). The primary water resource is the Berg River; however groundwater still plays a significant role as a water supply source. The area falls within the winter rainfall region of South Africa and therefore receives most of its rainfall April and September. Mean annual evaporation (MAE) is relatively high with a total potential rate of some 1 300 mm (EMF, 2015).

The site is situated within the Berg River catchment area (*Figure 6.3*), which is over 9,000 km^2 in area, and is the most important and largest catchment in the Western Cape Province. The catchment area is divided into 12 zones. The proposed site is located in quaternary catchment G10M [(1)], within the Berg Water Management Area (WMA). G10M is the catchment area's biggest zone, covering an area of 1,999 km^2.

There are no surface water resources (including rivers, dams or wetlands) located at the proposed site or along the pipeline route.

Figure 6.3 ***Berg River Catchment***



Groundwater

<u>Geology and aquifers and recharge</u>

(1) Department of Water Affairs water management area boundary description number

According to the available published geological information, the proposed site is underlain by limestone and calcrete of the Langebaan Formation (GMS, 1973). The formation is of Quaternary age and the thickness ranges from 30m to 80m. The older limestone dunes of the formation in the area are heavily calcretised and are capped by a 1-2m thick layer of cohesionless, quartzitic sand overlying hardpan calcrete. The younger limestone dunes occur on the western shore of the Langebaan Lagoon are exposed as a calcrete-capped, consolidated barrier dune (Theron *et al*. 1992).

The proposed site is located on the Langebaan Road Aquifer System (LRAS) which extend towards Vredenburg in the North-west, Velddrif in the north and Hopefield in the east. The aquifer is an intergranular type aquifer with typical borehole yields between 0.1 and 0.5 litres/second. Using the Aquifer Classification according to the Aquifer Classification Map of South Africa (DWAF, 1999) the aquifer at the site is classified as a poor aquifer system with low vulnerability ( ) and low susceptibility ( ) to contamination.

The mean annual precipitation for the area ranges from 300 to 400mm and groundwater recharge is 10 to 15mm per annum (DWAF, 1995).

Groundwater levels and flow direction

The depth to groundwater is important primarily because it determines the depth of material through which any contaminants from surface must migrate before reaching an aquifer. There is a greater chance for attenuation of contaminants to occur as the depth to groundwater increases. The groundwater levels in the area are typically 10 to 20 meters below ground level (DWAF, 1995) and groundwater level data obtained from NGA boreholes suggest groundwater ranges between 2 and 7 meters below ground level. The difference in depth to groundwater levels suggest that the boreholes are accessing a perched water aquifer, perhaps above the calcrete geology typically found in the area.

Groundwater flows in a south-westerly direction across the site towards the coast and Saldanha Bay.

Quality and groundwater users

The electrical conductivity (EC) of water is a physical property which is widely used as an alternative to the chemical measuring of total dissolved solids (TDS), to determine water quality. Pure water has a low conductivity and an increase in conductivity generally reflects a decrease in water quality. The EC of groundwater in area of Sites A and B is generally between 150 and 300 mS/cm (DWAF, 2002). According to DWAF (1998) this represents saline conditions and is unacceptable for long-term drinking purposes.

According to the National Groundwater Archive (NGA) there are a number of registered boreholes within 1 km of Site A and Site B. The location, usage and owner of the boreholes are detailed in *Table 6.2.*

Table 6.2 Identified NGA boreholes

Approx. distance and direction	Land owner / operator	Usage	Other information
3.0km, west	Arcelor Mittal	Unknown	None
4.0km, south west	Arcelor Mittal	Groundwater monitoring	Depth to groundwater is 4-7mbgl (Aurecon, 2013)
7.5km, west	Water works plant	Unknown	Depth of groundwater is 2-3mbgl (NGA, 2015)

The closest municipal abstraction of groundwater occurs approximately 20 kilometres to the north east of the sites close to Langebaanweg where the range of extraction is between 1 and 2 million cubic metres per annum.

6.1.4 Geology, Soils and Fossils

The geology of the region and its paleontological history are closely linked as fossil types, their abundance, and mode of occurrence is directly related to the nature of the sediments in which they occur (EMF, 2015). Thus a description of the fossil potential or sensitivity is closely related to the geology of the area. The Saldanha Bay area has the following key formations:

- The *Varswater* Formation: This consists of two key sub members. The Langeberg Quartz Sand Member (LQSM) is richly fossiliferous, with a diversity of bones, shells and microfossils reflecting river floodplain, salt marsh and tidal-flat environments; and the Muishond Fontein Pelletal Phosphorite Member (MPPM) reflects further deepening, with deposition in an expanded estuarine system.

- The *Uyekraal* Formation: Shelly Sands were deposited on the shoreline to form the lower, outer part of the coastal plain after a seal level lowering occurring in the middle of the Pliocene period.

- The *Velddrif* Formation: includes all Quaternary marine deposits below about 15 meters above sea level (masl) that fringe the coast.

- The *Prospect Hill* Formation; consists of the inner aeolianite ridge between Saldanha Bay and Paternoster, includes fossil eggshell of the extinct ostrich *Diamantornis wardi.*

- The *Langebaan* Formation: These calcareous aeolianites are evident in the coastal landscape as the ridges, low hills and mounds beneath a capping calcrete crust, or surface limestone.

- The *Springfontyn Formation*: This formation comprises the mainly non-calcareous, windblown sand sheets and dunes that have covered parts of the landscape during the Quaternary.

There have been numerous fossil discoveries in the area many of which are now preserved in the West Coast Fossil Park, near Langebaan. Stone Age artifacts and remains of the indigenous Khoikoi are also widespread.

The soils in the area range from calcareous sands at the coast to acidic sands further inland. Shale and granite soils are relatively fertile and form the backbone of agriculture in the region (CWCBR, 2010). The area is primarily underlain by the *Langebaan Formation*, characterised by old calcareous aeolianites (dune sandstones), beneath a capping calcrete crust. The old dune accumulation dominates the local topography, forming the low mounded hills that are evident in the coastal landscape and are covered with vegetation of darker-green hue. The old dunes were formed during a lower sea level, when Saldanha Bay was exposed. At the coast these old dunes are now erosionally truncated by previous high shorelines and the present shoreline, forming a cliff that is partly covered by more recent sands.

Between the low hills of outcropping "Langebaan Limestones" is a cover of pale sands with less dense vegetation. Due to the erosional truncation of the Langebaan Formation at the present coast, it is exposed in the intertidal zone of the beach fringing the farm Spreeuwal. These beds are fossiliferous, with large mammal bones and some MSA artefacts (Avery & Klein, 2009). These "Spreeuwal Beds" illustrate the palaeo-environments that are a typically interbedded in the lower parts of the Langebaan Formation.

6.1.5 Flora and Fauna

Flora

Saldanha Bay falls within the Fynbos Biome and the Cape Floristic Region (CFR). The CFR is one of only six floristic regions in the world, is the richest temperate flora in the world, and is the only one confined to a single country. It is also the smallest floristic region and supports about 9000 plant species - almost half of all the plant species in South Africa. At least 70% of all the species in the Cape region do not occur elsewhere, and many have very small home ranges (these are known as narrow endemics, and may be confined to a single farm).

Many of the vegetation types that are present in the Saldanha Bay area occur only along the West Coast and are thus endemic to this area. The area is characterised by lowland habitats which are under pressure from agriculture, urbanisation, and alien plants, and thus many of the range restricted species are also under threat of extinction, as habitat is reduced to extremely small fragments. Data from the Red Data Book listing process recently undertaken for South Africa is that 67% of the threatened plant species in the country occur only in the Fynbos biome, and these total over 1800 species (Raimondo *et al* 2009). The south-western Cape is a national and global conservation priority (Helme, 2015). In addition, there are Critical Biodiversity Areas (CBA's) across Saldanha Bay and the West Coast. CBAs are regarded as essential areas for the achievement of regional conservation targets, and are designed to ensure minimum land take for maximum result (Maree and Vromans 2010). These areas are categorised across the country.

Power Plant Site

A survey of the proposed site [(1)] was undertaken by Nick Helme during August 2015 (flowering season). The site is largely disturbed (likely by ripping) and has been heavily grazed and trampled which has reduced the rehabilitation success. The heavy grazing has meant that there were virtually no flowering annuals on the site at the time of the survey. Prior to disturbance the site would have supported Saldanha Flats Strandveld. The site is largely flat, but with deep neutral sands overlying calcrete, which are seldom exposed at the surface. There are no wetlands.

Figure 6.4 ***View of the proposed site looking northeast looking toward Blouwater substation***

Source: Nick Helme, 2015
* Note the relative lack of flowering spring annuals, due to heavy grazing by livestock.

The northern 5-10% of the study area (adjacent to the road to Blouwaterbaai substation) supports intact Saldanha Limestone Strandveld, which has not

(1) Note that at the time of survey the site area had not been refined and was larger than the site area now indicated. The area of high conservation concern has been removed from the proposed site.

been ripped or heavily disturbed, and is thus more structurally diverse and of higher conservation value than the rest of the site.

Saldanha Limestone Strandveld was previously listed as an Endangered vegetation type (Rouget *et al* 2004), and then was unfortunately downgraded to Least Threatened (DEA 2011), due to an oversight by SANBI, and this error will apparently only be remedied only in about 2016. The unit has the highest number of threatened and localised plant species of all vegetation types in the Saldanha region (Helme & Koopman 2007). The unit is also poorly conserved (represented) in the West Coast National Park.

Typical species in this intact limestone area include *Thamnochortus spicigerus*, *Zygophyllum morgsana*, *Limonium capense*, *Senecio alooides*, *Pteronia divaricata*, *Euphorbia burmanii*, *Othonna cylindrica* and *Searsia glauca*.

Two plant Species of Conservation Concern (SCC) were recorded in this limestone area, and the likelihood that any others occur here in viable numbers is low. The recorded SSC include *Limonium capense* (Near Threatened), *Aloe distans* (a large population of this regional endemic, but now regarded as a subspecies of *A. perfoliata*), and *Nenax hirta ssp calciphila* (Near Threatened).

Indigenous plant species diversity includes *Galenia fruticosa*, *Exomis microphylla* (brakbos), *Oncosiphon suffruticosum* (stinkkruid), *Arctotheca calendula* (Cape weed), *Osteospermum incanum* (dune bietou), *O. chrysanthemoides* (bietou), *Muraltia spinosa* (tortoise berry), *Helichrysum niveum*, *Phyllobolus canaliculatus*, *Tetragonia fruticosa* (kinkelbos), *Stachys ballota*, *Mesembryanthemum crystallinum* (slaai), *Lycium ferocissimum*, *Oxalis pes-caprae* (geel suuring), *O. obtusa*, *Limeum aethiopicum* (koggelmandervoet), *Trachyandra divaricata* (duinekool), *Carpobrotus edulis* (suurvy), *Torilis arvensis*, *Senecio burchellii* (hongerblom), *Gladiolus cunonius*, *Calobota sericea* (fluitjiesbos), *Felicia hyssopifolia*, *Ehrharta calycina* (polgras), *Cynodon dactylon* (fynkweek), *Conicosia pugioniformis*, *Hermannia prismatocarpa*, *Ehrharta villosa* (pypgras), *Pelargonium myrrhifolium*, *Thamnochortus spicigerus* (duinriet), *Aspalathus acuminata*, *Searsia glauca* (kunibush), *Searsia laevigata* (dune taaibos), *Melolobium adenodes*, *Cissampelos capensis*, *Asparagus africanus*, *A. capensis*, *Amellus sp*., Gymnosporia buxifolia (pendoring), *Oxalis luteola*, *Crassula expansa*, *C. vaillantii*, *Ornithogalum sp*., *Zygophyllum morgsana*, *Viscum capense* (voelent), *Haemanthus pubescens* (poierkwas), *Trachyandra falcata* (veldkool) and *T. ciliata*.

Various annual alien grasses are also present, including *Bromus pectinatus*, *Bromus diandrus* (ripgut brome), *Lolium sp.* (ryegrass), *Avena sp*. (wild oats) and *Vulpia myuros* (ratstail fescue), plus the alien herbs *Erodium moschatum* (cranesbill), *Echium plantagineum* (Pattersons's curse), *Raphanus rapistrum* (wildemostert) and *Brassica tournefortii*. No woody alien species are present, and none of the alien herbs or grasses is dominant.

No plant Species of Conservation Concern were recorded in the disturbed part of the study area, and the likelihood that any occur here in viable numbers is low.

Importantly it should be noted that the small northern portion of the study area with high conservation concern has been removed from the proposed site subsequent to the survey.

Botanical Conservation Value

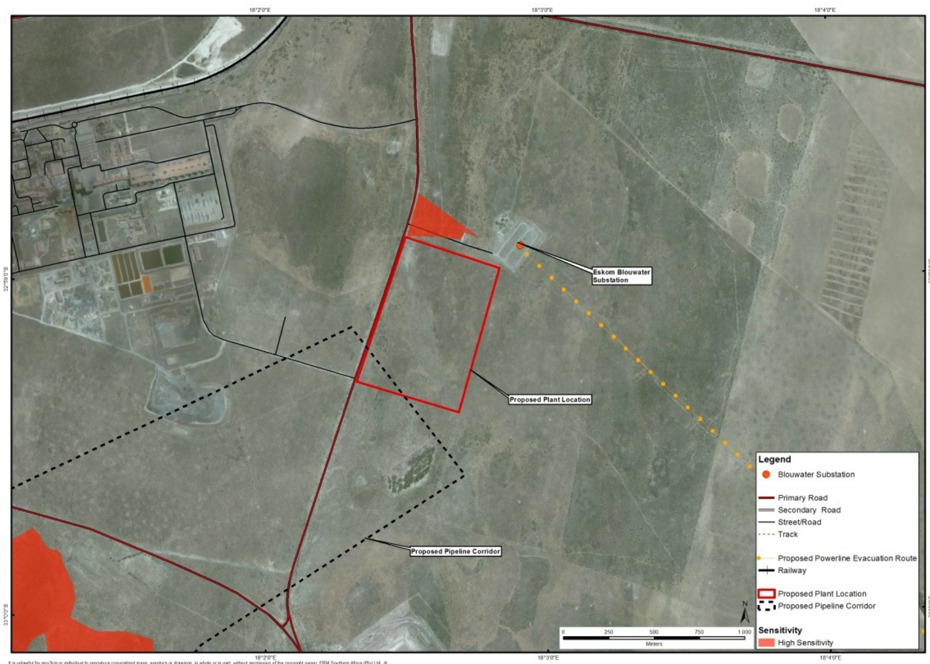
The terms conservation value and sensitivity are often used interchangeably, but this is not strictly correct. The term "conservation value" refers to the value of the habitat in local and regional conservation terms (*i.e.* answering the question how important is it?), whilst "sensitivity" strictly means how resilient is the habitat to disturbance. In the case of urban or industrial development any natural or partly natural habitat would effectively be permanently lost in the development footprint, and thus technically sensitivity would be high, irrespective of the conservation value of the underlying habitat.

The conservation value of a habitat is a product of species diversity, rarity of habitat, rarity of species, ecological viability and connectivity, vulnerability to impacts, and reversibility of threats (ease of rehabilitation).

Areas that have been cultivated or ripped and have relatively low botanical diversity and no significant populations of plant Species of Conservation Concern (SCC) are considered to be of Low botanical conservation value at a regional scale.

High conservation value areas support relatively intact examples of the locally restricted vegetation type Saldanha Limestone Strandveld, with regionally significant populations of various plant Species of Conservation Concern. These areas may or may not be designated CBAs. These areas are considered ecologically irreplaceable, on account of the presence of relatively intact examples (with both high species diversity and high structural heterogeneity) of a regionally restricted vegetation type (in this case Saldanha Limestone Strandveld), and due to the presence of regionally endemic plant Species of Conservation Concern. Conservation of such areas would contribute significantly to species and/or ecological process targets for the region, and should be considered No Go areas for development.

Figure 6.5 Orthophoto showing the proposed site and the area of high conservation concern to the north



Source: ERM, 2016

Fauna

In general, fynbos vegetation cannot support high numbers animals due to the poor nutrients in the soils. However, there is a range of faunal life within the Saldanha Bay area (EMF, 2015).

- *Mammals*. A number of mammal species are threatened, endemic or near endemic to the area. Key species include: The Van Zyl's Golden Mole (*Cryptochloris zyli)*, Cape Dune Molerat (*Batyergus suillus)*, Cape Gerbil *Tatera afra* and Grant's Golden Mole (*Eremitalpa granti)* (Vulnerable) are endemic or near endemic. The Honey Badger (*Mellivora capensis)* is listed as Near Threatened, as is the Cape Horseshoe Bat (*Rhinolophus capensis)*, and the White-tailed Mouse (*Mystromys albicaudatus)* is endangered.

- *Reptiles*. The diversity of reptile species is relatively high in the drier areas along the West Coast including snakes, lizards and tortoises. For example. Seven species of girdled lizards of the genus Cordylus, including the armadillo girdled lizard (*Cordylus cataphractus*, Vulnerable) and the Cape Girdled Lizard *(Cordylus niger)* (endemic to Cape Peninsula and Saldanha Peninsula) are endemic to the area. The Geometric Tortoise (*Psammobatus geometricus)* is Critically Endangered and has lost more than 90% of its habitat.

Avifauna

Up to 267 bird species have been recorded within the relevant and respective South African Bird Atlas Project (SABAP 1) and within the study area as well as the broader impact zone of the development, including 26 red-listed or threatened species, 40 endemic species and 26 near – endemic species. A large portion of these species were however not considered relevant for this study due to the fact that the grid size used for the SABAP 1 data collection was 27 km X 27 km, extending out to sea.

The birds of greatest potential relevance and importance in terms of the possible impacts of the proposed CCGT power plant are likely to be local populations of endemic passerines (Cape Long-billed Lark Certhilauda curvirostris and Cape Clapper Lark Mirafra apiata), resident or visiting large terrestrial birds (Blue Crane, Southern Black Korhaan and Secretarybird Sagittarius serpentarius), resident or passing raptors (Martial Eagle, Lanner Falcon, Black Harrier) and transient waterbirds (Greater Flamingo, Lesser Flamingo, Great White Pelican and Maccoa Duck).

Table 6.3 includes a list of priority species list considered central to the avifaunal impact study for the proposed Project, selected on the basis of conservation status (Taylor *et al*., 2015).

Critical Biodiversity Areas (CBA)

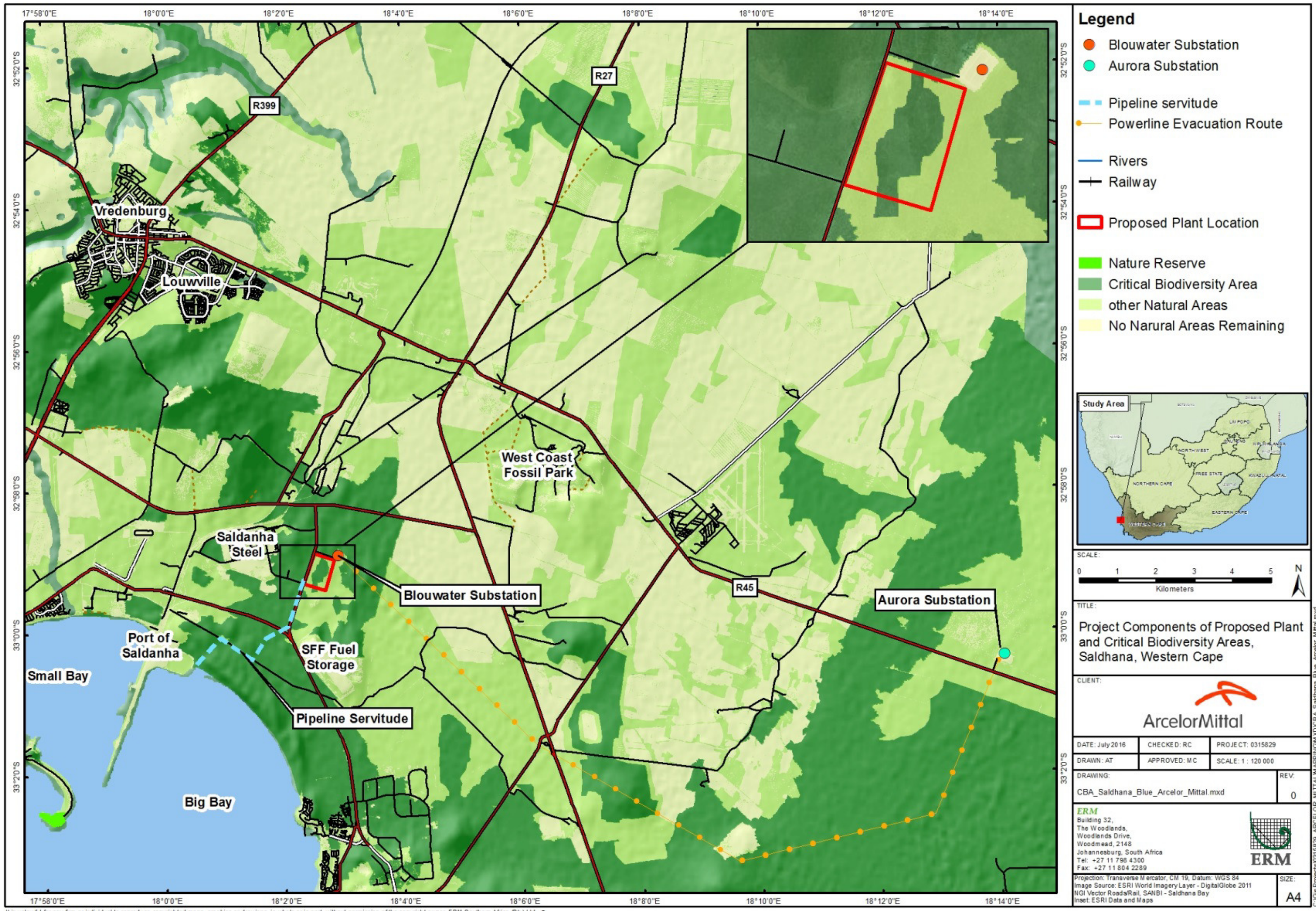
CBA information has been drawn from the Biodiversity Sector Plan that has been prepared for the Saldanha Bay, Berg River, Cederberg and Matzikama municipalities. The sector plan is based on the work conducted under the auspices of Cape Nature’s Fine-Scale Biodiversity Planning project. The study area is within the planning domain of the Saldanha Fine Scale Conservation Plan (Pence, 2008). The maps have been produced to satisfy legislation in Chapter 3 of NEMBA. CBA’s defined as biodiversity areas that are of high priority and that is required to maintain biodiversity pattern and process (i.e. functioning ecosystems) and to meet conservation targets (EMF, 2015). *Figure 6.6* illustrates the CBA and potential Project component, showing that potentially up to 43percent of the land within the ArcelorMittal project site is within a declared CBA.

Table 6.3 Important avifauna species found within study area

Common name	Scientific name	Conservation status	Regional endemism	Estimated importance of local population	Preferred habitat	Likelihood of occurring in the study area
Bustard, Ludwig's	*Neotis ludwigii*	Endangered	Endemic	Moderate	Semi-arid dwarf shrubland, also in arid savanna and fynbos	Low
Crane, Blue	*Anthropoides paradieus*	Near-threatened	Endemic	High	Grasslands, but also in wetlands, cultivated pastures and croplands	High
Courser, Burchell's	*Cursorius rufus*	Vulnerable	Near-endemic	Low	Sparsely vegetated arid regions	Low
Duck, Maccoa	*Oxyura maccoa*	Near-threatened	-	Moderate	Inland water bodies with emergent vegetation; flyover	Moderate
Eagle, Martial	*Polemaetus bellicosus*	Endangered	-	Low	Open savanna and woodland on plains, also semi-arid shrublands	Recorded in the study area
Eagle, Verreaux's	*Aquila verreauxii*	Vulnerable	-	Moderate	Mountainous regions and rocky areas with cliffs	High
Falcon, Lanner	*Falco biarmicus*	Vulnerable	-	High	Open grassland or woodland near cliff or electircity pylons	Recorded in the study area
Flamingo, Greater	*Phoenicopterus ruber*	Near-threatened	-	High	Saline or brackish water bodies; flyover	High
Flamingo, Lesser	*Phoenicopterus minor*	Near-threatened	-	High	Eutrophic shallow wetlands, saltpans; flyover	High
Harrier, African Marsh	*Circus ranivorus*	Endangered	-	High	Inland and coastal wetlands, and ajacent moist grasslands	High
Harrier, Black	*Circus maurus*	Endangered	Near-endemic	High	Fynbos, shrubland, dry grassland and croplands	Recorded in the study area
Korhaan, Southern Black	*Afrotis afra*	Vulnerable	Endemic	High	Renosterveld, fynbos and succulent Karoo	Recorded in the study area
Pelican, Great White	*Pelecanus onocrotalus*	Vulnerable	-	High	Shallow lakes, estuaries, large pans and dams	High
Secretarybird	*Sagittarius serpentarius*	Vulnerable	-	Moderate	Open grassland with scattered trees and shrubs	Moderate

Common name	Scientific name	Conservation status	Regional endemism	Estimated importance of local population	Preferred habitat	Likelihood of occurring in the study area
Stork, Black	*Ciconia nigra*	Vulnerable	-	Moderate	Mountainous regions	High
Vulture, Cape	*Gyps coprotheres*	Endangered	Near-endemic	Low	Mountainous regions, but range widely in surrounding areas	Low

Figure 6.6 *Critical Biodiversity Areas close to the Project*



6.1.6 *Noise*

The area is sparsely populated in the vicinity of the industrial zone. The closest noise-sensitive receptors are further than 2000 m from the proposed Project. An assessment of the area was done using available topographical maps to identify potential Noise Sensitive Developments (NSD) in the area. Noise-sensitive developments and other potential Interested and Affected Parties identified are highlighted in *Figure 6.7*.

Ambient sound levels were measured at one location for a two night-time period during May 2016 using a class-1 Sound Level Meter. The sound level meters would measure "average" sound levels over a 10 minutes period, save the data and start with a new 10 minute measurement till the instrument was stopped. This data was also augmented with additional measurements at three locations during the day and night.

The data collected and information about the measurement locations are presented in *Table 6.4*.

Short term measurements indicated ambient sound levels typical of an urban noise district (with main roads, business and workshops) closer to the project site. Daytime ambient sound levels are higher, mainly due to road traffic, although wind-induced noises also contributed to the ambient sound levels. Short term measurements away from roads, business and residential dwellings indicate an area with the potential to be very quiet.

Figure 6.7 Aerial image indicating potential noise sensitive receptors in the vicinity of the proposed development

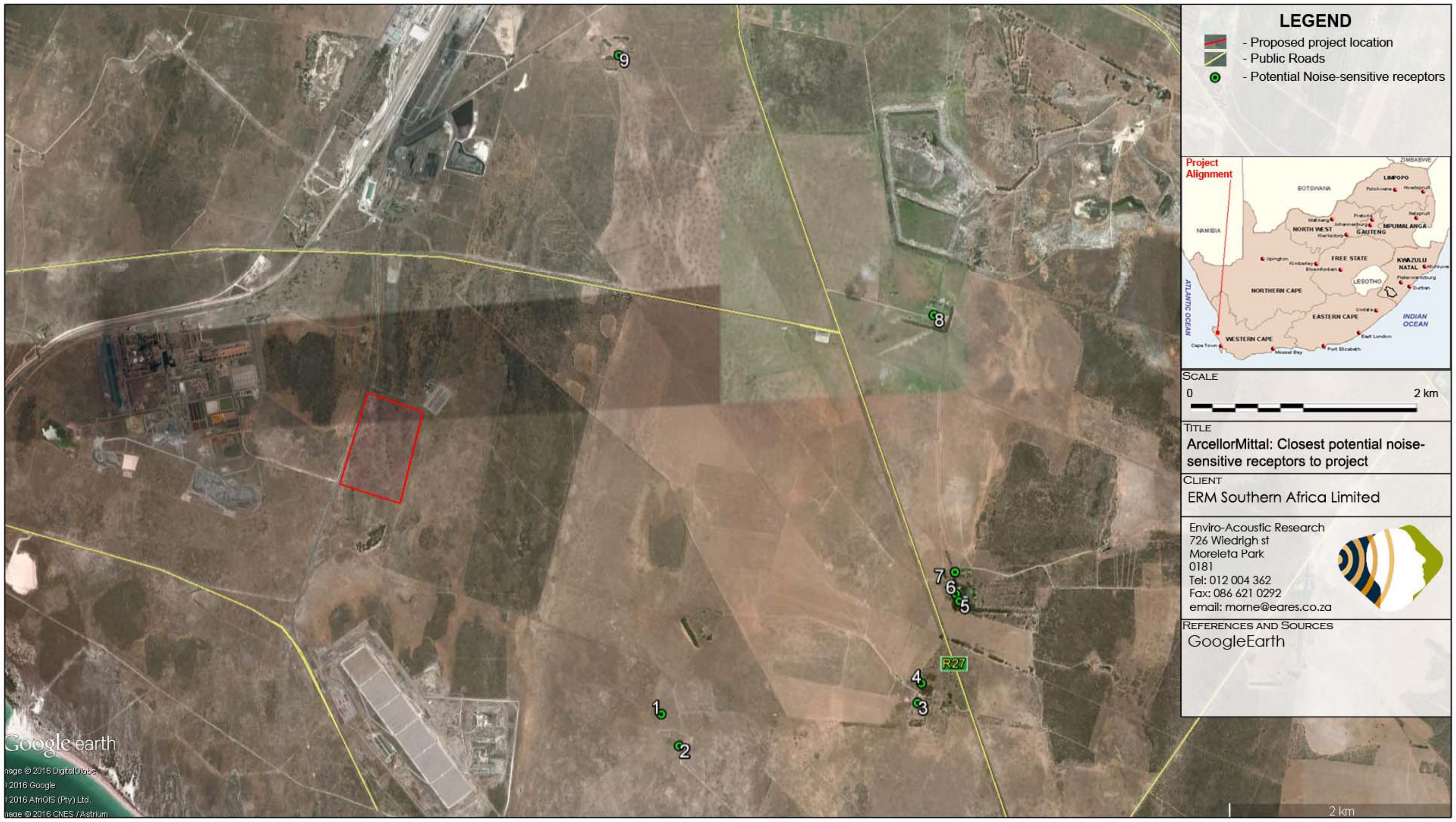
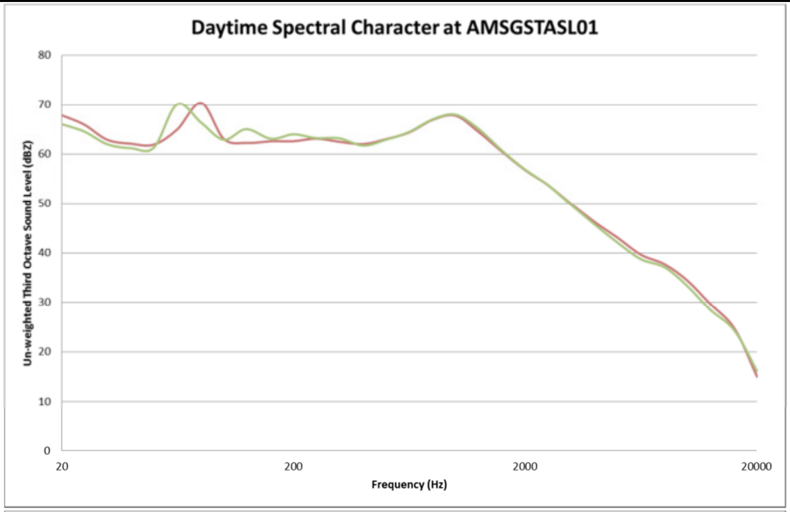


Table 6.4 Summary of singular noise measurements

Measurement location	$L_{Aeq,i}$ level (dBA)	$L_{Aeq,f}$ level (dBA)	L_{A90} Level (dBA90)
AMSGSTASL01 Daytime	76	73	52
	76	73	50
AMSGSTASL01 Night-time	51	47	45
	52	48	45
AMSGSTASL02 Daytime	75	72	51
	75	72	51
AMSGSTASL02 Night-time	49	46	45
	51	47	46
AMSGSTASL03 Daytime	49	47	39
	47	45	37
AMSGSTASL03 Night-time	37	29	24
	32	24	20

Legend:
$L_{Aeq,i}$ - Equivalent (average) A-weighted impulse-time-weighted noise level
$L_{Aeq,f}$ - Equivalent (average) A-weighted fast-time-weighted noise level
L_{A90} - Noise level that is exceeded 90% or more of the time, A-weighted fast-time-weighted noise level

Figure 6.8 Day and night spectral frequencies recorded at AMSGSTASL01



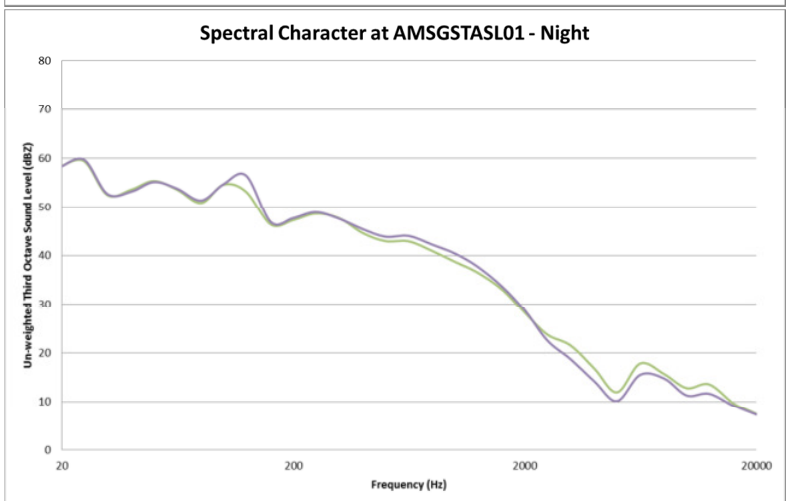


Figure 6.9 Day and night spectral frequencies recorded at AMSGSTASL02

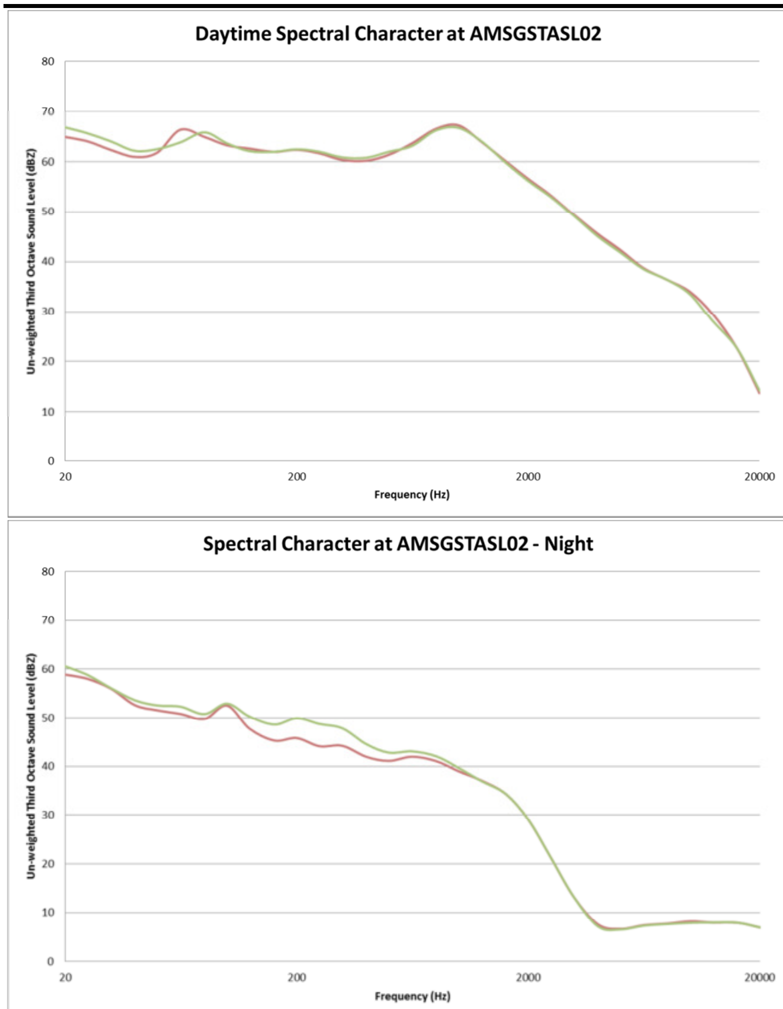
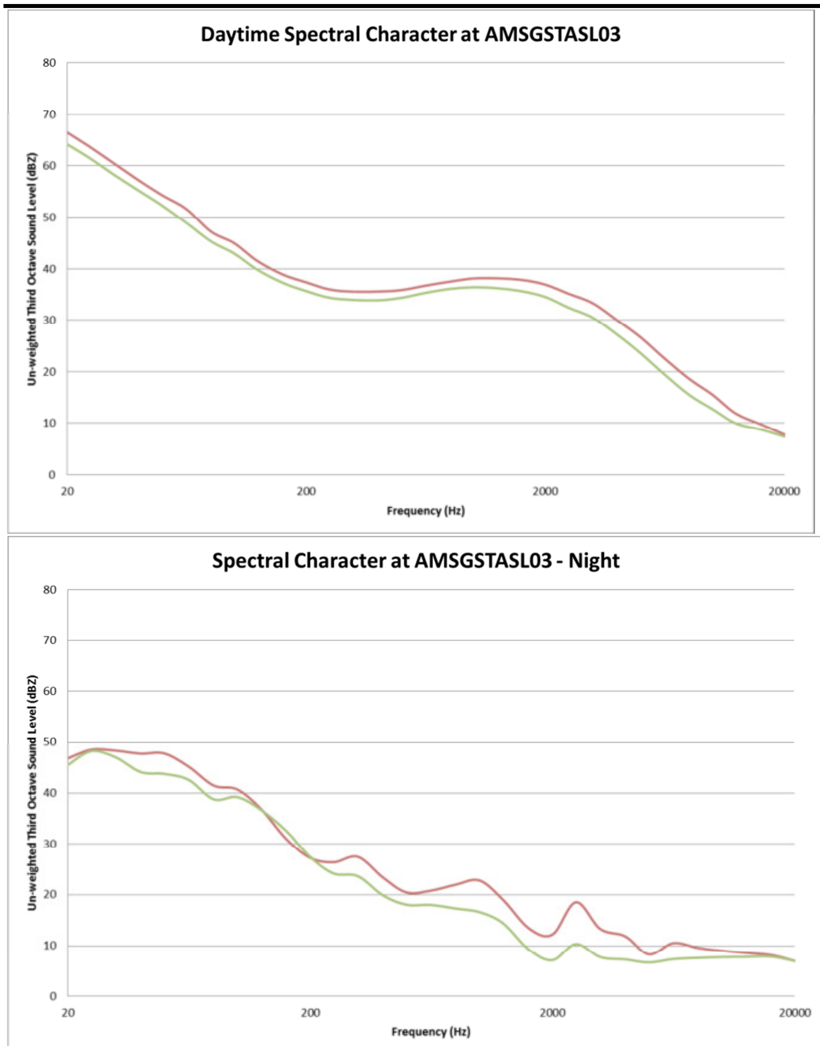


Figure 6.10 Day and night spectral frequencies recorded at AMSGSTASL03



7 *SOCIO-ECONOMIC BASELINE*

This Section describes the socio-economic environment in which the Project is situated. The description provided in this section is based on publicly available and secondary information, as well as primary data collected for the Project.

7.1 *AREA OF INFLUENCE (AOI)*

The socio-economic baseline description is focused on local level, i.e. within the Saldanha Bay Local Municipality, situated in the West Coast District Municipality. This is because it is expected that although the proposed Project will result in macro-economic benefits at a national level, the primary socio-economic impacts of the Project will be experienced at a district and local level.

The socio-economic area of influence has been divided into the Direct Area of Influence and the Indirect Area of Influence, these are described below.

7.1.1 *Area of Direct Influence*

The Area of Direct Influence, ADI, includes the Project footprint and related facilities as well as the associated effects of the Project on the receiving environment. This encompasses:

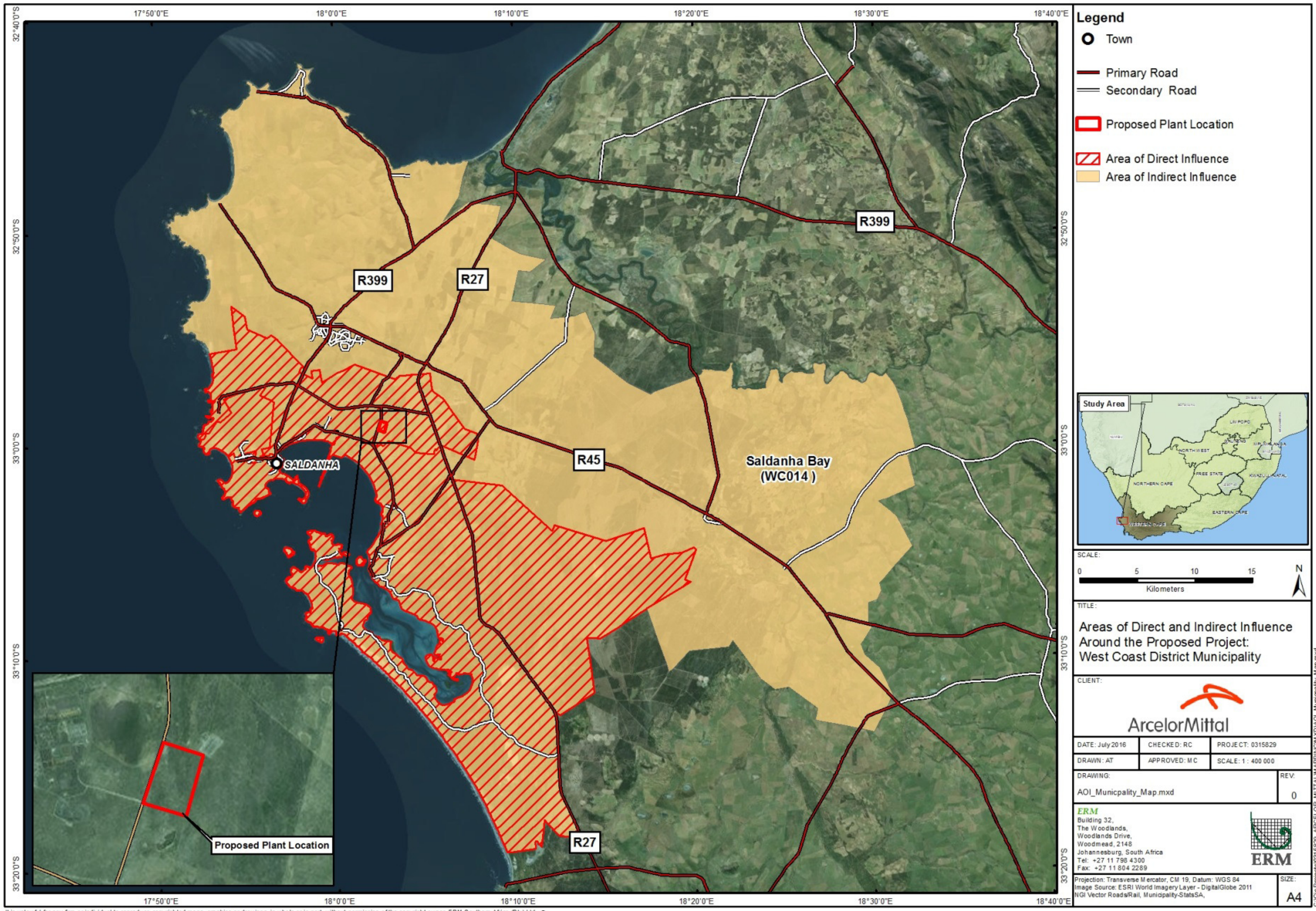
- The 45 ha CCGT Power Plant site;
- the 5 km pipeline route;
- the transmission line to Saldanha Steel.

In the context of this study, the ADI further includes areas around the site likely to be affected by the Project activities during the pre-construction, construction and operation phases. The effects can be positive or negative, short or long term or permanent, as well as direct and in-direct. These areas include the settlements located within close proximity to the Project site, namely, the greater Saldanha Bay area, in particular Ward 1, Ward 3, Ward 4, Ward 5 and Ward 6 (refer to *Figure 7.1*).

7.1.2 *Indirect Area of Influence*

The Area of Indirect Influence, AII, includes areas within a wider radius of the Project Site, which may be affected by the Project, this includes, although to a lesser extent, the remainder of the Saldanha Bay Local Municipality, particularly the town of Vredenburg, Ward 2, Ward 9, Ward 10 and Ward 13 (refer to *Figure 7.1*).

Figure 7.1 Project Area of Influence



7.2 *Administrative Structure*

The Project is in the Western Cape Province and the West Coast District Municipality (WCDM). The WCDM borders the Northern Cape District Municipality (NDCM) in the north and the Cape Metro District Municipality (CMDM) and Cape Winelands District Municipality (CWDM) in the south and south-east, respectively. The District Municipality has five local municipalities; namely Swartland, Bergrivier, Matzikama, Cederberg, and Saldanha Bay, and the Project site is located in the Saldanha Bay Local Municipality (SBLM) (see *Figure 7.2).* There are 13 Wards within the SBLM and the Project footprint falls within Ward 5.

The Provincial government is responsible for providing the strategic vision and framework for the Province. They are responsible for ensuring cooperation and collaboration between municipalities and that each municipality performs their respective functions. In turn, each of the District Municipalities is responsible for the preparation of Integrated Development Plans and for the overall provision of services and infrastructure within their District. *Figure 7.3* shows the administrative structure of the respective levels of government.

Figure 7.2 West Coast District Municipality Boundaries

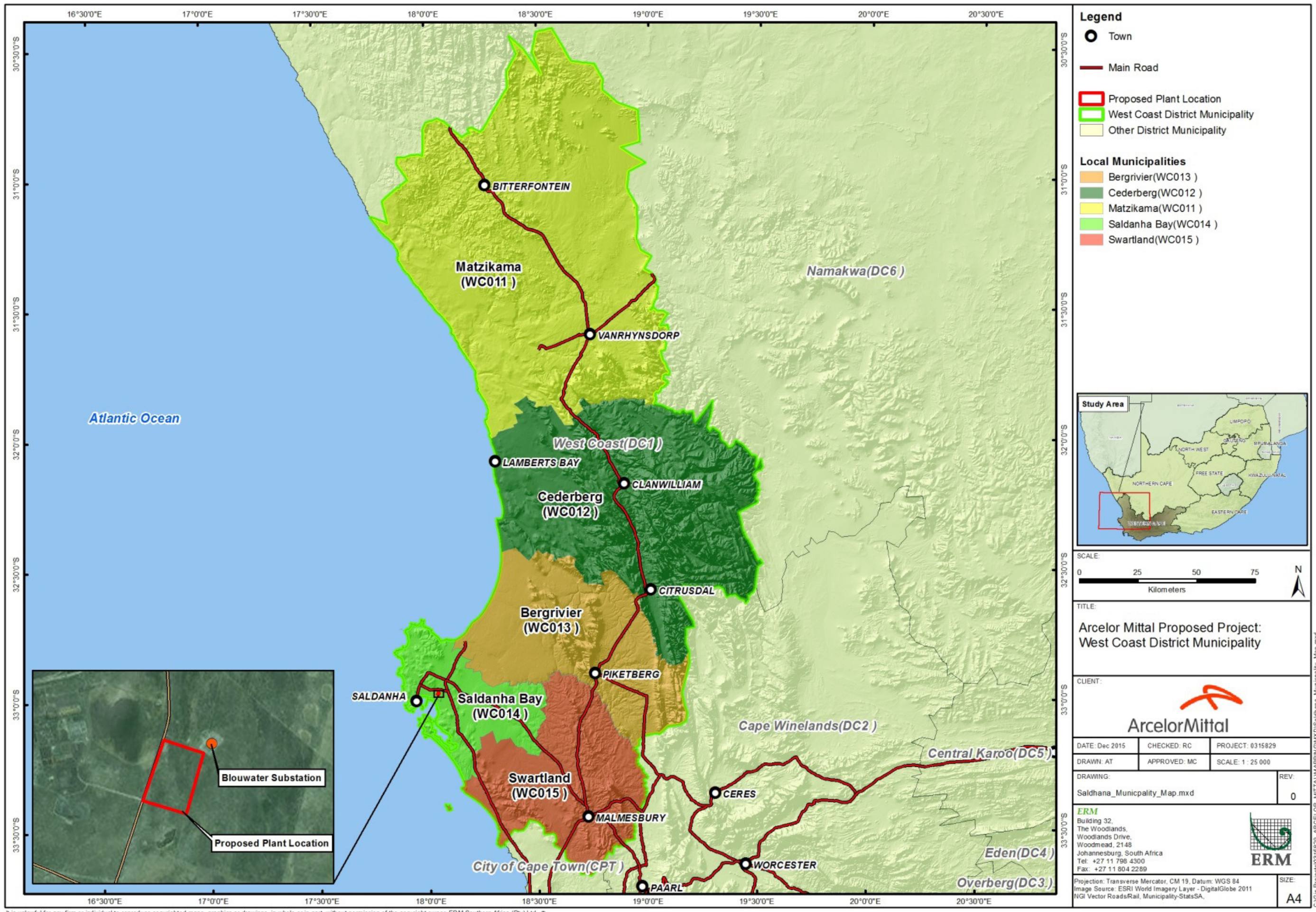
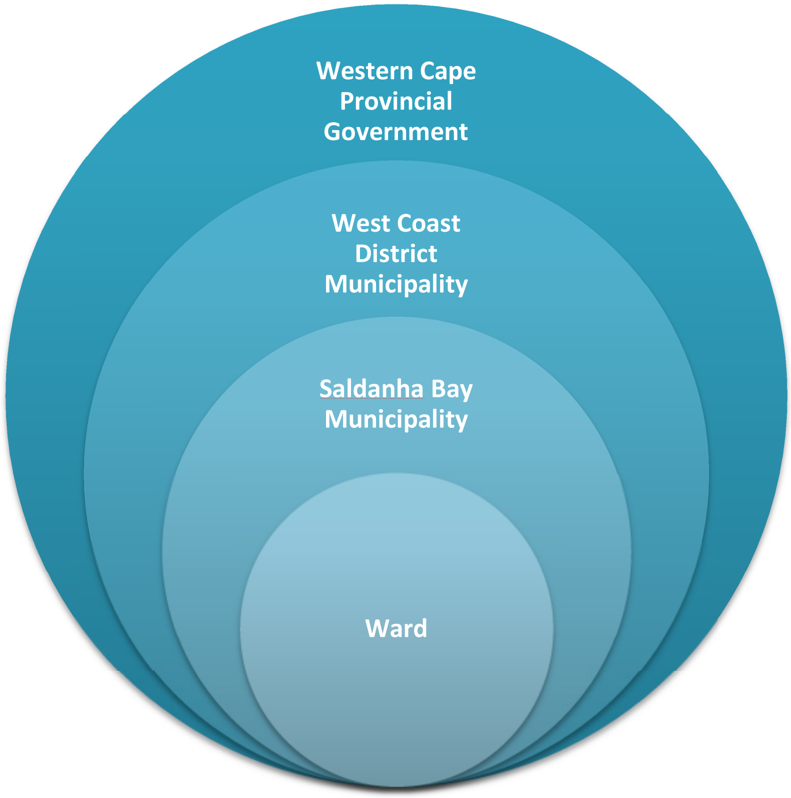


Figure 7.3 Administrative Structure



7.3 SITE SETTING AND LANDUSE

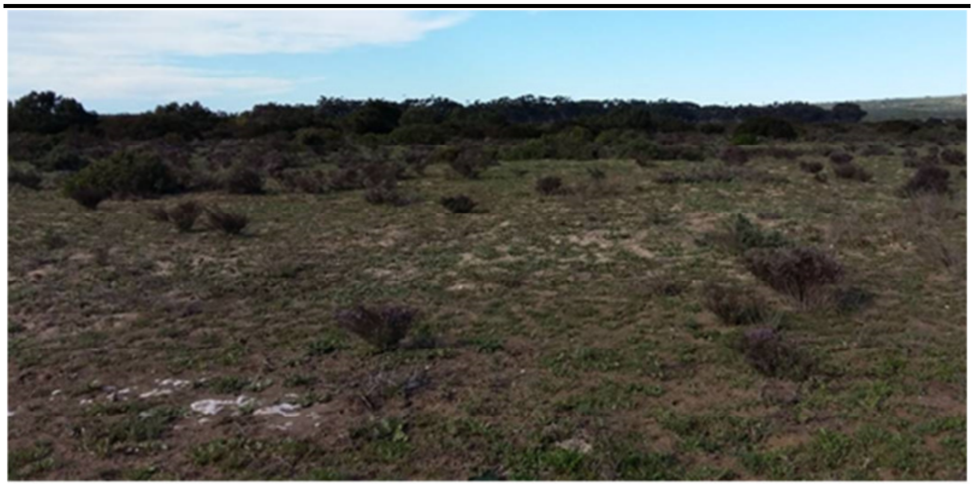
7.3.1 Land-use of the Project Site

The Project site is located on land currently owned by ArcelorMittal, less than 1 km to the east of the existing Saldanha Steelworks, immediately adjacent to the Blouwater substation. The site is vacant and is currently managed by Saldanha Steel for grazing. The site is not leased out to other farmers. The site is located within an area identified for industrial development according the Saldanha Bay Municipal Spatial Development Framework (2011).

The pipeline will traverse across land owned by ArcelorMittal until the Port boundary (where the Scope of this EIA ends).

The site is served by the existing road infrastructure. The access to the development is via TR 85/1 coming from the east off the R27 (TR 77/1). Provincial Road OP7644 abuts the site to the west and links TR85/1 to MR559. OP7644 is a two lane undivided rural roadway from which access to the site is provided opposite the Saldanha Steel entrance.

Figure 7.4 *View of the Site*

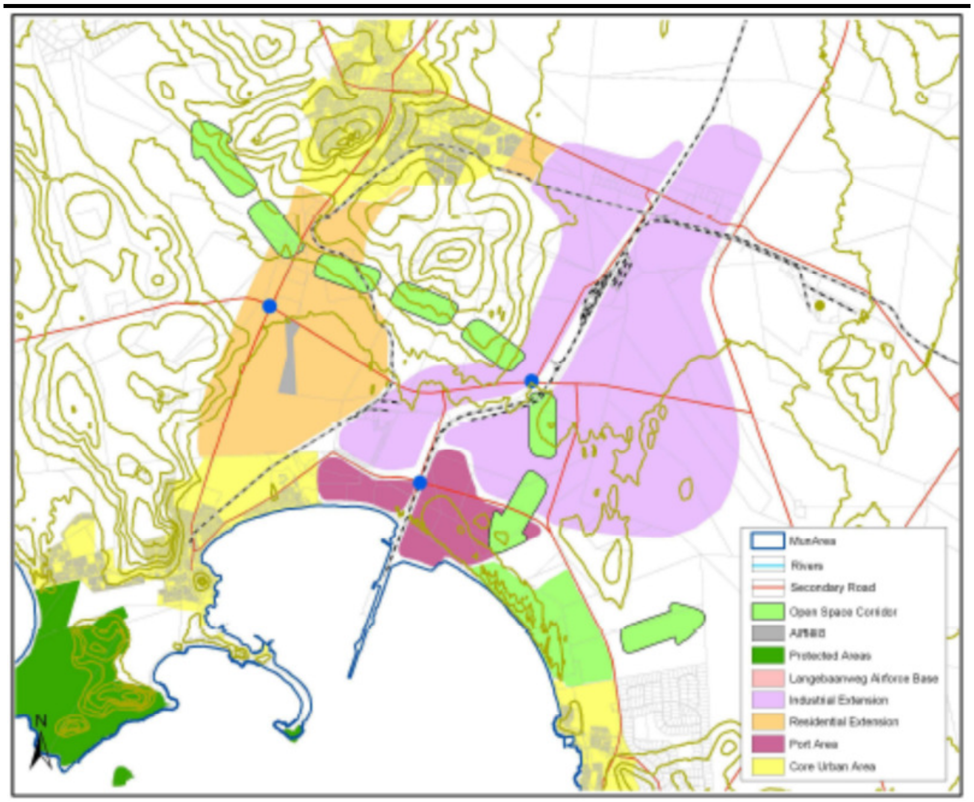


7.3.2 *Surrounding Land-use*

The Project site is located in an industrial area within Saldanha Bay. The land immediately surrounding the site it utilised for industrial purposes, grazing or is vacant land. Within the broader area, much of the surrounding land to the north and east is utilised for agriculture. The residential areas of Langebaan and Saldanha Bay are located approximately 7 km south and west of the site respectively, while Vredenburg is located approximately 8 km north-west of the site.

Surrounding industries include Saldanha Steel, a number of engineering companies with an oil and gas focus located in the IDZ, and the Port of Saldanha with associated infrastructure and terminals. The West Coast National Park is located approximately 15 km south of the site, and the SAS Saldanha Contractual Nature Reserve is located 12 km south west of the site. *Figure 7.5* shows the planned land-use zoning within Saldanha Bay.

Figure 7.5 Planned Land Use within Saldanha Bay Area



Source: Saldanha Bay Municipal Spatial Development Framework, 2011

The Saldanha Bay residential area is divided in to a number of sub-places, namely, Saldanha, Diazville (including Middlepos), White City and the Military Area. Diazville and White City are densely populated areas, with low cost, single unit dwellings on small stands. The population in these areas are predominantly lower income families. The population of Saldanha are predominately of middle to high income. The residential area of Langebaan and the surrounding sub-places consist largely of single unit residential homes and housing estates, many of which are second homes or rented out to accommodate tourists.

This pattern is replicated in Vredenburg, which is divided into Vredenburg, Louwville, Witteklip and Ongegund. Louwville, Witteklip and Ongegund are densely populated, with a population of a lower income bracket, while Vredenburg is comprised of middle to high income families.

7.3.3 *The Port of Saldanha*

The Port of Saldanha Bay is South Africa's largest natural anchorage. The Port developed into a modern harbour when it became necessary to facilitate the export of iron ore from the Northern Cape via an 800 km railway line from the mines at Sishen in the Northern Cape. The Port accepts vessels of up to 20.5 m draught. The Port entrance channel is dredged to a depth of -23 m Chart Depth and a width of 400 m.

The total area occupied by the Port (land and water areas) is 18,300 ha and it has a 990 m long jetty containing two iron ore berths linked to the shore along a 3.1 km long breakwater. There is also an 874 m long multipurpose quay for the handling of breakbulk cargo. Between 2011 and 2012 the Port of Saldanha Bay handled a total of 528 ships with a total gross tonnage of 34,503,749-gt. In 2011/12 cargo handled by the port totalled 58,263,030 tonnes, of primarily iron ore but also oil.

Figure 7.6 Ariel View of the Port of Saldanha

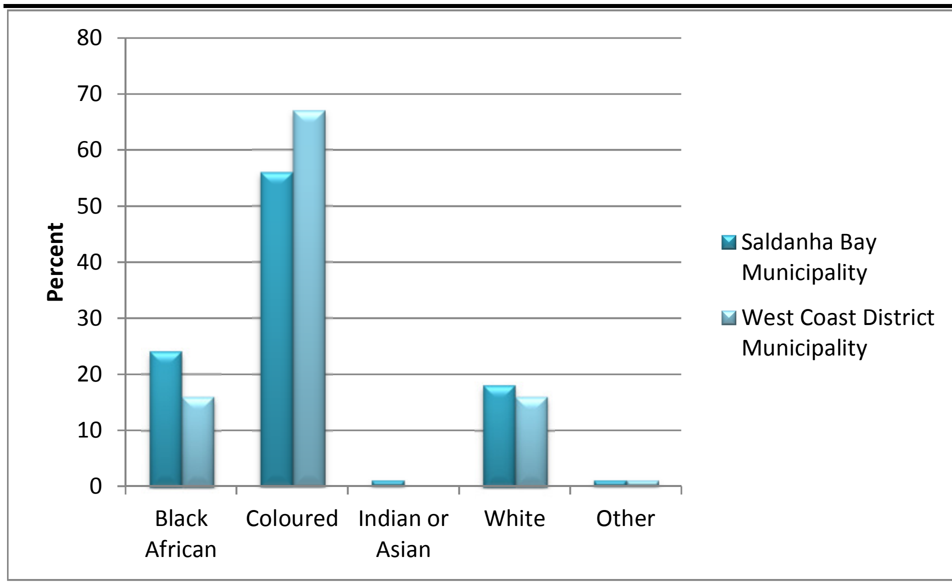
7.4 DEMOGRAPHIC PROFILE

The 2011 Community Survey notes that the population of the WCDM is estimated to be 391 758. The District occupies 19 percent of the total land area of the Western Cape Province and is sparsely populated with a population density of 13 people per square kilometre. Approximately 72 percent of the population lives in urban areas with the remaining 28 percent living in rural areas. The District is relatively urbanised and the rural areas are sparsely populated.

The SBLM has the second largest population (99,193 people) in the District area with the Swartland Municipality having the highest population (113 763). The population of the SBLM increased by 3.4 percent between 2001 and 2011 (StatsSA, 2011), greater than the predicted 2.2 percent growth expected in the Saldanha Bay Local Municipality, IDP, 2007/2008. Some 95 percent of SBLM households are concentrated in urban areas with the remaining 5 percent living in rural areas (DEA&DP, 2012). This is the highest proportion of people living in urban areas as compared to the other Local Municipalities in the WCDM and well above the District average of 72 percent (StatsSA, 2011). The population density in SBLM is 49 persons per square kilometer which is significantly higher than that of the District Municipality (13 people per square kilometer).

The WCDM's population is composed of three ethnic groups, namely; Coloured, Black Africans and White Communities. The most dominant of these is the Coloured community (67 percent) while both White and Black African groups account from 16 percent of the population, as shown in *Figure 7.7*. Within the SBLM, the Coloured community account for 56 percent of the population, while Black Africans account for 24 percent and White people account of 18 percent of the population (StatsSA, 2011).

Figure 7.7 Ethnic Composition in the WCDM and the SBDM



Source: StatsSA (2011)

The total population within the ADI is 37,866, and a breakdown thereof is provided in *Table 7.1* below. While the population is fairly evenly spread between the five wards, Ward 3 and 4 are significantly smaller than the other wards, indicating that the population density is highest within these two wards.

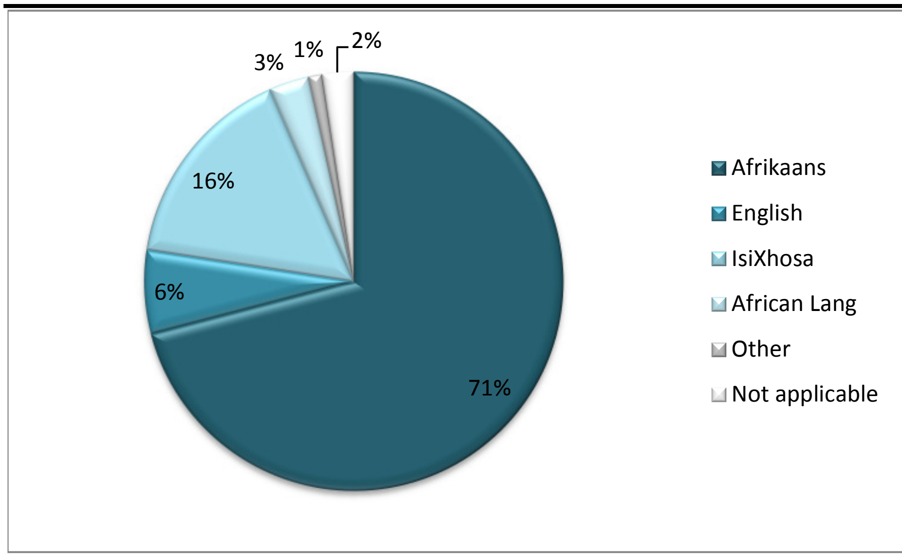
Table 7.1 Population with the ADI

Ward	Black African	Coloured	Indian or Asian	White	Other	Total Population
1	4 647	3 519	120	9	105	8 400
3	2 115	3 237	96	717	42	6 207
4	1 191	7 254	84	6	57	8 592

Ward	Black African	Coloured	Indian or Asian	White	Other	Total Population
5	492	1 818	96	3 744	51	6 201
6	630	2 931	39	4 749	117	8 466
Total Population						37 866

Afrikaans is the dominant language spoken in the SBLM, with an estimated 71 percent of the population being native speakers, isiXhosa is the second most commonly spoken language at 16 percent and English at 6 percent this is illustrated in *Figure 7.8.*

Figure 7.8 Language Spoken in the SBLM



Source: StatsSA (2011)

7.5 MIGRATION

The primary driver of migration is the search for employment and income, and the urban centres of the Western Cape attract many migrants as they provide a hub of economic activity. The agriculture sector dominates much of the WCDM, with populations highly dependent on agriculture for employment. The contraction of the agriculture sector in the WCDM resulted in notable job losses and although the agricultural sector remains a large employer (25 492 workers), the sector shed 19 786 between 2000 and 2013 (Western Cape Government, 2013). As a result, many people seeking alternative employment will gravitate towards larger urban centres, where there is perceived to be a greater prospect of employment opportunities.

The population of the SBLM increased by 3.4 percent between 2001 and 2011 (StatsSA, 2011), greater than the predicted 2.2 percent growth expected in the Saldanha Bay Local Municipality, IDP, 2007/2008, and this is likely due to an in-migration of job seekers. Saldanha Bay and Vredenburg, the major urban centres in the SBLM, will attract many of the migrants entering the SBLM as they seek access to employment opportunities as well as social infrastructure and services.

7.6 LIVELIHOODS AND ECONOMY

The WCDM contributed about 4.3 percent to the Western Cape's total GDPR (Regional Gross Domestic Product) in 2011 (Western Cape Government, 2013). The WCDM has experienced slow economic growth in the past five years. This can be attributed to the contraction in agriculture in some of the municipal areas, namely Bergrivier LM, Matzikama LM and Cederberg LM, as well as a struggling manufacturing sector, particularly in the SBLM, which was affected by the economic downturn. While jobs have been lost in the agricultural and manufacturing sectors, positive net employment was recorded in the services sector, with SBLM recording the highest number of new jobs in the service sector (Western Cape Government, 2013).

The agricultural, forestry and fishing sectors were the sectors that performed the best; contributing 16.8 percent to the GDPR of the WCDM. Sectors such as wholesale, retail trade catering and accommodation, and finance, insurance, real estate and business services had the lowest contribution to the GDPR of the West Coast Region at 3.7 percent and 3.4 percent respectively (Western Cape Government, 2013).

It is important to note that the SBLM differs significantly from the WCDM in terms of economic activity. The SBLM, being host to a large port, supports a more lively manufacturing and processing sector, and has developed the economic hub of the WCDM, supporting more business and commerce than the surround rural municipalities.

The SBLM contributed 33.9 percent towards the GDP of the WCDM. The key economic sectors for the SBLM are shown in *Table 7.2.* Collectively, these sectors contributed towards approximately 90 percent to the Local Municipality's economic output in 2011 (Western Cape Government, 2014).

These sectors are discussed further below.

Table 7.2 Contribution to the SBLM Economic Output 2014

Economic Sector	Percent Contribution to Economic Output
Finance, insurance, real estate and business services	32
General government	18
Manufacturing	13
Wholesale and retail, trade, catering and accommodation	10
Transport, storage and communication	9
Agriculture, forestry and fishing	8

Source: Western Cape Government (2014)

7.6.1 *Manufacturing and Processing*

The main contributors to the SBLM manufacturing sector are metal processing and food processing. The two sectors contributed 54.2 percent and 37.1 percent, respectively in 2009 (Demacon, 2009), and account for over 80 percent of the SBLM manufacturing sector. The high metals contribution is due to the exporting of metals from the Northern Cape mines for steel-manufacturing plants near the port of Saldanha. The contribution of the food processing is largely driven by the processing of products from the fishing industry. While the manufacturing sector enjoyed steady growth in the past (2,6 and 3,9 percent from 1995 to 2004), the sector has shown slow and negative growth since 2009, largely linked to the slump in the metals industry (Western Cape Government, 2014).

7.6.2 *Wholesale and Retail Trade, Catering and Accommodation*

This sector contributed 10 percent towards the SBLM's total GDPR, largely driven by the wholesale and retail trade sector. This sector has also been bolstered by positive growth in the tourism industry which is discussed in more detail below.

Tourism

Tourism is one of the fastest growing sectors of South Africa's economy with its contribution to the country's gross domestic product (GDP) reaching almost 12 percent in 2010. The tourism industry in the Western Cape contributes 14 percent to the total (GDP) of the Province and makes a significant contribution to economic development and jobs, thus being the most important growth sector in the Province.

The contribution made by tourism to the economy of the SBLM is included in the Wholesale and Retail Trade, Catering and Accommodation sector, which contributed 10 percent towards the SBLM's total GDPR. Tourism is recognized as sector of economic growth by the SBLM, and is seen to offer economic development potential to a large part of the local community, with the potential of a year round flow of tourists, and consequently, economic activity. Further, eco-tourism and agri-tourism are recognized as ways of supplementing the income of farmers.

The natural environmental is the primary attraction for tourists visiting the SBLM. There are numerous protected areas such as the SAS Saldanha Nature Reserve, West Coast National Park, and the West Coast National Fossil Park located in the SBLM (http://capewestcoastpeninsula.co.za, accessed November 2015). Within these protected areas people can take part in activities such as gaming, whale and bird watching, and seeing wild flowers blooming in the winter and spring.

WCDM IDP cites a lack of funding as a major challenge for the development and marketing of the tourism sector in the District.

7.6.3 *Transport and Communication*

Transport and communication was the second-largest sector in the Saldanha Bay Municipality, contributing 9 percent to the total GDPR in 2011. The industry showed growth between 1996 and 2001, but has subsequently started to slow, if not retract (Demacon, 2009). This could be linked to the general slow-down in economic growth experienced by the SBLM since 2009. Transport activities included bus and tour-bus services, taxis, school buses, travel agents, the hiring of transport equipment and telephone and radio-communication services.

7.6.4 *Agriculture, Forestry and Fishing*

Between 1994 and 2004 the agriculture, forestry and fishing sectors combined contribution to GDPR increased from 10 percent to 11.9 percent, (Western Cape Government, 2006). However, this combined contribution decreased to 8 percent in 2011, supporting the notion that there has been a general retraction in the agricultural sector within the WCDM (Western Cape Government, 2014). Agriculture is the primary economic contributor in the rural municipalities of the WCDM, such as Bergrivier, Matzikama and Cederberg. The rural areas of the SBLM, north Vredenburg, rely on agriculture, whereas agriculture is not a key economic activity with the ADI.

The SBLM IDP recognizes that the agricultural sector faces challenges, and noted that to improve economic viability and sustainability of agriculture within the municipal area, it is important that the development and implementation of integrated approaches to natural resource management are adopted, and that farmers should consider alternative income generating activities, such as agro-tourism, conservancies and value add services.

In SBLM, mariculture industry and the fishing industry are important activities and are therefore, discussed further below.

Aquaculture

The aquiculture industry in Saldanha Bay consists of mussel and oyster (bivalve) growers, located predominantly in Small Bay with just one operator with an allocation in Big Bay. Farmers lease space from the Transnet Ports Authority and must obtain a permit to operate from the Department of Agriculture, Forestry and Fisheries (DAFF).

The bivalve industry currently employs approximately 130 people, of which 85 to 90 percent are factory workers or boat crew. Lack of a formal education is not a barrier to entry within the aquaculture sector, and according Olivier et al (2013), 75 percent of the workforce employed by the bivalve sector in Saldanha is educated to Grade 9 level or less, and a further 21 percent of factory employees had passed matric (Grade12), (Olivier et al, 2013). The bivalve industry has provided employment for many people that have lost their jobs due to the decline in the fishing industry in Saldanha.

There are a number of emerging farmers operating in Small Bay who have branched off from the bigger operators. They have received support from bigger companies such as start-up capital. The emerging farmers are typically limited to Small Bay as they do not have the boats and skills to operate in the rougher sea of Big Bay.

Figure 7.9 Mussels seed themselves onto ropes suspended beneath rafts

Mussel Rafts — Cane hoisting a rope with mussels attached

Source: Dr Sue Jackson

Fishing

There are well known national fishing companies that operate from Saldanha Bay, such as Sea Harvest and Southern Seas Fishing. While the fishing industry is well established in Saldanha, it showed slow growth between 2001 and 2009, (only 2.2 percent) (SBLM IDP) and continues to contract.

Figure 7.10 Fishing Boats Docked in the Port of Saldanha

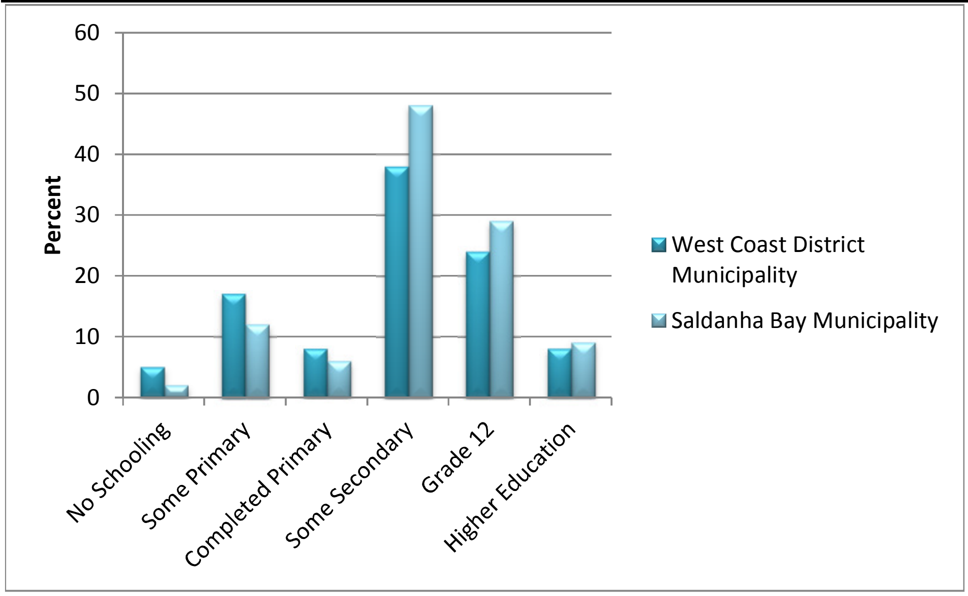
7.7 EDUCATION

The WCDM has a total of 130 schools (primary and secondary schools). The literacy rate [(1)] in the WCDM is 79.1 percent (Western Cape Government, 2014), which falls short of the Provincial literacy rate of 87.2 percent. The teacher student ratio is 28 students per teacher.

SBLM has a total of 19 schools and the literacy rate is 86.7 percent. Similar to the WCDM, the levels of illiteracy are highest amongst those above the age of 14 years. The learner-educator ratio is 1:28.5, in line with that of the WCDM, (Western Cape Government, 2014). *Figure 7.11* below shows that overall the level of education is slightly higher in the SBLM than in the WCDM, with a slightly higher percent of people having obtained a Grade 12 or some level of higher education in the SBLM. The figure also shows that in both Municipalities a greater proportion of learners have completed some secondary schooling, while fewer that have completed Grade 12. Overall, the population within both municipalities is poorly educated, with just a small portion of the population having received higher education.

(1) The Department of Social Development defines people aged 14 years and older as literate if they have successfully completed 7 years formal education (passed Grade 7/Standard 5).

Figure 7.11 Levels of Education in the Local Municipality

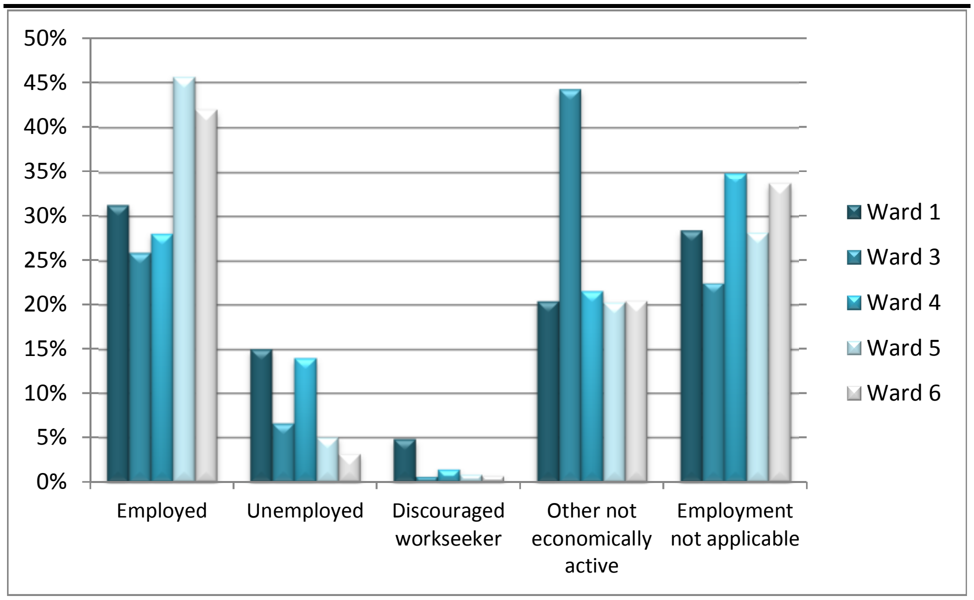


Source: Statssa, Census 2011

7.8 EMPLOYMENT AND SKILLS

The unemployment rate in the WCDM was 14.6 percent in 2011. This is comprised of people who are unemployed but seeking employment, as well as those who are not seeking employment. The unemployment rate in the SBLM was higher than that of the District at 23.4 percent (Western Cape Government, 2014). *Figure 7.12* shows a breakdown of the employment status within the ADI. Wards 5 and 6 have the highest employment rates, while Wards 1 and 4 have the highest unemployment rates. Across all wards, the percentage of people who have stated either that they are not economically active or "that employment does not apply", is high. This indicates that a large portion of the population are not economically active and are either dependent on social grants, or others people for an income (such as students or the elderly).

Figure 7.12 Employment Status within the ADI



Source: StatsSA (2011)

Sectoral–employment data (2011) showed the following sectors as being the biggest employers in Saldanha Bay Local *Table 7.3.* Manufacturing is key employer in the SBLM, which is in contrast to the WCDM where agriculture, forestry and fishing are the major employment sector.

Table 7.3 Formal Employment by Sector in the SBLM 2014

Sector	Percent Employed
Manufacturing	24.2
Community, personal, and social services	20.4
Wholesale and retail trade; and catering and accommodation	15.1
Agriculture, forestry and fishing	14.2
Finance and business services	11.4

Source: CCA (2014)

The major employers in the fishing industry include companies such as Sea Harvest, Oceana, Southern Seas and West Point Processors. Within the Steel and mineral-processing companies (Manufacturing sector), the Saldanha Steel Project (ArcelorMittal SA), Namakwa Sands is the major employer.

7.8.1 Skills Levels

The population of SBLM is typically engaged in occupations requiring a higher level of skills than that of the WCDM (West Coast District Municipality IDP, 2012 – 2016). According to the IDP, almost half the population of the SBLM has some skills, which implies that they have received some training in the past. *Table 7.4* provides a comparison of the skills levels within the two populations.

Table 7.4 ***Comparison of Skills Levels between District and Local Municipality in 2012***

Area	Highly Skilled %	Skilled%	Low Skilled%	Not Specified%
West Coast District Municipality	21.3	41.9	27.9	8.9
Saldanha Bay Local Municipality	28.5	49.3	12.1	10

Source: West Coast District Municipality (2012)

7.8.2 Income Levels and Poverty

Within both the WCDM and the SBLM, household income falls predominantly into the middle to low income categories. However, the SBLM does have a larger number of households in the higher income brackets which is likely linked to employment opportunities in skilled positions, as shown in *Table 7.5.*

Within the ADI, Ward 1 and 4 have a larger number of households in the lower income brackets, while Wards 5 and 6 have a larger number of households in the higher income brackets.

Table 7.5 ***Percentage of population per Average Household Income Bracket in 2011***

	No income	R 1 - R 4800	R 4801 - R 9600	R 9601 - R 19 600	R 19 601 - R 38 200	R 38 201 - R 76 400	R 76 401 - R 153 800	R 153 801 - R 307 600	R 307 601 - R 614 400	R 614 001 - R 1 228 800	R 1 228 801 - R 2 457 600	R 2 457 601 or more
WCDM	11%	2%	3%	14%	22%	19%	13%	9%	5%	1%	0%	0%
SBLM	14%	2%	4%	11%	17%	17%	15%	11%	6%	2%	0%	0%
Ward 1	22%	4%	6%	15%	22%	14%	10%	5%	2%	0%	0%	0%
Ward 3	7%	1%	3%	9%	16%	19%	20%	17%	6%	1%	0%	0%
Ward 4	8%	2%	5%	14%	24%	25%	17%	4%	1%	0%	0%	0%
Ward 5	8%	1%	1%	4%	7%	11%	18%	25%	17%	5%	1%	1%
Ward 6	18%	1%	1%	4%	8%	13%	18%	17%	14%	5%	1%	0%

Source: StatsSA (2011)

The SBLM has an estimated poverty rate of 23.9 percent. This is lower than the surrounding municipalities and that of the WCDM, which has a poverty rate of 30.4 percent.

7.9 *HEALTH*

The WCDM has 76 medical facilities (26 clinics, 24 satellite clinics, 19 mobile clinics and seven district hospitals) (Western Cape Government, 2014). Some of the challenges encountered by the Health Department in the WCDM are the poor/insufficient physical infrastructure, overcrowded primary healthcare facilities and insufficient numbers of skilled health workers in the region.

The most common illnesses affecting communities are infectious diseases such as HIV/Aids and TB, as well as chickenpox and measles amongst children. The SBLM has the lowest number of antiretroviral treatment (ART) clinics/treatment sites in the WCDM, which is of concern considering it has the heaviest ART patient load in the WCDM (1,779 patients in March 2014, up from 1,435 patients in 2013) (Western Cape Government, 2014).

There has been a general increase in the numbers of teenage pregnancies recorded in the region; the increase in teenage pregnancies is potentially linked to poverty in the area. Violence and substance abuse are also common in the District leading to increased pressure on the local health services (West Coast District Municipality, 2009).

SBLM has 14 medical facilities (8 clinics, 3 satellite clinics, 2 mobile clinics and 1 district hospital) (Saldanha Bay Municipality, 2012). According to the IDP, nine doctors and 59 professional nurses have been employed by the Department of Health to render health services to patients attending the health facilities in Saldanha Bay [(1)].This indicates that there is high number of patients compared to the nursing staff available to service the patients' medical needs.

The most common illnesses are HIV/Aids and TB; this is similar to the District level. The HIV/Aids prevalence in the District was 4.3 percent in 2005 and it was expected to increase to 5.5 percent by 2010 (West Coast District Municipality, 2006). There is a relationship between the high prevalence of TB and HIV/Aids.

(1) Note that these totals exclude health professionals employed within the private sector.

Figure 7.13 Saldanha Health Clinic

7.10 SOCIAL INFRASTRUCTURE AND SERVICES

7.10.1 Water

In the SBLM, 99.2 percent of the population has access to piped water; households that have access to water inside their homes, from outside taps on their properties and from communal taps (Western Cape Government, Socio-economic Profile Saldanha Bay Municipality, 2014).

The WCDM provides bulk potable water to the Saldanha Bay Municipality through the Misverstand Scheme which is part of the Berg River – Saldanha supply system (EMF, 2015). Water is obtained from both surface water (Berg River) and groundwater (Langebaan Road Aquifer) for the Misverstand Scheme. This scheme supplies the Saldanha Bay municipality and some of the towns in the Berg River municipality (EMF, 2015).

Water demand in the SBLM increased significantly with the establishment of a number of industries over the past 30 years (EMF, 2015). This is attributed to the development of the Port and associated infrastructure. According to the IDP Review, industrial water users account for approximately 50 percent of potable water use within the Saldanha Bay municipal area (EMF, 2015).

There are plans to construct a desalination plant in Saldanha Bay to supply additional water to the local area (WCDM IDP, 2012).

7.10.2 *Sanitation*

The WCDM has provided 92 percent of households with adequate sanitation. Compared with the District Municipality, the SBLM has provided 96.2 percent of its households with adequate sanitation facilities (Western Cape Government, 2014).

Table 7.6 below illustrates the existing wastewater treatment plants operated by the Saldanha Bay Local Municipality. In addition, it is important to note that a regional Waste Water Treatment Works (WWTW) is proposed for the SBLM, which will service the proposed industrial areas within Saldanha.

Table 7.6 Wastewater Treatment Plants in the Saldanha Bay Municipality

Responsible Municipality/ Organization	Name Of WWTW	Water Disposal Method	Technology Being Used
Saldanha Bay LM	Sandy Point (Shelly Point	Irrigation, 100 % Re-use	Package plant, Activated sludge
Saldanha Bay LM	Paternoster	Irrigation	Oxidation pond (lined)
Saldanha Bay LM	Laingville (St Helena Bay)	Irrigation, 30 % Re-use	Activated sludge, Maturation ponds, Disinfection
Saldanha Bay LM	Hopefield	Irrigation, 100 % Re-use	Activated sludge, Maturation ponds
Saldanha Bay LM	Langebaan	Irrigation, 100 % Re-use	Oxidation pond (lined), Activated sludge, Maturation ponds, Disinfection
Saldanha Bay LM	Saldanha	Irrigation, 100 % Re-use	Oxidation pond (unlined), Activated sludge, Maturation ponds, Disinfection
Saldanha Bay LM	Vredenburg	Watercourse, 50 % Re-use	Oxidation pond (lined), Activated sludge, Maturation ponds, Disinfection

Source: DWA (2009)

7.10.3 *Waste*

SBLM dispose of all waste at the licensed Vredenburg landfill and a number of drop-off facilities are provided at various communities (WCDM, 2014). There is also a Materials Recovery Facility at the Vredenburg landfill. In addition, any hazardous material can be discarded at the Visserhoek Disposal facility. Finally, it is important to note that a regional waste disposal facility has been planned to be constructed in Vredendal (WCDM, 2012).

7.10.4 *Housing*

There is a wide variety of housing in the SBLM, from low cost housing to luxurious holiday homes. Wards 5 and 6 typical have larger houses, while Wards 3 and 4 consist of low cost housing.

There has been a slow delivery of housing in the WCDM and SBLM. Although 2,535 households gained access to housing for the first time since 2007, the number of households on the waiting list for housing is currently estimated at 8,179 and the number of households affected by the housing backlog is 6,730 (Saldanha Bay Local Municipality IDP, 2012). The housing backlog has been increasing steadily since 2001, when it was 2,836.

According to the 2006 West Coast Socio-Economic Profile, the slow pace of housing delivery was attributed to the constantly changing settlement patterns resulting from in-migration.

7.10.5 *Energy*

Within the SBLM the proportion of households using electricity for lighting has increased in the Municipality from 91.6 percent during the 2001 Census to 97 percent in 2011 (StatsSA, 2011). Even though an increase was seen in the number of households having access to electricity, 92 percent of households use electricity for cooking purposes, and the other 8 percent use gas or paraffin (StatsSA, 2011).

7.10.6 *Roads*

The WCDM has approximately 10 097 km of road, (West Coast District Municipality, 2012). The roads are maintained by the WCDM on behalf of the Western Cape Provincial Department Transport and Public Works.

The SBLM has 410 km of tarred Municipal roads and 48, 24 km of gravel roads (excluding private farm roads), and the roads are generally of poor quality. There is a backlog in the SBLM relating to road maintenance, and it is noted in the IDP that 548 households did not have access to a road from their dwelling (Saldanha Bay Local Municipality, 2012)

7.10.7 *Policing and Crime*

There are 26 police stations in the WCDM. These are evenly distributed across the local municipalities, with five in each local municipality. This distribution does not account for the geographic extent or the population size of each local municipality. There are police stations in all the major towns within the SBLM which service the town and the rural surroundings (Saldanha Bay Local Municipality, 2012). The most prolific crimes committed in the SBLM are "burglaries at residential premises" and 'drug-related crimes" with 995 and 828 incidents being reported in 2013/14 respectively. Crime statistics across all categories increased from 2010 to 2013, but have subsequently started to decrease again (refer to *Table 7.7*). At this stage the reason for this is unclear.

Table 7.7 Crime in the SBLM between 2009 and 2014

Type of Crime	2009/10	2010/11	2011/12	2012/13	2013/14
Burglary at residential premises	792	787	1 018	1 225	955
Driving under the influence of alcohol or drugs	262	194	161	148	137
Drug-related crime	1 138	1 071	1 006	1 013	828
Murder	35	33	21	29	25
Total Sexual Crimes	154	132	134	147	123

Source: Western Cape Government (2014)

7.11 CULTURAL HERITAGE

The West Coast gained prominence, from quiet coastal village better known for its fishing villages and grain-producing farms, to world heritage locality of international repute, with the discovery of one of the richest deposits of fossils in the world. The bones of over two hundred different kinds of animals have been recovered in the area (Potgieter, 1972). These fossils are now preserved in the West Coast Fossil Park, near Langebaan. The 14 ha Park lies on the R45 close to the Langebaanweg Air Force Base, roughly 14 kilometres ENE of the site under review. Stone Age artefacts and remains of the indigenous Khoikoi are also widespread, which makes it imperative that palaeontological, geological and cultural heritage surveys be undertaken to record and preserve the rich heritage of the region.

7.11.1 *Archaeological Background*

There have been numerous field assessments of the Saldanha Bay area during the course of the last 20 years. Kaplan (1996) recorded a scatter of MSA and LSA stone artefacts during his survey for the proposed Saldanha Steel facility. Orton (2011) noted, during his survey for the Isivunguvungu Wind Farm to the south of the ArcelorMittal site, that no significant archaeological remains were recovered. Orton (2011) undertook a survey for a possible pipe line for the Mass Oil and Gas Services (MOGS) and reported finding a single calcrete flake of unknown origin and has thus considered the archaeological significance of the area to be very low.

Saldanha Bay, which was named by the Dutch after Antonio de Saldanha who visited the Cape in the early 1500's, has since its discovery been used as a safe anchorage by virtually every sea going nation who had trading interests in the east. The bay shores were never permanently settled in any meaningful way until quite late in the history of the Cape.

7.11.2 *Cemeteries and Graves*

Burials in the later Stone Age occurred anywhere and typically in the sandy substrate. This is due to people being buried very close to where they died and this has thus led to many burials being reported from the Saldanha coast and in the adjacent hinterland (Morris 1992).

7.11.3 *Palaeontological Background*

In recent years the area has become famous for its fossil wealth – just inland of Langebaan is the largest Pliocene-Miocene (5-6 million years old) fossil deposit in the world, parts of which are on display at Langebaanweg Fossil Park. This material was deposited in sandbar sediments at the mouth of the proto-Berg River (an ancient river and estuary that was the precursor to the Berg River), the course of which changed over the millennia in response sea level changes. On the edges of the lagoon Dr Dave Roberts and Dr Lee Berger discovered the 200 000 year old footprints of an early modern human fossilized in calcrete sediments. At Hoedjiespunt Prof. John Parkington has excavated on the site of an ancient hyena lair where skull fragments and teeth of an early human were found. Nearby, fossilized within the calcretes and aeolianites are shell fish, animal bone, ashy hearths of people who lived in the area more than 100 000 years ago. A further find at Spreeuwalle between Paradise Beach and the ore terminal has been investigated by Dr G Avery and Mr D Halkett, but unfortunately most of the material lies below sea level as the site dates to a time when sea levels were lower than that of today.

7.11.4 *Findings*

The area surveyed is observed to have been extensively disturbed by agricultural practices, which have left large heaps of calcrete blocks deposited on the edges of the old fields. No palaeontological or Pleistocene archaeological remains were observed on the surface whilst there were also no pre-colonial archaeological sites found. There are also no structures of significance within the study area with the exception of a recently modified building located outside of the proposed activity.

No graves or stone cairns were found during the survey. The location of the power plant is an industrial landscape, adjoining the steel works site and ideally suited to the proposed development.

8 PUBLIC PARTICIPATION

8.1 PUBLIC PARTICIPATION OBJECTIVES

Public consultation is an inclusive and culturally appropriate process which involves sharing information and knowledge, seeking to understand the concerns of others and building relationships based on collaboration. It allows stakeholders to understand the risks, impacts and opportunities of the Project in order to achieve positive outcomes.

The public participation process is designed to provide information to and receive feedback from interested and affected parties (I&AP) for use throughout the EIA process, thus providing organisations and individuals with an opportunity to raise concerns and make comments and suggestions regarding the proposed project. By being part of the assessment process, stakeholders have the opportunity to influence the Project layout and design, and provide input into mitigation measures, technical solutions, and the Plan of Study for the EIA.

The main objectives of public participation are:

i. to ensure that adequate, accessible and timely information is provided to those potentially affected by the Project;

ii. to provide these groups with sufficient opportunity to voice their opinions and concerns;

iii. to ensure that comments are received in a timely manner; and

iv. to demonstrate that comments received are responded to and taken into account in Project decisions.

8.2 LEGISLATIVE CONTEXT

Public participation with regards to EIAs in South Africa is determined by the principles of the National Environmental Management Act (NEMA) (Act 107 of 1998, as amended) and elaborated upon in 'GN 657: Guideline 4: Public Participation' (Department of Environmental Affairs and Tourism, 19 May 2006), which states that: "*Public participation process means a process in which potential interested and affected parties (I&APs) are given an opportunity to comment on, or raise issues relevant to, specific matters.*"

Public participation is required for an environmental authorisation process in terms of the EIA Regulations GN R.982 (December 2014).

8.3 *PUBLIC PARTICIPATION ACTIVITIES UNDERTAKEN*

Table 8.1 details the public participation tasks that have been undertaken to date.

Table 8.1 Public Participation Tasks

Activity	Description and Purpose
Pre-Application	
Preparation of a preliminary stakeholder database	A preliminary database has been compiled of authorities (local and provincial), Non-Governmental Organisations, neighbouring landowners and other key stakeholders (refer to Annex B). This database of registered I&APs will be maintained and updated during the ongoing EIA process.
Preparation and Distribution of a Background Information Document (BID)	BIDs were distributed via email and post to all I&APs on the stakeholder database. See Annex B. The BID provides an introduction to the Project and the EIA process.
Advertisement of the Project and Open House Meeting	The Project was advertised on 21 January 2016 in the local newspaper the Weslander (English) and regional newspaper Die Burger (Afrikaans). See proof of Advertisement in Annex B.
Open House Meeting	An open house meeting was held at Hoedjiesbaai Hotel, Saldanha Bay on 16 February 2016 to present the proposed Project and solicit input from stakeholders into the scoping process. Presentation, attendance registers and meeting notes are included in Annex B.
Development of an Initial Comments and Response Report	All comments received during the initial consultation period and at the open house meeting were recorded in a Comments and Response Report. See included in Annex B.
Post-Application	
Erection of Site Notices	Site notices have been placed at the following locations: • The Saldanha Bay Public Library; • The Saldanha Bay Municipality Office notice board; • At the entrance to the project site.
Release of draft Scoping Report for Public Comment	The draft Scoping Report was released for a 30 day public comment period: 4 March 2016 – 6 April 2016 (including three public holidays). Notifications were sent to all stakeholders on the database and the report was made available online (www.erm.com/saldanhasteel) and in the Saldanha Bay Public Library.
Development of a Comments and Response Report	All comments received during the Scoping consultation period were recorded into a Comment and Response Report. See included in Annex B.
EIA Phase	
Release of draft EIR and EMP for Public Comment	The draft EIR and EMP document will be made available for a 30-day comment period (22 July – 25 August 2016) to stakeholders and the relevant authorities. A notification letter will be sent to all registered I&APs on the project database. This letter will invite I&APs to comment on the draft EIR. Newspaper adverts will be placed in local newspapers notifying stakeholders of the availability of the Draft EIR report for review and inviting them to public meetings. All comments received will be included in the final EIR.

Activity	Description and Purpose
Public Meeting	A public meeting will be held at Hoedjiesbaai Hotel, Saldanha Bay on 11 August 2016 in order to present the EIA findings to stakeholders. **When: 11 August 2016** **Where: Hoedjiesbaai Hotel, 38 Main Rd, Saldanha Bay** **Time: 17:30 (the Project team will be available from 16h00 at the venue)**
Notification of Environmental Authorisation	I&APs will be notified of the Environmental Authorisation and the statutory appeal period. An advertisement will be placed to advertise the Environmental Authorisation.

A summary of the main concerns raised during the public participation to date is provided in *Table 8.2*. Detailed comments and responses is included the Comments and Response Report has been included in *Annex B.*

Table 8.2 Summary of Key Comments raised during the Scoping Phase

Topic	Issue
Air Emissions	Stakeholders noted that the Project will generate dust and exhaust emissions which could be of concern from health and nuisance perspective. It was noted that the Project must comply with the National Dust Control Regulations of 1 November 2013 (GNR No. 827) in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA). It was further noted that the air quality study must identify appropriate management and mitigation measures to address the emission sources from the proposed CCGT plant and traffic.
Noise Emissions	There is a concern that Project will generate noise which may affect surrounding land users. It was noted that noise generated during the construction and operational phases of the development must comply with the Western Cape Noise Control Regulations (Provincial Notice 200/2013) of 20 June 2013.
Impact on Avifauna	There is concern that the Project site lies across one of the main flyways for water birds and migrant waders, travelling between St. Helena Bay/Lower Berg River and Langebaan Lagoon.
Impact on Flora and Flora	Stakeholders raised concerns regarding the potential impact on flora and fauna as some of the site falls within a CBA. It was noted that poor vegetation management and development in the area has put pressure on natural vegetation. Stakeholders requested that this issue be investigated in the botanical study.
Impacts on the Marine Environment	There is a concern that the marine environment is excluded from the scoping report, noting that the Project will increase shipping traffic in the Saldanha Bay marine environment and may impact on marine fauna and flora.

Topic	Issue
Socio-economic Impacts	Stakeholders wanted to know what kind of employment opportunities would be available to locals, and how many employment positions would be available. It was further noted that local employment should be prioritised. It was suggested that a partnership with the municipality should be developed to address possible pressure on the municipal infrastructure, especially basic services.
Water	There is a concern that the Project will increase pressure on stressed water resources within the area. Stakeholders noted that alternative sources of water must be considered.
Cumulative Impacts	Stakeholders pointed out that there are at least two other EIA processes being undertaken for gas turbine power plants within close proximity to the proposed site and that the potential cumulative impacts of the proposed must be assessed.
Traffic	Stakeholders noted that the Project will increase traffic volumes in the area and that a Traffic Study must be included as part of the EIA.

9 EIA METHODOLOGY

9.1 IMPACT ASSESSMENT METHODOLOGY

An EIA methodology should minimise subjectivity as far as possible and accurately assess the Project impacts. In order to achieve this ERM has followed the methodology defined below.

9.1.1 *Impact Identification and Characterisation*

An 'impact' is any change to a resource or receptor caused by the presence of a project component or by a project-related activity. Impacts can be negative or positive. Impacts are described in terms of their characteristics, including the impact's type and the impact's spatial and temporal features (namely extent, duration, scale and frequency). Terms used in this EIA are described in *Table 9.1.*

Table 9.1 Impact Characteristics

Characteristic	Definition	Terms
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect).	**Direct** - Impacts that result from a direct interaction between the Project and a resource/receptor (eg, 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 (eg, 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. Cumulative - Impacts that arise as a result of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect.
Duration	The time period over which a resource / receptor is affected.	**Temporary** - (period of less than 3 years -negligible/ pre-construction/ other). **Short term** - (period of less than 5 years i.e. production ramp up period). **Long term** - (period of more than 5 years and less than 19 years i.e. life of plant). **Permanent** - (a period that exceeds the life of plant – i.e. irreversible.).
Extent	The reach of the impact (i.e. physical distance an	**On-site** - impacts that are limited to the Project site.

	impact will extend to)	**Local** - impacts that are limited to the Project site and adjacent properties. **Regional** - impacts that are experienced at a regional scale. **National** - impacts that are experienced at a national scale. **Trans-boundary/International** - impacts that are experienced outside of South Africa.
Scale	Quantitative measure of the impact (e.g. the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.).	Quantitative measures as applicable for the feature or resources affects. No fixed designations as it is intended to be a numerical value.
Frequency	Measure of the constancy or periodicity of the impact.	No fixed designations; intended to be a numerical value or a qualitative description.

Unplanned events (e.g. incidents, spills) are considered in terms of likelihood (*Table 9.2*). The likelihood of an unplanned event occurring is determined qualitatively, or when data is available, semi-quantitatively. It is also important to distinguish that likelihood is a measure of the degree to which the unplanned event is expected to occur, not the degree to which an impact or effect is expected to occur as a result of the unplanned event.

Table 9.2 Definitions for Likelihood

Likelihood	**Definition**
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).

9.1.2 Determining Impact Magnitude

Once impact's are characterised they are assigned a 'magnitude'. Magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- extent
- duration
- scale
- frequency

Magnitude (from small to large) is a continuum. Evaluation along the continum requires professional judgement and experience. Each impact is evaluated on a case-by-case basis and the rationale for each determination is noted. Magnitude designations for negative effects are: negligible, small, medium and large.

The magnitude designations themselves are universally consistent, but the definition for the designations varies by issue. In the case of a positive impact, no magnitude designation has been assigned as it is considered sufficient for the purpose of the impact assessment to indicate that the Project is expected to result in a positive impact.

Some impacts will result in changes to the environment that may be immeasurable, undetectable or within the range of normal natural variation. Such changes are regarded as having no impact, and characterised as having a negligible magnitude.

In the case of impacts resulting from unplanned events, the same resource/ receptor-specific approach to concluding a magnitude designation is used. The likelihood factor is also considered, together with the other impact characteristics, when assigning a magnitude designation.

Determining Magnitude for Biophysical Impacts

For biophysical impacts, the semi-quantitative definitions for the spatial and temporal dimension of the magnitude of impacts used in this assessment are provided below.

High Magnitude Impact affects an entire area, system (physical), aspect, population or species (biological) and at sufficient magnitude to cause a significant measureable numerical increase in measured concentrations or levels (to be compared with legislated or international limits and standards specific to the receptors) (physical) or a decline in abundance and/ or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations (physical and biological). A high magnitude impact may also adversely affect the integrity of a site, habitat or ecosystem.

Moderate Magnitude Impact affects a portion of an area, system, aspect (physical), population or species (biological) and at sufficient magnitude to cause a measurable numerical increase in measured concentrations or levels (to be compared with legislated or international limits and standards specific to the receptors) (physical) and may bring about a change in abundance and/or distribution over one or more plant/animal generations, but does not threaten the integrity of that population or any population dependent on it (physical and biological). A moderate magnitude impact may also affect the ecological functioning of a site, habitat or ecosystem but without adversely affecting its overall integrity. The area affected may be local or regional.

Low Magnitude Impact affects a specific area, system, aspect (physical), group of localised individuals within a population (biological) and at sufficient magnitude to result in a small increase in measured concentrations or levels (to be compared with legislated or international limits and standards specific to the receptors) (physical) over a short time period (one plant/animal generation or less, but does not affect other trophic levels or the population itself), and localised area.

Determining Magnitude for Socioeconomic Impacts

For socioeconomic impacts, the magnitude considers the perspective of those affected by taking into account the likely perceived importance of the impact, the ability of people to manage and adapt to change and the extent to which a human receptor gains or loses access to, or control over socio-economic resources resulting in a positive or negative effect on their well-being. The quantitative elements are included into the assessment through the designation and consideration of scale and extent of the impact.

9.1.3 Determining Receptor Sensitivity

In addition to characterising the magnitude of impact, the other principal step necessary to assign significance for a given impact is to define the sensitivity of the receptor. There are a range of factors to be taken into account when defining the sensitivity of the receptor, which may be physical, biological, cultural or human. Where the receptor is physical (for example, a water body) its current quality, sensitivity to change, and importance (on a local, national and international scale) are considered. Where the receptor is biological or cultural (i.e. the marine environment or a coral reef), its importance (local, regional, national or international) and sensitivity to the specific type of impact are considered. Where the receptor is human, the vulnerability of the individual, community or wider societal group is considered. As in the case of magnitude, the sensitivity designations themselves are universally consistent, but the definitions for these designations will vary on a resource/receptor basis. The universal sensitivity of receptor is low, medium and high.

For ecological impacts, sensitivity is assigned as low, medium or high based on the conservation importance of habitats and species. For the sensitivity of individual species, *Table 9.3* presents the criteria for deciding on the value or sensitivity of individual species.

For socio-economic impacts, the degree of sensitivity of a receptor is defined as the level of resilience (or capacity to cope) with sudden social and economic changes. *Table 9.3* and *Table 9.4* present the criteria for deciding on the value or sensitivity of biological and socioeconomic receptors.

Table 9.3 Biological and Species Value / Sensitivity Criteria

Value / Sensitivity	**Low**	**Medium**	**High**
Criteria	Not protected or listed as common / abundant; or not critical to other ecosystem functions (e.g. key prey species to other species).	Not protected or listed but may be a species common globally but rare in South Africa with little resilience to ecosystem changes, important to ecosystem functions, or one under threat or population decline.	Specifically protected under South African legislation and/or international conventions e.g. CITIES Listed as rare, threatened or endangered e.g. IUCN

Note: The above criteria should be applied with a degree of caution. Seasonal variations and species lifecycle stage should be taken into account when considering species sensitivity. For example, a population might be deemed as more sensitive during the breeding/spawning and nursery periods. This table uses listing of species (e.g. IUCN) or protection as an indication of the level of threat that this species experiences within the broader ecosystem (global, regional, local). This is used to provide a judgement of the importance of affecting this species in the context of project-level changes.

Table 9.4 Socio-economic Sensitivity Criteria

Sensitivity	**Low**	**Medium**	**High**
Criteria	Those affected are able to adapt with relative ease and maintain pre-impact status.	Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.	Those affected will not be able to adapt to changes and continue to maintain-pre impact status.

9.1.4 Assessing Significance

Once magnitude of impact and sensitivity of a receptor have been characterised, the significance can be determined for each impact. The impact significance rating will be determined, using the matrix provided in *Figure 9.1.*

Figure 9.1 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

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity/vulnerability/ importance designations that enter into the matrix. *Box 9.1* provides a context for what the various impact significance ratings signify.

Box 9.1 Context of Impact Significances

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. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.

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. An aim of IA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

9.1.5 Mitigation Potential and Residual Impacts

A key objective of an EIA is to identify and define socially, environmentally and technically acceptable and cost effective measures to manage and mitigate potential impacts. Mitigation measures are developed to avoid, reduce, remedy or compensate for potential negative impacts, and to enhance potential environmental and social benefits.

The approach taken to defining mitigation measures is based on a typical hierarchy of decisions and measures, as described in *Table 9.5.* The priority is to first apply mitigation measures to the source of the impact (i.e. to avoid or reduce the magnitude of the impact from the associated Project activity), and then to address the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e. to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude).

Once mitigation measures are declared, the next step in the impact assessment process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the assumed implementation of the additional declared mitigation measures. The approach taken to defining mitigation measures is based on a typical hierarchy of decisions and measures, as described in *Table 9.5*.

Table 9.5 Mitigation Hierarchy

Avoid at Source; Reduce at Source: avoiding or reducing at source through the design of the Project (e.g. avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity).
Abate on Site: add something to the design to abate the impact (e.g. pollution control equipment).
Abate at Receptor: if an impact cannot be abated on-site then control measures can be implemented off-site (e.g. traffic measures).
Repair or Remedy*:* some impacts involve unavoidable damage to a resource (e.g. material storage areas) and these impacts require repair, restoration and reinstatement measures.
Compensate in Kind; Compensate Through Other Means where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g. financial compensation for degrading agricultural land and impacting crop yields).

9.1.6 Residual Impact Assessment

Once mitigation measures are declared, the next step in the impact assessment process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the assumed implementation of the additional declared mitigation measures.

9.1.7 Cumulative Impacts

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 (eg already in existence, approved or proposed) and how much data is available to characterise the magnitude of their impacts.

The approach to assessing cumulative impacts is to screen potential interactions with other projects on the basis of:

- projects that are already in existence and are operating;
- projects that are approved but not as yet built or operating; and
- projects that are a realistic proposition but are not yet built.

9.1.8 Specialist Methodologies

Specialist Study methodologies are included in *Annex D*.

10 ASSESSMENT OF POTENTIAL IMPACTS

10.1 INTRODUCTION

This Chapter identifies and evaluates the actual and potential environmental consequences of the proposed activity. Furthermore, the potential for mitigation of negative impacts and enhancement of positive impacts are described.

Impacts have been assessed based on the methodology provided in Chapter 4. Specialist study methodologies are provided in each study in *Annex D*.

10.2 SUMMARY OF IMPACTS TO BE ASSESSED

10.2.1 *Bio-physical and Socio-economic Impacts Identified*

The following impacts were identified in the Scoping Report as potentially significant:

Risk/Impact Grouping	**Potential Impacts**
Physical Presence and Footprint	• Site clearance for the construction of the power plant and pipeline servitude in green-field areas will result in removal of vegetation and habitat, thus resulting in an impact on terrestrial fauna. • Impact that the presence of the power plant and pipeline may have on terrestrial flora and fauna, cultural heritage and visual and landscape character.
Air Emissions	• Dust from site clearance and construction activities. • Emissions from the combustion of fuel in the power plant. • Engine emissions from construction and operational traffic. • Emissions of air pollutants from gas venting during commissioning, maintenance shutdowns and from process vents.
Noise	• Noise from construction of power plant and pipeline may have an impact on sensitive receptors. • Noise from power plant operation may have an impact on sensitive receptors. • Noise and vibration from construction and operation traffic along main transport/access routes.
Waste and Wastewater Management	• Non-hazardous and hazardous wastes will be generated that will require to be transported and disposed of in a manner protective of the natural and human environment. • Improper storage, handling and transport of solid and liquid wastes at the power plant can lead to loss of containment and spillages which could give rise to soil and ground water contamination.

Risk/Impact Grouping	Potential Impacts
Socioeconomic	*Community Health Safety and Security* • Equipment and activities will create noise and vibration and changes to air quality during construction, operations and demolition that could impact human health; • Movement of materials and workers during construction, operation and demolition could impact public safety; and • The presence of workers and opportunistic workers in the Project area could result in a change in the disease profile of the local population, communicable diseases and sexually transmitted infections.
	Worker Health & Safety • Hazardous construction, operational or decommissioning activities could impact worker health and safety; and • Handling of hazardous materials could impact worker health and safety.
	Local Community Demographics • Influx of workers from outside of the local Project area will result in a change in demographics of the local communities; and • The presence of a construction workforce hosted within the Project area will result in temporary changes to demographics.
	Local and Macro Economy • Procurement of goods and services required by the Project during construction, operation and decommissioning of the Project may enhance the local economy both directly and indirectly; and • The presence of construction, operation and decommissioning workers in the Project area may enhance the local economy through their purchase of local goods and services.
	Traffic • Transport of equipment and machinery (i.e. gas turbines) during the construction phase may impact on local traffic patterns; • Transportation of waste from the site and materials and equipment to the site during operation may impact on local traffic patterns; and • Decommissioning activities could also impact local traffic conditions.
	Cultural/Heritage Resources • Construction activities could have an impact on local cultural sites (paleontological); and • The presence of workers in the Project area and the transportation of materials and equipment to the construction sites may impact on cultural areas.
Non-Routine Discharges (accidental and emergency events)	• Leaks or accidental releases of diesel or chemicals during construction and operation activities could impact on soil and groundwater. • Accidental release of natural gas could be a risk to surrounding receptors.

Risk/Impact Grouping	Potential Impacts
Cumulative Impacts	A cumulative impact is defined as an impact that results from incremental changes caused by other past, present or reasonably foreseeable actions together with the Project. The cumulative impact assessment will consider the impact of the Project along with the impacts of other industrial developments in the area that may also impact on the same receptors and resources. The following cumulative impacts may result from the proposed development: • Air; • Noise; • Biodiversity; • Socio-economic effects; • Infrastructure and services; and • Traffic.

10.2.2 *Bio-physical and Socio-economic Impacts Investigated*

Further to the commencement of the impact assessment and the commissioning of specialist work, the following impacts have been identified as being of negligible significance and as a result have been screened out of the impact assessment. A description of these and reasons for their screening out is provided below and mitigation measures for the management of these are included in the EMPr:

- Waste management during all phases of the Project;
- Surface, groundwater and soil contamination;
- Cumulative impact on biodiversity;
- Cumulative impact on noise;
- Cumulative impact on traffic.

Waste

Waste from the Project may arise from a range of sources during the Project life including the following:

- excavated material (e.g. rock, sand, vegetation);
- construction activities (rubble, packaging, etc.);
- fuel spills and the clean-up thereof;
- used generator and turbine lube oil (collected in a tank on site and then removed off-site in drums for controlled disposal);
- occasional oily sludge recovered from on-site collected road surface or hard-standing surface water treatment;
- spent gas turbine fabric air filter cartridges;
- spent gas turbine lube-oil filter cartridges;
- dried powdered sludge from sewerage treatment;
- dried sludge from brown water (ablutions and canteen washing detergent) treatment;
- spent office consumables (paper, printer cartridges etc.);

- organic waste food from canteen operations;
- organic cooking oil waste from canteen operations;
- glass waste and metal can waste from canteen operations;
- scrap steel and copper from irreparable mechanical equipment;
- scrap plastics from equipment packaging;
- occasional medical waste from on-site clinic;
- dry solids (mineral salts) recovered from the zero-discharge reverse osmosis process;
- spent resins from water demineralisation;
- waste solvents and grease from workshop equipment cleaning operations; and
- spent laboratory chemicals from water testing and water treatment (each product neutralised, (if acidic), separately hermetically packed, and labelled for disposal).

No waste material will remain on site or be disposed of or released to the environment as part of the Project activities. All wastes will be handled, stored and transported in accordance with the relevant legislation.

Measures for the minimisation and management of wastes have been included in the EMPr.

Surface, groundwater and soil contamination

Effective stormwater management on site during all phases of the Project will minimise the risk of surface and groundwater resources as well as soil contamination. Specifically during operation, all stormwater on site will be channelled towards storage tanks. A conceptual stormwater management plan is provided in the EMPr. Procedures for handling contaminated soils, which may result during the construction phase of the Project, is also detailed therein.

Cumulative impact on biodiversity

The impact on biodiversity has been minimised as far as possible for the Project in the early stages of Project design, by avoiding sensitive areas. Impacts on biodiversity are therefore anticipated to be of low significance after these design modifications and the Project will not contribute to cumulative impacts on biodiversity in the area.

Measures to minimise the impact on biodiversity as a result of this Project specifically are included in the EMPr.

Cumulative impact on noise

The Project is located far from sensitive receptors and noise modelling has indicated that there will be negligible impact on these receptors. As such, it is envisaged that the Project will not be contributing to cumulative noise impacts in the area.

Measures to minimise the impact on noise as a result of this Project specifically are included in the EMPr.

Cumulative impact on traffic

There are a number of background projects planned within the Saldanha Bay IDZ and Vredenburg Industrial Development which will increase the traffic in the study area. The anticipated increases are off a low base and hence it is unlikely that the combined effect will create further impacts to the key intersections within the study area. This is especially in light of the Project's proposed introduction of turning lanes at the two access points to the site.

Geotechnical

The Department of Environmental Affairs (DEA) raised comment regarding the need to assess geotechnical aspects associated with the Project. The consideration of geotechnical aspects is not an environmental or social impact assessment consideration, but a design engineering consideration. As a result geotechnical impacts have been scoped out of the impact assessment.

According to SANS code 10160-4 (Basis of Structural Design and Actions for Buildings and Industrial Structures – Part 4: Seismic Actions and General Requirements for Buildings) the project site is located with a Zone where natural seismic activity can occur. The detailed engineering design should therefore also consider seismic loading factors as part of the design.

A design level geotechnical investigation will be considered prior to finalising the detailed design. The scope of such a study would include but not be limited to:

- Soil sampling and geological core logging;
- Soil bearing capacity tests;
- Settlement analysis; and
- Laboratory testing.

The findings of the geotechnical study will be provided to the civil engineering design team who would then consider excavation methods and foundation design according to best practice. The present design has assumed that piling would be required under the foundations of heavy static and rotational loads as well as large tank foundations. Non-concrete vibro compaction will be considered rather than invasive drilling and concrete column piling.

Existing pipelines and industrial facilities (such as the Saldanha Steel Mill opposite the proposed Project site) in the area covering the same geological terrain indicates that engineering design can overcome any potential geotechnical constraints and that the area is suitable for development. The excavatability for the trenches is also not expected to be a problem because of the presence of existing underground pipelines. Test pit investigations along the proposed pipeline would determine the excavatability in detail.

Specialist studies undertaken as part of this EIA

Specialist input was obtained for the assessment of the following impacts:

- Air Quality;
- Climate Change;
- Noise;
- Flora
- Fauna;
- Avifauna;
- Traffic;
- Socio-economic;
- Heritage; and
- Risk Assessment.

10.3 *AIR QUALITY*

Relevant legislation and guidelines

The national ambient air quality standard (NAAQS) ((DEA, 2013a)) consists of a limit value and a permitted frequency of exceedance for an array of potential pollutants. 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 relevant to the Project are sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$) and benzene, as shown in *Table 10.1*.

Table 10.1 NAAQS for SO2, NO2, CO, O3, benzene and PM10 (DEA, 2009) and PM2.5 (DEA, 2012)

Pollutant	**Averaging period**	**Limit value ($\mu g/m^3$)**	**Tolerance**
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
		25	4
	1 year	25	0
		20	0
		15	0
Benzene	1 year	5	0

Table 10.2 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

<u>Baseline conditions</u>

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.

The effect of these emissions on ambient air quality is determined through ambient air quality monitoring. Despite the number of sources of air pollution in Saldanha Bay, ambient monitoring data from the Saldanha Bay Municipality (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.

Without any major coal burning facilities in the area, the ambient hourly SO_2 concentrations are very low relative to the NAAQS of 350 µg/m^3 (*Table 10.1*), with hourly average concentrations consistently below 5 µg/m^3. Hourly ambient NO_2 concentrations are also very low relative to the NAAQS of 200 µg/m^3 (*Table 10.1*), with hourly average concentrations consistently below 10 µg/m^3.

Daily average PM_{10} concentrations are also relatively low compared to NAAQS of 75 µg/m^3, ranging between 22 and 30 µg/m^3. The maximum 24-hour average PM_{10} concentration of 69 µg/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 µg/m^3. Typically hourly O_3 concentrations range between 20 and 30 µg/m^3.

10.3.2 *Decreased Ambient Air Quality during the Construction and Decommissioning Phases of the Project*

Impact Description

Most construction and decommissioning activities generate dust. 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.

Impact Assessment

Air quality impacts during construction and decommissioning are predicted to be of *local* extent for all pollutants since these pollutants are released close to ground level, which limits their dispersion and the potential impacts, as described above.

The scale of the impact has been rated as Low as in the case of dust, SO_2, NO_2, PM_{10}, CO and benzene, impacts are expected to be within the site and ambient concentrations are expected to be well below the respective NAAQS.

Air quality sensitive receptors include, but are not limited to, schools, churches, residences, apartments, hospitals, day care facilities, elderly care facilities and nursing homes. These land uses do not occur in the area affected by the Project and as a result the receptor sensitivity on site is rated as 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. This impact is considered to be irreversible. See *Box 10.1.*

Proposed Mitigation

The following mitigation is proposed to minimise the impact:

- Covering of vehicle loads;
- Loading and unloading materials in wind-sheltered areas;
- Speed restrictions on site;
- Revegetation as soon as possible;
- Spraying of roads to minimise dust;
- Maintenance of vehicles and equipment.

Box 10.1 ***Decrease in ambient air quality during the during the Construction and Decommissioning Phases of the Project***

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low

Impact Magnitude: Low

- **Extent:** Local
- **Duration:** Short term
- **Scale:** Low
- **Frequency:** Rare
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): NEGLIGIBLE.
IMPACT SIGNIFICANCE (POST-MITIGATION): Mitigation measures will maintain the impact as **NEGLIGIBLE**

10.3.3 Decreased Ambient Air Quality during the Operational Phase of the Project

Impact Description

Emissions of air pollutants from the ArcelorMittal CCGT power plant will result during operations through the combustion of LNG resulting in NO_X, CO and CO_2 emissions and some methane (CH_4) [(1)]. NOx and CO have been modelled as part of the air quality study and detailed in this impact assessment. Carbon dioxide (CO_2) and methane (CH_4) are emitted when LNG is combusted, but these are greenhouse gases and consideration of their effects is addressed under the contribution of the Project to climate change, which is detailed as a separate impact, see *Section 10.4*.

NO_2 emissions

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 were determined by dispersion modelling and are presented in *Table 10.3*.

With regard to NO_2, ambient concentrations 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

(1) There is virtually no sulphur in LNG and therefore emissions of SO_2 have not been considered.

the atmosphere. Comparing the predicted concentrations of NO_2 to the NAAQS is therefore somewhat conservative.

Table 10.3 ***Annual average NO_2 concentration and the 99th percentile of the predicted 1-hour concentration at the points of predicted maximum ground-level concentration in µg/m3***

Averaging period	**Operational Phase**
Annual	1.1
1-hour	40.7

Predicted annual average NO_2 concentrations during the operational phase of the Project are shown as isopleths in *Figure 10.1* and compared to the NAAQS of 40 µg/m^3. The 99th percentile of the predicted 1-hour NO_2 concentrations are also presented as isopleths in *Figure 10.2* and compared with the NAAQS of 200 µg/m^3. No exceedences are observed.

The predicted annual average NO_2 concentrations are well below the NAAQS. The NO_2 concentrations predicted are a maximum concentration of 1.1 µg/m^3. The maximum concentrations occur just to the north of the facility.

The 99th percentile of the predicted 1-hour NO_2 concentrations during operation are lower with a predicted maximum concentration of 2.1 µg/m^3, which does not exceed the NAAQS. The predicted maximum concentration of 2.1 µg/m^3 occurs close to the proposed site. No exceedences are observed.

Figure 10.1 ***Annual average NO_2***

Figure 10.2 1-hour NO2

CO emissions

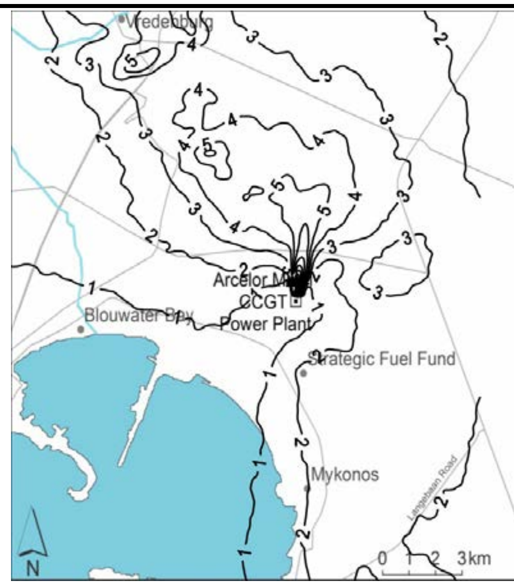
Predicted annual average and maximum 8-hour CO concentrations resulting from LNG combustion is very low and several orders of magnitude below the respective NAAQS. The concentrations at the points of predicted highest ground-level concentration are presented in *Table 10.4*. No exceedences are observed.

Table 10.4 Maximum predicted CO concentrations in µg/m3

Averaging period	Operational phase
8-hour	6.1
1-hour	12.0

Figure 10.3 Predicted 8-hour average CO concentrations (µg/m3) resulting from emissions from ArcelorMittal CCGT power plant (operation)

Figure 10.4 99th percentile of the predicted 1-hour CO concentrations (µg/m3) resulting from emissions from ArcelorMittal CCGT power plant (operation)



Impact Assessment

The impacts are predicted to be of local extent for all pollutants.

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 pollutants the predicted ambient concentrations are well below the respective NAAQS and the scale of the impact is scored low.

The sensitivity of receptors is rated as low as detailed for the construction phase impacts above.

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. No exceedances of the NAAQS are expected. This impact is considered to be irreversible.

Proposed Mitigation

The following mitigation measures are proposed:

- Development and implementation of servicing programmes for all operational components of the facility.
- Stocking of critical components to ensure the availability of spares in the event of mechanical faults.

Box 10.2 Decreased ambient air quality during the Operational Phase of the Project

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low

Impact Magnitude: Low

- **Extent:** Local
- **Duration:** Long term
- **Scale:** Low
- **Frequency:** Rare
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): MINOR
IMPACT SIGNIFICANCE (POST-MITIGATION): MINOR

10.3.4 Residual Impacts

A summary of the impact of noise levels during the construction and operation phases of the Project is provided in *Box 10.1* and *Box 10.2*.

Table 10.5 Pre- and Post- Mitigation Significance for Air Quality

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Decreased ambient air quality	Construction	Negligible	Negligible
Decreased ambient air quality	Operation	Minor	Minor

10.4 *CLIMATE CHANGE*

In the context of climate change impacts associated with GHG emissions from the Project, extent, duration, and frequency are the same irrespective of the Project context and the scale of its GHG emissions, and therefore do not form a good basis on which to assess the significance of the impacts associated with GHG emissions. Specifically, the extent of GHG (climate change) impacts is global, the duration of the impact is permanent (CO_2 has a residence time in the atmosphere of approximately 100 years), and the frequency of the impact is constant since GHG emissions will be produced throughout the lifetime of the plant.

As such, GHG impact significance is determined on the basis of the assessment of the scale of the GHG emissions from the power plant using benchmarks from international lender standards, further informed by reference benchmarks on the GHG intensity of electricity production for similar facilities and according to the grid emissions factor in South Africa, as well as an analysis of the Project's alignment with South Africa's energy and climate change policies.

Table 10.6 summarises the Project's estimated annual GHG emissions during Operations (Phase 1 and 2). Emissions associated with the construction and eventual decommissioning of the Project are excluded from the assessment, since these are likely to be insignificant in the context of the Project's operational emissions arising from the combustion of LNG for power generation.

Total estimated annual emissions for the first phase of the Project (210 MW), assuming 8 400 operating hours per year, are 920 712 t CO_2e (0.92 Mt t CO_2e). For the second Phase (1 317 MW), annual emissions are estimated to be 3 677 050 t CO_2e (3.68 Mt t CO_2e). Cumulatively, after the completion of Phase 2, total annual emissions from both Phases (i.e. with five Trent60s and three SGT6-4000F turbines running concurrently) are estimated to be 4 597 761 t CO_2e. Assuming the same load factor and operating patterns, and not factoring in a decrease in thermal efficiency over time, total (cumulative) estimated emissions over the 30 year lifetime of the 1 507 MW (1) plant are in the range of 138 Mt CO_2e.

(1)Note that the total capacity according to the 210 MW (Phase 1) + 1 317.3 MW (Phase 2) is 1 527.3 MW. The slight discrepancy between this figure and the 1 507 MW mentioned for the whole plant is due to the estimated parasitic loads of the plant. This value will be confirmed upon final selection of the power plant equipment, and this report refers to an overall capacity of 1 507 MW.

Table 10.6 ***Estimated GHG emissions arising from the operation of the Power Plant***

Operational activity	**Estimated Annual Emissions in Phase 1 (210 MW) (t CO_2e)**	**Estimated Annual Emissions in Phase 2 (1 317 MW) (t CO_2e)**	**Estimated Annual Emissions Phase 1 + 2 (1 507 MW) t CO_2e)**	**Data Source, Notes and Assumptions**
Natural gas combustion for power production	920 633	3 676 971	4 597 604	Natural gas combustion volumes estimated based on: 16 327 920 GJ per year (Phase 1) and 65 213 074 GJ per year (Phase 2) (Engineer calculation); Lower Heating Value (LHV) for natural gas of 35 924 kJ / Nm^3 (1); and natural gas emissions factor of 2.0255 kg CO_2 / m^3 (ERM calculation based on API Compendium methodology) (API, 2009)
Propane combustion in Gensets for back-up power	79	79	158	Estimated annual propane consumption based on one black start event every 5 years, assuming: average site load 2.5 MW; 220 kg propane per MWh generated; and 10 days' outage per event (Source: Response to ERM GHG data request by PowerConsult (2). Applies IPCC 2006 Net calorific values (47.3 MJ / kg), carbon content (17.2 kg C / GJ, and CH_4 (0.001 kg CH_4 / GJ) and N_2O (0.0001 kg N_2O / GJ) emissions factors for Propane (IPCC, 2006a; IPCC, 2006b).
Total	**920 712**	**3 677 050**	**4 597 761**	

Table 10.7 illustrates the thermal efficiency of the plant, and the emissions intensity of grid electricity generated (using annual estimated emissions above and annual estimated generated electricity in MWh).

Table 10.7 ***Saldanha Gas-Fired Power Plant GHG emissions intensity and thermal efficiency***

	Phase 1 (210 MW)	**Phase 2 (1 317 MW)**	**Phase 1 + 2 (1 507 MW)**	**Data Source, Notes and Assumptions**
Total estimated annual emissions (t CO2e)	920 712	3 677 050	4 597 761	Estimated total annual GHG emissions from the plant (calculations in *Table 10.6*)
Total annual electricity generation (MWh)	1 802 598	11 065 320	12 867 918	Plant net power (214.6 MW Phase 1 + 1 317.3 MW Phase 2) * 8 400 (annual operating hours)

(1) Response from PowerConsult to ERM on ERM's GHG Data Request – 26 June 2016.
(2) Email to ERM from Adrian Venzo, PowerConsult, 28 June 2016

	Phase 1 (210 MW)	Phase 2 (1 317 MW)	Phase 1 + 2 (1 507 MW)	Data Source, Notes and Assumptions
Electricity emissions intensity (t CO_2e / MWh, or kg CO_2e / kWh)	**0.51**	**0.33**	**0.36**	Total annual emissions divided by total annual electricity output
Thermal efficiency	**39.93**	**58.30**	**56.51**	Thermal efficiency for Phase 1 and 2 using lower heating values (LHV) (Source: Response to ERM GHG data request) [1]

It should be noted that the GHG intensity factor, 0.36 t CO_2e per MWh for Phase 1 and 2 combined, reflects the emissions intensity of electricity generated by the plant for distribution. The total MWh output used to calculate the emissions intensity excludes auxiliary power consumption by the plant, and excludes losses from transmission and distribution.

Finally, it is important to note that two of the Project's objectives relate to 'Education' and 'Demonstrating Technology', and that the Project plans to install 400 kW of renewable energy – namely solar PV – which will be used to provide stand-by emergency DC power and will power various features and activities including the main building LED lighting as well as the security lighting. The use of renewable (low carbon) energy to power these auxiliary processes will help to further reduce the emissions intensity of the plant.

Impact Description

The Project will result in an increase in Greenhouse Gas Emissions during the operational phase of the project and for the life of the operation.

Impact Assessment

Contribution of the Project to South Africa's national GHG inventory

Table 10.8 illustrates the magnitude of the Project's emissions relative to South Africa's national GHG emissions.

Table 10.8 Estimated GHG Emissions from the 1 507 MW Gas-Fired Power Plant Relative to Projected GHG Emissions for South Africa

Year	Estimated annual emissions – South Africa (t CO_2e)– PPD Lower Range	Estimated annual emissions – South Africa (t CO_2e)– PPD Upper Range	Estimated annual emissions – Saldana Gas-Fired 1 507 MW Project (t CO_2e)*	Saldana Gas-Fired 1 507 MW Project % contribution to South Africa's projected national GHG emissions (as a % of upper and lower Range PPD trajectory)
2020*	398 000 000	583 000 000	4 597 761	0.8 – 1.2%
2025	398 000 000	614 000 000	4 597 761	0.7 – 1.2%
2030	398 000 000	614 000 000	4 597 761	0.7 – 1.2%

(1) Response to ERM's information request from PowerConsult, 23 June 2016

Year	Estimated annual emissions – South Africa ($t\ CO_2e$)– PPD Lower Range	Estimated annual emissions – South Africa ($t\ CO_2e$)– PPD Upper Range	Estimated annual emissions – Saldana Gas-Fired 1 507 MW Project ($t\ CO_2e$)*	Saldana Gas-Fired 1 507 MW Project % contribution to South Africa's projected national GHG emissions (as a % of upper and lower Range PPD trajectory)
2035	398 000 000	614 000 000	4 597 761	0.7 – 1.2%
2040	336 000 000	552 000 000	4 597 761	0.8 – 1.4%
2045	274 000 000	490 000 000	4 597 761	0.9 – 1.7%
2050	212 000 000	428 000 000	4 597 761	1.1 – 1.2%

* Assumes Phase 2 will have commenced operations by 2020
Source: DEA (2011) and DEA (2014a) (estimated annual emissions for South Africa using lower and upper ranges of PPD). A linear decline to INDC targets by 2050 from 2035 levels is assumed.

As illustrated above, the Project's GHG emissions are estimated to comprise 0.8 – 1.2% of South Africa's national emissions in 2020, rising to 1.1 – 1.2% in 2050.

Scale of the Project's Emissions relative to GHG Magnitude Scale from Wider Standards

Various international lender organisations including the IFC, EBRD and EP, give guidance on the scale of a Project's GHG emissions based on thresholds of annual emissions that trigger requirements for quantifying, reporting and mitigating Project GHG emissions. The magnitude scale derived from these organisations is illustrated in *Table 10.9*.

Table 10.9 Magnitude scale for project-wide GHG emissions based on wider standards

Project-Wide GHG Emissions / annum	Magnitude Rating
>1 000 000 tonnes CO_2e	Very Large
100 000 – 1 000 000 tonnes CO_2e	Large
25 000 – 100 000 tonnes CO_2e	Medium
5 000 – 25 000 tonnes CO_2e	Small
<5 000 tonnes CO_2e	Negligible

Based on the magnitude scale above, and considering the estimated annual GHG emissions from the final 1 307 MW Project (4 597 761 $t\ CO_2e$), the magnitude of the project's GHG impact is considered to be **Very Large**. It should be noted that, in the absence of abatement technologies such as Carbon capture and storage (CCS) (which has historically almost exclusively been applied to coal – rather than gas - fired power plants), most if not all fossil-fuel based power plants will fall into this category by nature of their significant GHG emissions.

Benchmarking performance against other gas-fired power plants

The Project's estimated emissions intensity and stated thermal efficiency are compared to benchmarks for alternative gas-fired power plant technologies in *Table 10.10* below.

Table 10.10 Benchmarking emissions intensity and thermal efficiency of the Project against alternative gas-fired power plant technologies

Coal-fired power plant name / technology	**Thermal efficiency (LHV, net)**	**CO_2e intensity factor (LHV, net)**	**Reference**
The Project	39.93% (Phase 1); 58.30% (Phase 2); 56.51% (combined)	0.51 kg CO_2e / kWh (Phase 1); 0.33 kg CO_2e / kWh (Phase 2); 0.36 kg CO_2e / kWh (combined)	ERM calculations – see *Table 10.7*
Open cycle gas turbine (OCGT)	30 – 40%	0.48 – 0.58 kg CO_2e / kWh	IEA ETSAP (2010), C2ES (n.d.), IPIECA (n.d.)
Closed cycle gas turbine (CCGT)	50 – 60%	0.34 – 0.40 kg CO_2e / kWh	IEA ETSAP (2010), C2ES (n.d.), IPIECA (n.d.)
CCGT with Carbon capture & storage (CCS)*	Reduction of 7-8%	0.04 kg CO_2e / kWh	IEA GHG (2012)

* Based on a techno-economic study on CO_2 capture at natural gas fired power plants modelled using plant simulation software. Reflects results for post-combustion capture technologies.

The results from the benchmarking assessment highlight the following key messages:

- Thermal efficiency for Phase 1 (comprising six Siemens Trent60, OCGT plants) is reported to be 39.93% (net), and the emissions intensity is estimated to be 0.51 tCO_2e/MWh. This is within the expected range and is at the higher end of what can be expected (i.e. the proposed plant has relatively high thermal efficiency and low GHG intensity) for OCGT technologies;

- Thermal efficiency for Phase 2 (comprising three Siemens SGT5-4000F CCGT plants) is reported to be 58.30% (net), and emissions intensity is estimated to be 0.33 tCO_2e/MWh. This is on the higher end of what can be expected for CCGT technologies (i.e. relatively high thermal efficiency and low GHG intensity), and represents a significant improvement on Phase 1 from a GHG emissions perspective; and

- There is the potential for CCS to reduce the GHG intensity of fossil fuelled power plants significantly, though with a penalty on thermal efficiency which decreases due to the additional auxiliary power required for the carbon capture technologies. However, as noted, CCS technologies have to date almost exclusively been applied at coal-fired power plants, and the technology has not yet been demonstrated in South Africa, so this is not at present considered to be a viable option for the Saldanha Steel gas-fired power plant.

Implications of the Project on the South African grid emissions factor

The GHG intensity factor for the plant is estimated to be **0.51 t CO_2e / MWh** in Phase 1 and **0.33 t CO_2e / MWh** in Phase 2, based on total estimated annual GHG emissions and total electricity generated and sent to the grid (i.e. excluding plant auxiliary consumption and any losses from transmission and distribution). For Phase 1 and 2 combined, based on total estimated annual GHG emissions and total electricity generated, the emissions intensity is estimated to be **0.36 t CO_2e / MWh.**

By comparison, the emissions intensity of the electricity generated by Eskom (representing 95% of electricity generated and distributed in the South African electrical grid), for the period 1 April 2014 to 31 March 2015, as published by Eskom, was **1.01 t CO_2e / MWh** (further discussion in the specialist study in *Annex D*). This factor is based on total GHG emissions from Eskom facilities (noting that 90% of Eskom's power in 2014-15 was generated from coal and the remaining 10% from low-carbon energy sources), and total electricity generated and sent to the grid, excluding Eskom (auxiliary) consumption and excluding transmission and distribution losses.

The above analysis suggests that the emissions intensity of the electricity generated by the Project represents a significant improvement relative to the current grid emissions factor for South Africa. It also represents an improvement relative to the emissions intensity of Eskom's gas power plants, which have historically run on liquid fuels (diesel and kerosene), and which in 2011 were reported to have an average intensity of **0.82 t CO_2e / MWh.**

Alignment with South Africa's climate change policy and international GHG mitigation commitments

There is a clear mandate from the DoE for the procurement of additional capacity from gas-fired power plants, and whilst there is some uncertainty as to the level of electricity generation that will come from coal post-2030 and how this aligns to the longer-term Peak, Plateau and Decline (PPD) trajectory for national GHG emissions, the introduction of new gas-based power will help to bring about the transition to a lower carbon energy mix required in order to meet the country's climate change commitments.

Project GHG impact significance rating

The above analysis shows that the magnitude of the Project's GHG emissions, estimated to be 4 597 761 t CO_2e annually during operations on completion of Phase 2, is '**Very Large**', as per the benchmarks from international lender standards which apply the highest rating ('Very Large') to projects emitting >1 000 000 t CO_2e per annum. Relating this to the impact significance scale being used for the project, this translates to an overall significance rating of **High (Negative)**. As noted, in the absence of abatement technologies such as CCS, most (if not all) coal and gas power plants will fall into this category by nature of their significant GHG emissions.

Whilst the Project's GHG emissions and therefore climate change impacts are significant, these findings should be considered in the context of the following positive impacts associated with the Project in relation to efficiency and impact on the South African average grid factor:

- The power plant (notably Phase 2 which uses combined cycle technologies) has a high thermal efficiency (Phase 2: 39.93%; Phase 2: 58.3%) and low emissions intensity (Phase 1: 0.51 t CO_2e / MWh; Phase 2: 0.33 t CO_2e / MWh) both in terms of what is achievable for gas-fired power plants, and also when compared to coal-fired power plants (1); and

- The emissions intensity of electricity generated by the power plant (0.51 t CO_2e / MWh in Phase 1 and 0.33 t CO_2e / MWh in Phase 2, or 0.36 t CO_2e / MWh for Phases 1 + 2 combined) is a significant improvement on the average emissions intensity of Eskom's plants of 1.01 t CO_2e / MWh. With electricity generated in Phase 2 likely to feed into the national grid, this Project will therefore help to contribute to a reduction in the average grid emissions intensity.

Finally, it is also important to note that the Project is being developed in line with South Africa's energy policy, which (through the IRP 2010-2030) seeks to increase installed capacity in order to meet increasing demands on the grid, and which (through the GUMP and the Gas to Power IPP Programme) seeks to initiate the development of South Africa's gas economy.

Proposed mitigation

The following specific emissions management measures are suggested:

- It is important that the plant's thermal efficiency is being maximised throughout the life of the plant in order to reduce the gas consumption and therefore GHG emissions per unit of electricity (i.e. kWh or MWh) generated. The plant should seek to identify specific measures that can be implemented in order to maximise thermal efficiency and therefore minimise GHG intensity over time. This will need to be based on a plant specific assessment informed by the operations and maintenance (O&M) requirements for the equipment in question, and assessments should be carried out upon final selection of the equipment and, subsequent to the commencement of operations, periodically.

- Whilst noting that, at present, the assumption is for the plant to operate for 8 400 hours per year (96% load factor) throughout its lifetime, it will be important to manage any changes to operating philosophy should these arise for example as a result of changes in grid dispatch rules (this will mainly be applicable to the three Siemens SGT5-4000F turbines in Phase 2

(1) For comparative purposes, coal-fired power plants have thermal efficiencies in the range of 30 – 38 % (subcritical plants) or 38 – 45 % (plants using supercritical steam technologies), and corresponding emissions intensities of > 0.88 t CO2e / MWh (subcritical plants), or 0.67 – 0.88 t CO2e / MWh (supercritical plants). Source: IEA (2012a), IEA (2012b), and Michener (2012).

which are likely to feed electricity into the grid). Whilst noting that any reduction in the operating time or load factor (i.e. annual power generation in MWh) is likely to result in decreased total annual emissions from the plant, such changes to cycling philosophies could have an adverse impact on thermal efficiency and GHG intensity per MWh generated as a result of increased start-ups and wear and tear on the plant. As such, the potential impact of any future changes in operating philosophy should be investigated and managed for example through upgrades to plant hardware and modifications to operating practices, as applicable.

- The Project documents note the potential for converting at least two of the 42 MW Trent60 OCGTs in Phase 1 to combined cycle at a later stage for improved efficiency [(1)]. Whilst noting that the technological and economic feasibility of such a change will need to be assessed when that time comes, it is recommended that the option to make such a change is reviewed periodically and implemented when possible, and on as many of the six Trent60 turbines as is feasible. This will allow the Project to benefit from the much improved efficiencies and reduced emissions associated with the use of combined cycle technologies, and will improve the GHG profile of the plant.

- The development and implementation of a GHG management plan is critical if GHG emissions from the plant are to be managed over time. Since GHG emissions are primarily driven by the fuel consumption at the plant and are closely linked to the plant's heat rate and thermal efficiency, this can take the form of a combined thermal efficiency and GHG management plan. Key elements of a thermal efficiency / GHG management plan include:

    - Development of an overarching policy statement indicating the Plant's commitments with respect to minimising GHG emissions and implementing actions to ensure optimum emissions management;
    - Measuring GHG emissions on an annual basis [(2)], which will require data on:
        - the total amount of gas consumed, its chemical properties and GHG emissions factor; and the consumption of any other fuels such as LPG for the black starts; and
        - Plant heat rate / thermal efficiency should be closely monitored over time as this is closely correlated to the GHG intensity of the plant.
    - Setting short, medium and long-term targets relating to maximising and maintaining heat rate / thermal efficiency and GHG intensity

(1) Updated Information for EIA Input and Consideration: 1 500 MW Saldanha Gas-to-Power Project. PowerConsult. 12 June 2016

(2) For example, IFC Performance Standard 3 requires that 'For projects which are expected to or currently produce more than 25 000 tonnes of CO_2e-equivalent annually'… 'Quantification of GHG emissions will be conducted by the client annually in accordance with internationally recognized methodologies and good practice'

(t CO_2e per MWh generated) over time, against which performance can be assessed;
  - Tracking South Africa's evolving GHG and energy related regulations, including the implications / requirements for the Plant of the proposed carbon tax, GHG reporting regulations, and energy reporting regulations, all of which are currently in draft form but likely to be finalised in 2016 or 2017;
  - Identifying and implementing heat rate improvement / GHG reduction projects, based on any deviations from expected heat rate and knowledge of required maintenance or upgrades. Internal and external energy audits should be used to help identify opportunities for performance improvement, and a business case can be developed for each area of opportunity to help prioritise projects. More significant projects can be implemented during the major maintenance overhauls as scheduled by the Plant;
  - Allocating responsibility to key individuals such that someone (or a team of individuals) is responsible and accountable for managing and reporting on the GHG performance of the plant;
  - Communicating the Plan, including its key objective and any actions being taken, to staff working at the plant to ensure buy-in;
  - Encouraging employee participation in the GHG management plan, including contribution of ideas relating to opportunities for improvement; and
  - Reporting progress over time with respect to annual gas consumption and GHG emissions, GHG reductions / heat rate improvements achieved, and progress against targets set.

The Department of Energy (DoE) is currently developing an Energy Efficient Monitoring System (EEMS) to track the efficient consumption of energy within South Africa and the trends involved. The DoE will need reliable data from all legal entities operating in the most intensive sectors of the economy and they have set certain thresholds, that if exceeded will require certain steps to be taken:

  - Companies using 400 terajoules or more per annum will be required to submit a detailed energy management plan; and
  - The energy management plan must include an energy baseline determined in accordance with SANS 50001, as well as areas of energy efficiency savings potential and energy performance indicators. Additionally, it will be required to submit a list of technically and financially viable measures that can be put in place to meet the savings potential

- The Project plans to make use of solar PV energy to meet some of the plant's auxiliary load requirements. As a low or 'no' carbon form of energy, solar PV provides a means of reducing the emissions intensity of the plant and of the electricity it produces. Renewable energy can play a key role in the site's GHG emissions management plan and further opportunities to install more renewable capacity on-site should be investigated going forwards.

10.5 *INCREASED NOISE LEVELS*

Relevant legislation and guidelines

In South Africa, the guideline for environmental noise is SANS 10103:2008. It defines land use districts and acceptable sound levels for day and night time noise.

Figure 10.5 Acceptable Sound Levels for Noise in Districts (SANS 10103:2008)

1	2	3	4	5	6	7
Type of district	Equivalent continuous rating level ($L_{Req,T}$) for noise dBA					
	Outdoors			Indoors, with open windows		
	Day/night $L_{R,dn}$ [a]	Daytime $L_{Req,d}$ [b]	Night-time $L_{Req,n}$ [b]	Day/night $L_{R,dn}$ [a]	Daytime $L_{Req,d}$ [b]	Night-time $L_{Req,n}$ [b]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

SANS 10103:2008 also provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise. If Δ is the increase in sound level, the following criteria are of relevance:

- **Δ ≤ 3 dBA:** An increase of 3 dBA or less will not cause any response from a community. It should be noted that for a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level would not be noticeable.

- **3 < Δ ≤ 5 dBA:** An increase of between 3 dBA and 5 dBA will elicit 'little' community response with 'sporadic complaints'. People will just be able to notice a change in the sound character in the area.

- **5 < Δ ≤ 15 dBA:** An increase of between 5 dBA and 15 dBA will elicit a 'medium' community response with 'widespread complaints'. In addition, an increase of 10 dBA is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 15 dBA the community reaction will be 'strong' with 'threats of community action'.

Note that an increase of more than 7 dBA is defined as a disturbing noise and prohibited (National and Provincial Noise Control Regulations).

International guidelines have also been considered in this impact assessment. The International IFC (Equator Principle) General EHS Guidelines for Residential; Institutional and Educational receptor types stipulates ambient noise levels as:

- Use of LReq,D of 55 dBA during the daytimes; and
- Use of LReq,N of 45 dBA during the night-times.

Baseline conditions

The area to the south, west and north of the proposed Project site is used for industrial purposes, with ambient sound levels west and north reflecting this industrial use.

The closest potential noise-sensitive receptors are located more than 2,000 m to the south-east. See *Figure 10.6*.

The following measurements have been recorded at sites in close proximity to the Project site, see *Table 10.11* and then through single measurements in the Project area, *Table 10.12.* Measurement locations are shown in *Figure 10.6*.

Table 10.11 Ambient Sound Level Measurements

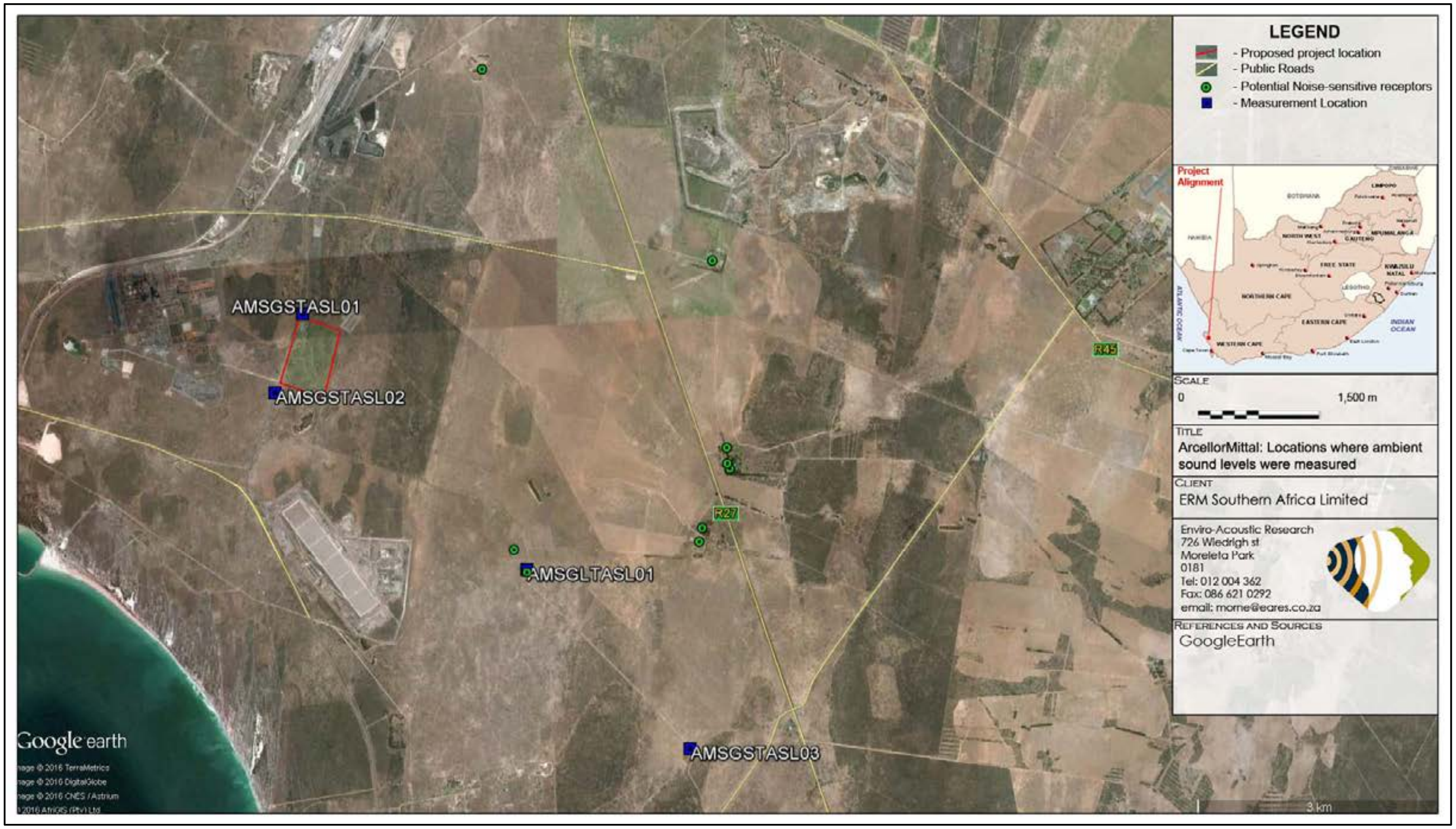
Measurement	Day time	Night time
$L_{Aeq,10min}$ values	37 to 77 dBA	40 to 55 dBA
$L_{Aeq,I}$ arithmetic mean	49 dBA	47 dBA
$L_{Aeq,I,}$ equivalent sound levels	61 dBA	47-49 dBA
$L_{Aeq,10min,f}$	35to 74 dBA	38 to 54 dBA
$L_{Aeq,f}$ arithmetic mean	47 dBA	46 dBA
$L_{Aeq,f,}$ equivalent sound levels	55, 58 and 48 dBA	48 and 46 dBA
L_{FA90}	26 to 54 dBA90	23 to 50 dBA
L_{FA90} average	37 dBA	35 dBA
LIAeq - LFAeq average difference	2.6 dBA	1.3 dBA

Table 10.12 Results of single measurements of ambient sound levels

Measurement location	$L_{Aeq,i}$ level (dBA)	$L_{Aeq,f}$ level (dBA)	L_{A90} Level (dBA90)
AMSGSTASL01 Daytime	76	73	52
	76	73	50
AMSGSTASL01 Night-time	51	47	45
	52	48	45
AMSGSTASL02 Daytime	75	72	51
	75	72	51
AMSGSTASL02 Night-time	49	46	45
	51	47	46
AMSGSTASL03 Daytime	49	47	39
	47	45	37

AMSGSTASL03	37	29	24
Night-time	32	24	20

Figure 10.6 Locations where ambient sound levels were measured



Given the ambient noise level measurements, the SANS 10103:2008 rating levels typical of a Rural Noise District have been considered for the noise impact assessment for this Project:

- Rating Level during the day (LReq,D) of 45 dBA; and
- Rating Level during the night (LReq,N) of 35 dBA.

10.5.2 *Increased Noise Levels during the Construction Period*

Impact Description

Noise levels are expected to increase as a result of construction activities on site. These activities include:

- Numerous road trucks that deliver various construction equipment;
- Earthworks using a combination of one or more graders, bulldozers, excavators and front-end-loaders for the clearing of vegetation, the levelling of the ground surface as well as developing access roads;
- The development of laydown areas for equipment and material;
- Dump or road trucks to deliver road building material as well as equipment used in road construction (grader, vibratory steel drum roller, bitumen sprayer, paver, roller and water truck);
- The use of one or more backhoe-loaders for the digging of trenches, foundations and assist in the installation of security fencing;
- Piling activities if required;
- The development of onsite batching plants or the delivery of ready-mix concrete using trucks, formwork, rebar construction and the pouring of concrete;
- Construction of buildings and installation of power generation structures and components (road trucks, cranes, welding, various impulsive sounds); and
- Cleaning of site, loading and removal of unused construction equipment.

Construction activities are highly variable, taking place at different locations, using various equipment, each piece of equipment operating under a different load. As a result, noises generated during the construction phase are highly variable and cannot be defined. The approach taken in this assessment is to assume a number of construction activities at numerous locations using various equipment, all operating at full load.

The location of activities that are likely to generate noise during the construction phase of the Project can be seen in *Figure 10.7*.

Impact Assessment

The anticipated ambient noise levels during the construction phase of the Project have been modelled using a sound propagation model. This has been presented in this report for the night-time noise impact only given that noise generated during the day by construction activities may be masked by other noises from a variety of sources surrounding potentially noise-sensitive developments. The night-time noise impact has therefore been used as the worst case scenario. It should be noted however that construction during the night is not anticipated and working hours are likely to be 6am until 6pm. The results thereof can be seen in *Figure 10.8*.

It is anticipated that the change in ambient noise levels will be negligible. Ambient noise levels are not expected to exceed the 35 dBA guideline at any of the identified receptors, although the construction phase sound levels may impact on the ambient noise levels for an area of 2 500 m from the proposed activity. This impact is considered to be irreversible.

Proposed Mitigation

Based on the modelling of the worst case scenario no mitigation measures are required.

Box 10.3 Increase in Ambient Noise Levels during the Construction Phase (Night time)

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium to High

Impact Magnitude: Small

- **Extent:** Local
- **Duration:** Short term
- **Scale:** Low
- **Frequency:** Constant
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): NEGLIGIBLE
IMPACT SIGNIFICANCE (POST-MITIGATION): NEGLIGIBLE. NO MITIGATION REQUIRED

Figure 10.7 Location of activities that are likely to generate noise

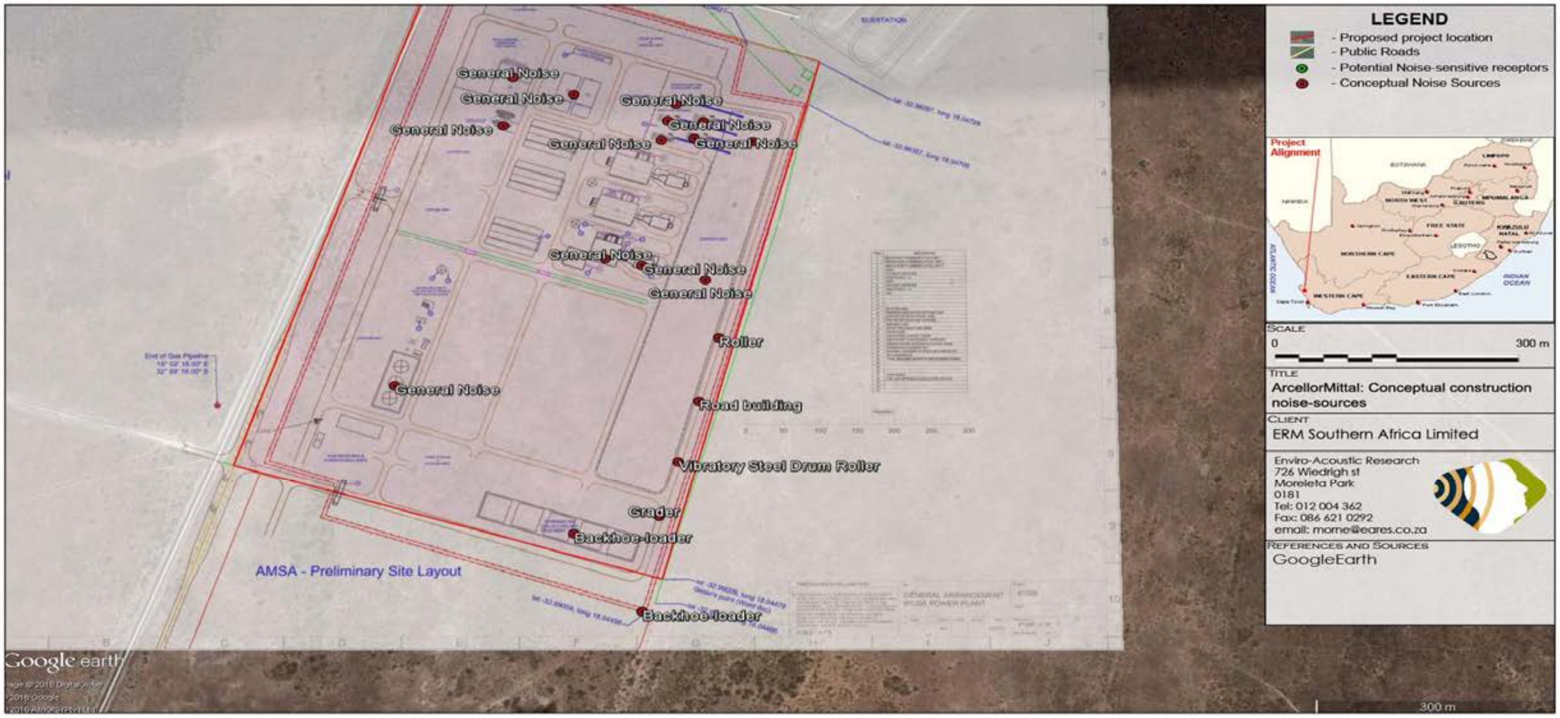
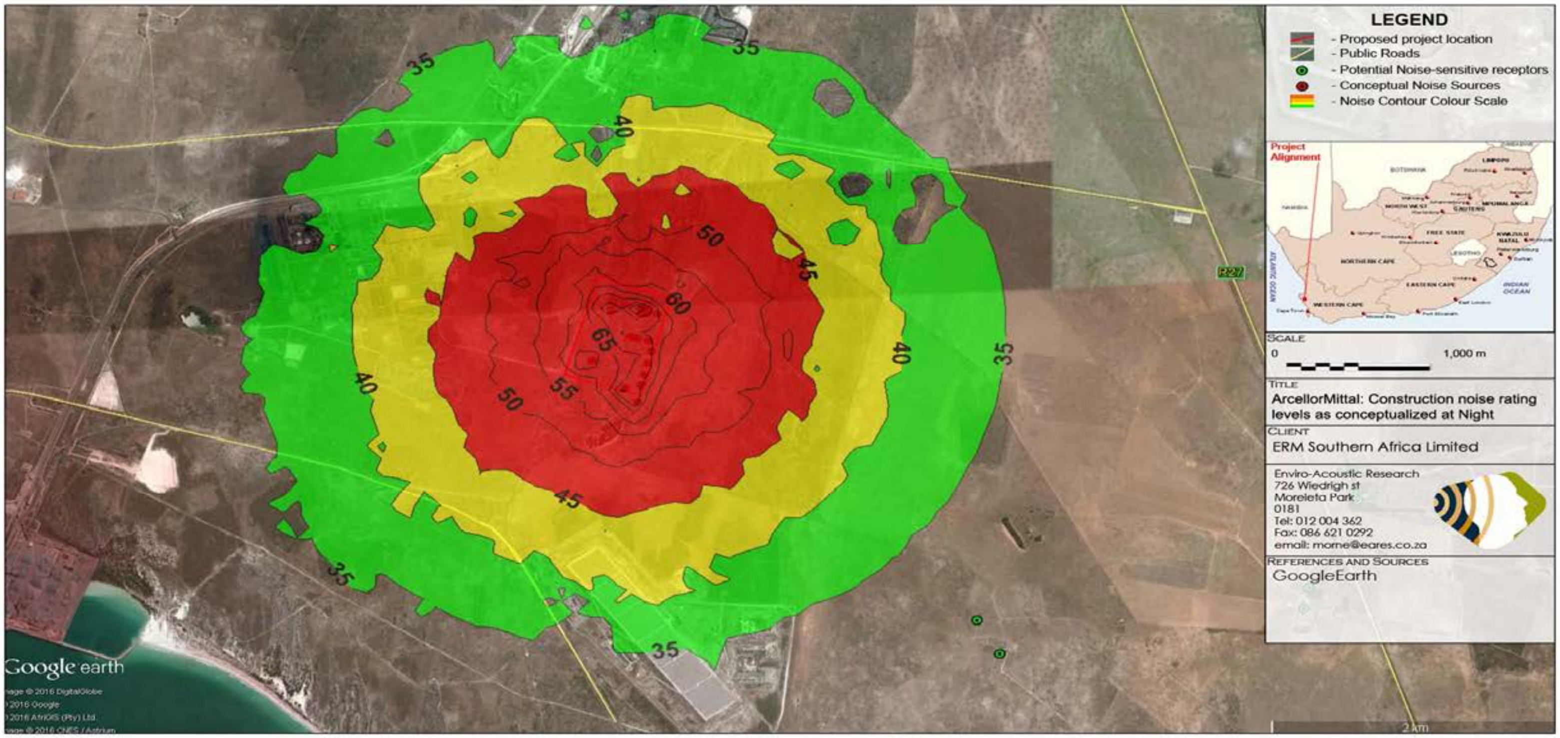


Figure 10.8 Contours of Noise Rating Levels for night-time construction activities



10.5.3 *Increased Noise Levels during the Operational Phase*

Impact Description

The operational phase of the Project will be undertaken over two phases and two different power generating regimes could be adopted depending on the supply agreement that is signed with Eskom.

The two development phases are: Phase 1 - the initial period to provide power to meet the demand for ArcelorMittal Saldanha Steel via an open cycle process; and Phase 2 - the second phase to supply additional power to feed other consumers via a combined cycle process. Both Phases will produce a mix of base load and peaking power.

Phase 1: Five Siemens Trent 60 50 MW open cycle gas turbines and ancillary equipment for peak power generation (six will be constructed with one turbine as backup).

Phase 2: Three complete Siemens SGT5-4000F combined cycle power plants and ancillary equipment (gas turbines, heat recovery boilers, steam turbines, steam turbine condensers).

Both of these have been assessed for the operational phase impact and the following noise sources have been identified:

- The air intake fans;
- Fans located on the air and steam condensers;
- Gas turbine, steam turbine and generator (normally within building);
- Ventilation fans located on the turbine generator building; and
- Exhaust and flue stacks.

These sources can be seen in *Figure 10.9*.

Figure 10.9 Conceptual Noise Sources – Operational Phase

Noise will also be generated during the start-up and commissioning phase of the power plant, as follows:

- Hot commissioning and clean-out of the heat recovery boiler hot–path exchanger bundles and the super-heater piping using high pressure, high temperature steam in order to clean the pipe internals of all welding debris and mill scale. The high pressure steam would be vented to atmosphere, generating high noise levels for around 2 - 4 hours per day over 2 – 4 days.

- Hot commissioning of steam piping running from heat recovery steam generation (HRSG) to steam turbines, during 'blow-out' operations to clean the pipe internals of all debris and mill scale. High pressure steam will be blown through the live steam line and vented to atmosphere. This process could last for 3 – 4 hours per day for up to 2 – 4 days.

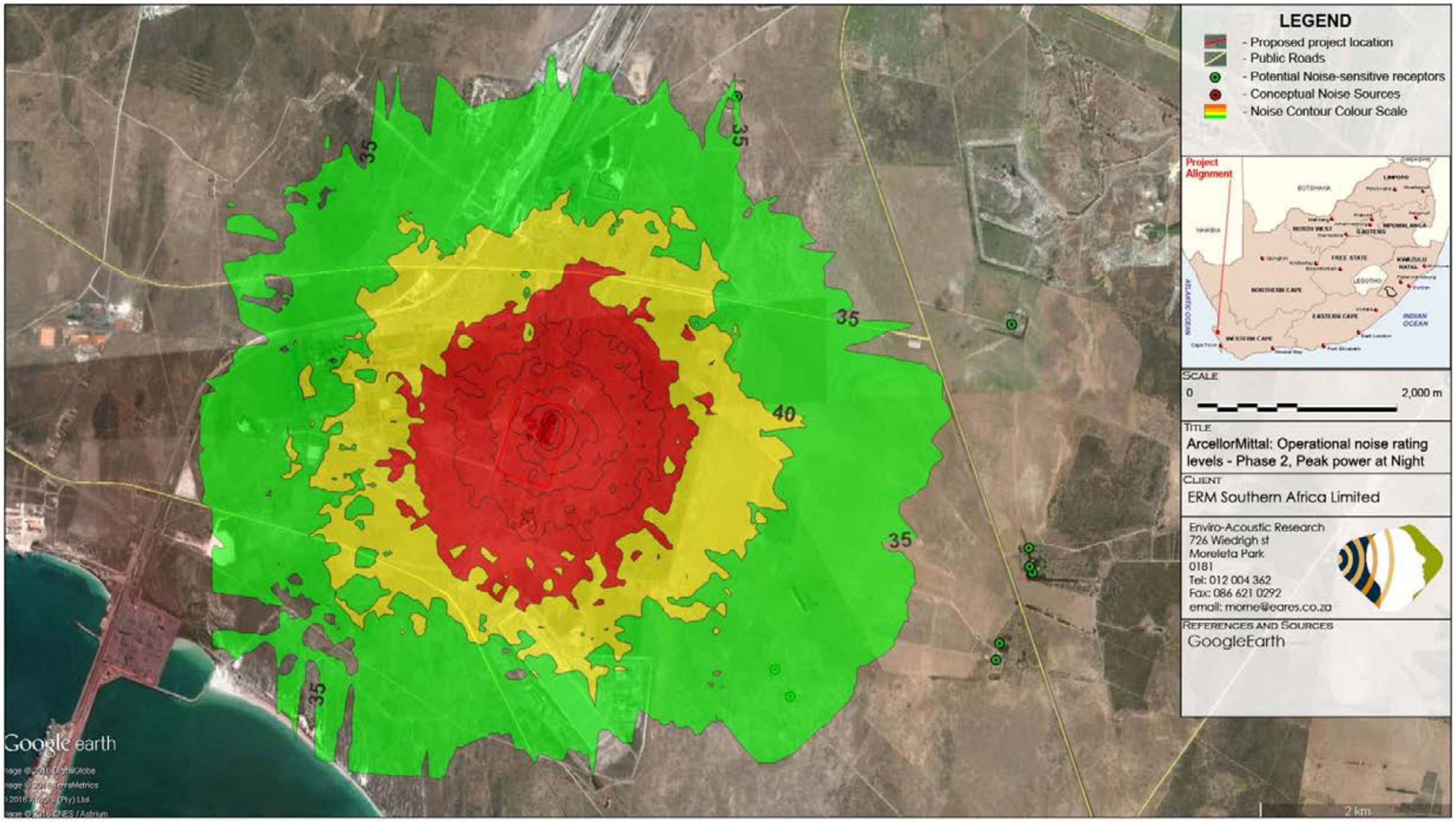
- Testing of high pressure steam safety valves during commissioning could generate a sound pressure level of 160 dBA. This state would be sustained intermittently only for a few minutes at a time over a one hour period at most.

These can be considered temporary noises, and excluding the testing of the safety valves, the noise levels are similar to the noises modelled for the operational phase of the Project. Noises from the testing of the safety valves will be high, but very temporary and the testing will be taking place during the day, when noises are of lower concern than noises at night.

Impact Assessment

The anticipated ambient noise levels during the operation phase of the Project have been modelled using a sound propagation model. This has been presented in this report for the night-time noise impact only given that daytime levels are anticipated to be lower and noise generated during the day by the power plant may be masked by other noises from a variety of sources surrounding potentially noise-sensitive developments. The worst case scenario in terms of noise generation during the operational phase has also been modelled, namely that of peaking power production throughout the night. The results thereof can be seen in *Figure 10.10*.

Figure 10.10 Contours of Noise Rating Levels for night-time operational activities (peaking power)



It is anticipated that the change in ambient noise levels will be negligible during Phase 1 of the Project and low during Phase 2, with the 35 dBA ambient guideline being slightly exceeded (by less than 3 dBA) at two sensitive receptors. Operational phase sound levels may impact on the ambient noise levels for an area of 3 000 m from the Project site. This impact is considered to be irreversible.

Proposed Mitigation

Given that the impact is anticipated to be Minor, monitoring is proposed if there are noise complaints or if people in the future settle closer than 2,000 m from the power plant.

Box 10.4 Increase in ambient noise levels during the Operation Phase (Night time)

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium to High

Impact Magnitude: Small

- **Extent:** Local
- **Duration:** Long term
- **Scale:** Low
- **Frequency:** Constant
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): MINOR
IMPACT SIGNIFICANCE (POST-MITIGATION): MINOR

10.5.4 *Increased Noise Levels during Decommissioning Phase*

Decommissioning starts when power generation stops, signalling the beginning of the dismantling of the equipment. Activities that can take place include:

- Dismantling of all equipment;
- Removal of all remaining redundant infrastructure (buildings and structures, dams, workshop, access roads, possibly the offices and other buildings, etc.);
- Removal of any contaminated soil;
- The rehabilitation of disturbed areas including the necessary ripping of compacted soils and the shaping of rehabilitated areas to ensure free drainage;
- Seeding of disturbed areas (if necessary to re-establish vegetation); and
- Monitoring and maintenance of the rehabilitated areas.
- Final decommissioning activities will have a noise impact lower than either the construction or operational phases. This is because decommissioning and closure activities normally take place during the day using minimal equipment (due to the decreased urgency of the Project). While there may be various activities, there is a very small risk for a noise impact.

10.5.5 *Residual impacts*

A summary of the impact of noise levels during the construction and operation phases of the Project is provided in *Table 10.13*.

Table 10.13 Pre- and Post- Mitigation Significance for Noise

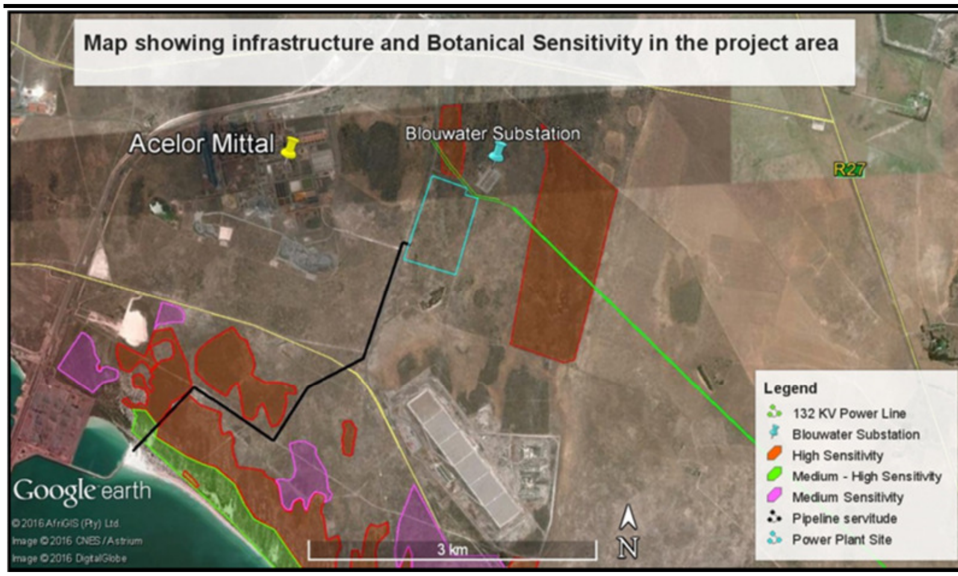
Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Increase in ambient noise levels	Construction	Negligible	Negligible
Increase in ambient noise levels	Operation	Minor	Minor

10.6 *IMPACT ON FLORA*

The study area is within the planning domain of the Saldanha Fine Scale Conservation Plan (Pence 2008). This important reference indicates that the majority of the Project area is a terrestrial Critical Biodiversity Area (CBA). Critical Biodiversity Areas are regarded as essential areas for the achievement of regional conservation targets, and are designed to ensure minimum land take for maximum result (Maree & Vromans 2010). It should be noted that the CBA mapping process in this area unfortunately suffered from a lack of groundtruthing and misinterpretation of the satellite imagery, and is therefore not considered particularly accurate or useful for planning purposes, and was in fact redone by Helme (2011) for the IDZ feasibility project. All ecological assessments in this area should thus be based on detailed groundtruthing, as has been the case for the current study.

Figure 10.11 summarises the conclusions of the baseline floral studies by identifying and describing areas of botanical conservation value.

Figure 10.11 *Areas of Botanical Conservation Value*



- Areas of high sensitivity in the Project area are associated with:
    - Relatively intact examples of the locally restricted vegetation type Saldanha Limestone Strandveld (Helme & Koopman (2007)) found south of the coast road to Saldanha. These areas are considered ecologically irreplaceable, on account of the presence of relatively intact examples (with both high species diversity and high structural heterogeneity) of the Saldanha Limestone Strandveld, and due to the presence of regionally endemic plant Species of Conservation Concern (SCC). Conservation of such areas would contribute significantly to species and/or ecological process targets for the region, and should be considered No Go areas for development. Saldanha Limestone Strandveld habitat surrounds the pipeline footprint which has been specifically aligned to avoid these areas.

- Areas of medium-high sensitivity are associated with:
    - The Spreeuwal dune area. This area is largely pristine, apart from some alien plant invasion, and has high plant diversity and a high level of structural (growth form) diversity. It does not support many known populations of plant SCC. The pipeline will partially fall within this dune area.

- Areas of medium sensitivity are associated with:
    - Areas of Saldanha Limestone Strandveld that has been partly disturbed, but rehabilitated naturally to some degree. Populations of plant SCC may be present, although in limited numbers. These areas have been avoided in the placement of all project infrastructure.
- Areas of low sensitivity are associated with:
    - Areas that have been cultivated or ripped, have little botanical diversity or significant populations of plant SCC. The power plant site is characterised as being of low sensitivity.

10.6.1 Loss/Disturbance of Flora during the Construction Phase

Impact Description

Flora may be impacted in the following ways during the construction phase of the Project:

- Clearing of the vegetation on the proposed power plant site (50 ha);
- Clearance of a 36 m wide servitude for the pipeline, for a distance of 4 km; and
- Potential introduction of alien invasive vegetation.

Impact Assessment

Up to 50 ha of degraded but partly natural vegetation will be permanently lost within the power plant site, all of it during the construction phase of the Project. No plant SCC are known to occur in this area, and the vegetation in the area is deemed to be of Low sensitivity. The magnitude of the impact is likely to be Low – Moderate as a result. The loss of flora in the plant footprint area during the construction phase cannot easily be mitigated (irreversible).

Although only 4 km long the disturbance corridor of the pipeline will be up to 36 m in width in most areas. For about 80 percent of the route this passes through Low sensitivity habitat where this will have only a Low negative impact. In about 800 m (20 percent) of the route the corridor passes through High or Medium – High sensitivity habitat, where a number of plant SCC may be present. The magnitude of the impact in this more sensitive area is **Moderate**, and most of the impact should be of a long term nature (5-19 yrs) rather than a permanent impact, as the corridor should rehabilitate naturally over this period (partially reversible). However, disturbance favours certain species, and the more sensitive ones are unlikely to return to the disturbed habitat. See *Box 10.5*.

Proposed Mitigation

The following measures are proposed to minimise the impact:

- It is recommended that the pipeline construction corridor in the area within and between the High and Medium – High sensitivity areas should be minimised and kept as narrow as possible, and should ideally be less than 25 m wide in this area, or 30 m at most. The approved development footprint in this area must be surveyed and clearly demarcated with wire or coloured rope, and strung with warning signs, prior to any construction.
- Carrying out a search and rescue programme from the Medium – High and High sensitivity areas prior to construction, and use of these plants in the active rehabilitation of the disturbed corridor, will help speed up habitat recovery.

Box 10.5 Loss/Disturbance of Flora during the Construction Phase

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low to Medium

Impact Magnitude: Low to Moderate

- **Extent:** Local
- **Duration:** Long term to Permanent
- **Scale:** Low to Moderate
- **Frequency:** Once-off
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): MINOR TO MODERATE
IMPACT SIGNIFICANCE (POST-MITIGATION): Mitigation measures will reduce the impact to **MINOR**

10.6.2 Disturbance of Flora during Operation

Impact Description

Flora may be impacted in the following ways during the operation phase of the Project:

- Potential introduction and spread of alien invasive vegetation; and
- Disturbance of ecological connectivity.

Impact Assessment

Operational phase botanical impacts of this Project are likely to be of very minor significance. The primary operational phase impact is loss of ecological connectivity, related mainly to the 50 ha power plant site. A secondary operational phase impact could be the proliferation of invasive alien plants in the pipeline route and around the power plant, facilitated by the soil disturbance during construction.

The loss of ecological connectivity in the power plant area is likely to be of Low negative botanical significance, as the site does not break a key ecological corridor, with adequate natural or partly natural areas still surrounding the site. The pipeline will not have any significant negative impacts on botanical connectivity.

The alien invasive plant issue is one that can be successfully mitigated, by means of ongoing alien invasive plant management around the power plant, and in the servitude. After mitigation this could be reduced to a Very Low negative level in all areas assessed. See *Box 10.6.*

Impacts on flora during operation as a result of the proposed power plant are considered to be irreversible as construction phase activities would have impacted on connectivity and no rehabilitation of the site is proposed until post closure of the facility. For the pipeline, the impact is considered to be partially reversible.

Proposed Mitigation

The following measures are proposed to minimise the impact:

- Rehabilitation of pipeline corridor with rescued material and additional species brought in; and
- ongoing alien invasive plant removal within all corridors and on site.

Box 10.6 Disturbance of Flora during the Operation Phase

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low to Medium

Impact Magnitude: Very low to Low

- **Extent:** Local
- **Duration:** Long term to Permanent
- **Scale:** Low to Moderate
- **Frequency:** Ongoing
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): NEGLIGIBLE TO MINOR
IMPACT SIGNIFICANCE (POST-MITIGATION): Mitigation measures will reduce the impact to **NEGLIGIBLE TO MINOR**

10.6.3 Floral Impacts during the Decommissioning Phase

No further floral impacts are anticipated on the power plant site as a result of decommissioning activities. Should the pipelines be removed during the decommissioning phase, the floral impacts along the pipeline route would mirror that of the construction phase.

10.6.4 *Residual Impacts*

A summary of the impacts on flora during the construction and operation phases of the Project are presented below.

Table 10.14 Pre- and Post- Mitigation Significance for the Disturbance/Destruction of Flora

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Destruction/disturbance of flora	Construction	Minor to Moderate	Minor
Disturbance of flora	Operation	Negligible to Minor	Negligible to Minor

10.7 IMPACT ON FAUNA

The sensitivity map for the proposed power plant site and pipeline corridor is depicted *Figure 10.12*. The gas pipeline follows an existing road for the large part, which means its impact is fairly low. The area towards the coast is deemed to have the highest sensitivity on account of the better condition of the vegetation and sensitivity of the habitat within this area, but the extent of sensitive dune area on the existing proposed route is low, and the remaining habitat is historically overgrazed and fairly degraded in places. The natural but highly disturbed and transformed vegetation of the power plant is considered low sensitivity, given the low cover and low diversity.

Baseline conditions in the Project area can be summarised as follows:

- Although there are potentially 52 different terrestrial mammals in the area, there has been significant transformation and a lower number are likely to be present.
- Habitat variety is limited and there are no wetlands or rocky outcrops present.
- The following mammals were observed during the site visit: Cape Golden Mole, Cape Dune Mole Rat, Cape Porcupine, Bush Vlei Rat, Cape Gerbil, Cape Grey Mongoose, Bat-Eared Fox, Four-striped Grass Mouse and Steenbok.
- The majority of mammals are smaller mammals and tolerant of habitat fragmentation.
- Two listed species occur at the site namely the White-tailed Mouse *Mystromys albicaudatus* (EN) and Honey Badger *Mellivora capensis* (EN). Given the power station site is previously transformed, there is a lack of cover and adequate food resources for the Honey Badger. The White-tailed Mouse is potentially present with a low likelihood, given the low vegetation cover. The small footprint of the pipeline is not likely to have a high impact on mammal fauna.
- According to the SARCA database, 45 reptiles have been recorded in the area, which corresponds well with distribution records from the literature

As with mammals, a large proportion of these are not likely to occur at the site on account of a lack of suitable habitat and in particular the lack of any rocky outcrops.

- Species observed during the site visit include Cape Skink *Mabuya capensis* and Angulate Tortoise *Chersina angulata*, which was observed to be abundant at the site. The Cape Girdled Lizard *Cordylus cordylus* and the Brown House Snake were also observed at the site.
- Of concern is the fact that five listed species are known from the area including the Large-scaled Girdled Lizard *Cordylus macropholis*, Black Girdled Lizard *Cordylus niger*, Gronovi's Dwarf Burrowing Skink *Scelotes gronovii*, Kasner's Dwarf Burrowing Skink *Scelotes kasneri* and Bloubergstrand Dwarf Burrowing Skink *Scelotes montispectus*, all of which are listed as Near Threatened. The majority of these are however not likely to occur at the site as they are associated with coastal dunes and in the case of the Large-scaled Girdled Lizard the strand line. Although there are still some dunes remaining within the proposed pipeline corridor, the extent of the impact of the pipeline on this habitat is likely to be low, especially if the alignment can be placed within existing disturbance footprints. The Black Girdled Lizard is restricted to two isolated populations, one on the Cape Peninsula and the other on coastal rocks around Saldanha. Given the localised distribution of this species impact on it would be undesirable, but as there were no rocky outcrops within the site, it is not likely that this species occurs at the site or would be impacted by the development.
- The site lies within or near the range of 8 amphibian species, which along with the general lack of water or wetlands at the site suggests that frog diversity is likely to be fairly low. The only listed species which may occur at the site is the Cape Caco *Cacosternum capense*, which is restricted to low lying flat or gently undulating areas with poorly drained clay or loamy soils. Given the sandy soils at the site and the lack of suitable pans for breeding, it is not likely that this species occurs at the site.
- Species which are likely to occur at the site are likely to those less dependent on perennial water including the Cape Sand Toad *Vandijkophrynus angusticeps*, Sand Rain Frog *Breviceps rosei rosei* and Cape Sand Frog *Tomopterna delalandii*.

Figure 10.12   Areas of Faunal Sensitivity

10.7.1 *Loss of Faunal Habitat during the Construction and Decommissioning Phases*

Impact Description

Some loss of vegetation is an inevitable consequence of the development. As a result some habitat will no longer be available for use as a result of transformation or the presence of permanent infrastructure. This potentially includes the habitat for 5 red-listed reptiles, two red data-listed mammals and one listed amphibian.

This impact is likely to be very low for the operational phase of the Project given that no additional habitat will be lost. This impact has therefore only been assessed for the construction and decommissioning phases.

Impact Assessment

The extent of the habitat is likely to be low as the footprint will be onsite and limited in extent.

The impact will be medium to long term in duration as the disturbed areas will take time to recover and/or this will only take place during project decommissioning.

The scale is rated as Low to Moderate as the extent of sensitive dune area on the existing proposed route is low and the remaining habitat is historically overgrazed and fairly degraded in places. Faunal habitat diversity to low. The sensitivity of the fauna environment is considered Low to High, given that this entails red-listed species.

The impact is considered irreversible.

Proposed Mitigation

The following measures are proposed to minimise the impact:

- Demarcate all areas to be cleared with construction tape or similar material.
- ECO to provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially in the vicinity of sensitive features.
- All vehicles to remain on demarcated roads and no driving in the veld should be allowed except where necessary along the power line/pipeline route during construction when all vehicles should follow the same track.
- No fuelwood collection on site.
- No fires should be allowed on-site.
- Sensitive habitat features should be avoided.

Box 10.7 *Faunal habitat loss during the Construction and Decommissioning Phases*

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low for power plant; High for pipeline

Impact Magnitude: Low

- **Extent:** on-site
- **Duration:** Long term to Permanent
- **Scale:** Low to moderate
- **Frequency:** Once-off
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE
IMPACT SIGNIFICANCE (POST-MITIGATION): Mitigation measures will reduce the impact to **MINOR**

10.7.2 Direct Faunal Impacts during the Construction and Decommissioning Phases

Impact Description

Smaller fauna such as many reptiles would either seek shelter or not be able to move away from construction activity sufficiently quickly during construction and would be killed by vehicles and earth-moving machinery. In addition, the presence of a work force on the site during construction would pose a risk to species such as snakes, tortoises and mammals which would be vulnerable to poaching for food, trade or killed out of fear and superstition. During the operational phase, the activity would be much lower.

During the operational phase of the project, it is envisaged that this impact will be negligible given that the majority of the species would have already migrated away from the area.

Impact Assessment

The extent of the habitat is likely to be local.

The impact will be short term as will only take place during the Construction Phase of the Project.

The scale is rated as Low to Moderate given that the extent of sensitive dune area on the existing proposed route is low, and the remaining habitat is historically overgrazed and fairly degraded in places. Faunal habitat diversity is low.

The impact is considered reversible.

Proposed Mitigation

The following measures are proposed to minimise the impact:

- All vehicles at the site should adhere to a low speed limit to avoid collisions with fauna such as tortoises.
- Personnel should not be allowed to roam into the veld.
- All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.
- No activity should be allowed in the veld between sunset and sunrise.
- Any dangerous fauna (snakes, scorpions etc) that are encountered during construction should not be handled or molested by the construction staff and the ECO or other suitably qualified persons should be contacted to remove the animals to safety.
- No litter, food or other foreign material should be thrown or left around the site and should be placed in demarcated and fenced rubbish and litter areas.
- Holes and trenches should not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days, should have places where the loose material has been returned to the trench to form an escape ramp present at regular intervals to allow any fauna that fall in to escape.
- If there is any part of the site that needs to be lit at night for security reasons, then this should be with low-UV emitting types which do not attract insects.

Box 10.8 Direct faunal impacts during the Construction and Decommissioning Phases

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low for power plant; High for pipeline

Impact Magnitude: Low

- **Extent:** Local
- **Duration:** Short term
- **Scale:** Low to Moderate
- **Frequency:** Ongoing during the Construction Phase
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): MINOR
IMPACT SIGNIFICANCE (POST-MITIGATION): Mitigation measures will reduce the impact to **NEGLIGIBLE**

10.7.3 *Habitat degradation for Fauna during Construction and Operation*

Impact Description

The noise and activity during the construction and operation of the pipeline and power plant would generate a lot of noise which will deter many animals from the area, or will curb the activity of those less able to move away, but in the long-term the operation of the pipeline and power plant would be of minimal disturbance to fauna. There is also the risk that construction would result in accidental spills of oil or chemicals and generate pollution. Amphibians in particular are very sensitive to such pollutants and should such pollution enter the breeding habitat the local amphibian population is highly likely to decline.

Impact Assessment

The extent of the habitat is likely to be local.

The impact will be long term as will only continue through the operational phase of the Project.

The scale is rated as Low.

The impact is considered reversible as with mitigation further degradation to the habitat can be avoided.

Proposed Mitigation

The following measures are proposed to minimise the impact:

- Personnel should not be allowed to roam into the veld.
- No activity should be allowed in the veld between sunset and sunrise.
- No litter, food or other foreign material should be thrown or left around the site and should be placed in demarcated and fenced rubbish and litter areas.
- All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.

Box 10.9 *Habitat degradation for fauna during Construction, Operation and Decommissioning*

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low for power plant; High for pipeline

Impact Magnitude: Low

- **Extent:** Local
- **Duration:** Short to Medium term
- **Scale:** Low
- **Frequency:** Ongoing
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): MINOR
IMPACT SIGNIFICANCE (POST-MITIGATION): Mitigation measures will reduce the impact to **NEGLIGIBLE**

10.7.4 Residual Impacts

A summary of the impacts on fauna during all phases of the Project is presented below.

Table 10.15 *Pre- and Post- Mitigation Significance for the Impact on Fauna*

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Loss of faunal habitat	Construction and Decommissioning	Moderate	Minor
Direct faunal impacts	Construction and Decommissioning	Minor	Negligible
Habitat degradation for fauna	Construction and Operation	Minor	Negligible

10.8 Impact on Avifauna

The area proposed for the power plant is characterised as the Strandveld shrubland habitat unit (Helme & Koopman (2007)) which is comprised of sparse shrub with scattered rock and succulent-dominated undergrowth. The habitat unit around the site is homogenous, lacking structural and compositional variation, and does not support a high diversity and abundance of bird species. One bird SCC – the Black Harrier *Circus maurus* – was recorded in and is known to favour this habitat unit.

The study area has already been subject to varying degrees of disturbance and degradation caused by past and present land-use practises such as agriculture and industry, due to its close proximity to the town of Saldanha.

The proposed development is in close proximity to the West Coast National Park, Saldanha Bay Islands and Berg River Estuary Important Bird and Biodiversity Areas (IBAs) which have been identified in terms of the Important Bird and Biodiversity Areas Programme, a Birdlife South Africa Conservation Initiative.

10.8.2 *Avifauna Habitat Loss Due to Construction Activities*

Impact Description

Habitat loss may result from the following activities during the Construction Phase of the Project:

- Clearing of the vegetation on the proposed power plant site (50 ha); and
- Clearance of a 36 m wide servitude for the pipeline, for a distance of 4 km.

Extensive areas of vegetation (habitat) are to be cleared to accommodate the infrastructure required at these facilities, reducing the amount of habitat available to birds for foraging, roosting and breeding (Smallie, 2013).

This impact is likely to affect smaller bird species (i.e. larks and pipits) with small home ranges.

Impact Assessment

Overall, the avifauna of the study area and the broader impact zone are not considered unique and are typical of what occurs across large areas of the Fynbos Biome. However, because of the expected occurrence of numerous priority species in the study area and the nearby proximity of two IBAs, the sensitivity of the site, from an avian perspective, will be of **moderate** significance.

The scale is considered high given that the integrity of the avifauna habitat within the Project footprint area will be compromised. This impact is considered to be irreversible for the power plant site and partially reversible for the pipeline alignment if there is effective rehabilitation. See *Box 10.10.*

Proposed Mitigation

The following mitigation measures are proposed:

- Minimise project footprint;
- Existing roads for access to be utilised as far as possible;
- Briefing of site personnel; and

- Nesting sites to be reported to ECO and monitored to inform further action which may include avoiding the nests of there are eggs or chicks present.

Box 10.10 Avifaunal Habitat Loss Due to Construction Activities

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium

Impact Magnitude: Moderate

- **Extent:** On site
- **Duration:** Short term
- **Scale:** High
- **Frequency:** Once-off
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE
IMPACT SIGNIFICANCE (POST-MITIGATION): Mitigation measures will reduce the impact to **MINOR.**

10.8.3 Disturbance to Avifauna during Construction

Impact Description

Construction of CCGT power plants requires a significant amount of machinery and labour to be present on site for a period of time. For shy, sensitive species or ground-nesting birds resident in the area, construction activities are likely to cause a temporary disturbance or even result in displacement from the site entirely. Birds are particularly sensitive to disturbance during the breeding season.

In addition, certain bird species may seek to benefit from the plant, using the erected structures as prominent perches, sheltered roost sites or even nesting sites, and possibly foraging around the infrastructure. This may result in the fouling of critical components of the plant, bringing local bird populations into conflict with facility operators.

Impact Assessment

As detailed in *Section 10.6* above, the sensitivity of the site is considered to be moderate. The scale is considered high given that the integrity of the avifauna habitat within the Project footprint area will be compromised. This impact is considered to be partially reversible.

Proposed Mitigation

The following mitigation measures are proposed:

- ECO to be notified of roosting, nesting or breeding sites to inform further action which may include avoiding the nests of there are eggs or chicks present.;
- Laydown areas to be as close to the site as possible;
- Disturbance footprint to be restricted;
- Existing roads to be utilised; and
- Speed limit of 50 km/h adhered to on internal roads.

Box 10.11 Disturbance to Avifauna during the Construction Phase

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium

Impact Magnitude: Medium

- **Extent:** On site
- **Duration:** Short term
- **Scale:** High
- **Frequency:** Ongoing
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE
IMPACT SIGNIFICANCE (POST-MITIGATION): With mitigation this impact will be reduced to **MINOR**

10.8.4 Avifauna Disturbance during Operation

Impact Description

Ongoing operation and maintenance activities at the facility are likely to cause some degree of disturbance to birds in the general vicinity.

Impact Assessment

As detailed above, the sensitivity of the site is considered to be moderate. The scale of this impact is considered medium as the ecological functioning and integrity of the site may improve from that of the construction phase with less frequent disturbance in the area. This impact is considered to be partially reversible. See *Box 10.12*.

Proposed Mitigation

The following mitigation measures are proposed:

- Measures to be put in place to discourage nesting on power infrastructure if problematic;
- No shooting, poisoning or harming of birds to control;
- Birds already with eggs and chicks allowed to fledge chicks before nests removed;

- Avifaunal specialist input to be sought if cannot be resolved;
- Restricted site access; and
- Use of existing roads and enforcement of speed limits.

Box 10.12 Disturbance to Avifauna during the Operation Phase

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium

Impact Magnitude: Moderate

- **Extent:** Local
- **Duration:** Long term
- **Scale:** Medium
- **Frequency:** Ongoing
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE
IMPACT SIGNIFICANCE (POST-MITIGATION): With mitigation this impact is reduced to **MINOR**

10.8.5 Avifauna Disturbance during Decommissioning

It is envisaged that the impact during the Decommissioning Phase will mirror that experienced for the Construction Phase. *Box 10.12*

10.8.6 Residual Impacts

A summary for the impact on avifauna during the construction and operation phases of the Project is presented in *Table 10.16* below

Table 10.16 Pre- and Post- Mitigation Significance for the Impact on Avifauna

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Avifaunal habitat loss during Construction	Construction	Moderate	Minor
Disturbance to avifauna during Construction	Operation	Moderate	Minor
Disturbance to avifauna during Operation	Operation	Moderate	Minor

10.9 *ROAD AND TRAFFIC IMPACTS*

Traffic operations at intersections are typically described in terms of the "Level of Service" (LOS). LOS is a qualitative measure of the effect of several factors on traffic operating conditions, including speed, travel time, traffic interruptions, freedom to manoeuvre, safety, driving comfort, and convenience. It is generally measured quantitatively in terms of vehicular delay and described using a scale that ranges from LOS A to F, with LOS A representing essentially free-flow conditions and LOS F indicating over-capacity conditions with substantial congestion and delay.

Table.10.17 summarises the relationships between the average control delay per vehicle and LOS for signalised intersections, roundabouts and stop and yield controls.

Table.10.17 Level-Of-Service Definitions Based on Delay (Highway Capacity Manual of the Transport Board, 2010)

Level of Service		**Control delay per vehicle in seconds (d) (including geometric delay)**	
		Signals and Roundabouts	**Stop Signs and Give Way (Yield) Signs**
A	Good progression, few stops, short cycle lengths	$d \leq 10$	$d \leq 10$
B	Good progression and/or short cycle lengths, more vehicle stops	$10 < d \leq 20$	$10 < d \leq 15$
C	Fair progression, significant proportion of vehicles must stop	$20 < d \leq 35$	$15 < d \leq 25$
D	Congestion becomes noticeable; longer delays, high v/c ratio	$35 < d \leq 55$	$25 < d \leq 35$
E	At or beyond acceptable delay, poor progression, long queues	$55 < d \leq 80$	$35 < d \leq 50$
F	Unacceptable to drivers. Arrival volumes greater than discharge capacity, unstable unpredictable flows	$80 < d$	$50 < d$

The following key conclusions can be drawn from the baseline road conditions:

The site is well served by existing road infrastructure. The road intersections that may be impacted on by the proposed development are (see *Figure 10.13*):

1. R27 (TR 77/1) and R45 (TR 22/1);
2. R27 (TR 77/1) and TR 85/1; and
3. TR 85/1 and OP7644.

Figure 10.13 Location of Road Infrastructure

According to the results of the Signalised and Unsignalised Intersection Design and Research Aid software package[1] (SIDRA) it appears that the traffic operations at the existing intersections are currently operating at a LOS A in the AM and PM peak hours, respectively.

There are two proposed access points to the site: the northern access which is proposed on the west of the power plant off the OP7644 and 5.8 km from the studied intersection of the TR77/1 (R27) and TR85/1; and the southern access (and main access) into the development via a new access road off OP7644. This main entrance is located approximately 6.35 km from the intersection of TR85/1 and TR77/1 (R27).

10.9.1 *Impact on Traffic Levels during Construction and Decommissioning*

Impact Description

Traffic levels are expected to increase in the area of the site during the construction phase of the project. Additional vehicle movements during peak periods are anticipated to be in the order of 450 person trips during the peak hour, or 206 cars, 14 minibus taxis and two buses. The cars may enter the site and park in the open areas during construction. The minibus taxis and buses may collect and dispatch passengers in the vicinity of the site.

It has been assumed that the site traffic will be distributed as follows: 55 percent originating from the east of Vredenburg, Velddrif and Langebaanweg

[1] SIDRA Version 5 Software, SidraSolutions, Australia, 2010.

areas, 20 percent from the southern Yzerfontein and Melkbosstrand areas, 20 percent from the Langebaan and Saldanha areas, and 5 percent from Vredenburg and Saldanha.

Anticipated truck traffic is likely to be in the order of 246 trucks per day or 20 trucks per hour which equates to one every three minutes.

Impact Assessment

Predictions of the level of service at the project affected intersections is provided in *Table 10.18*, *Table 10.19*, and *Table 10.20* below, with the extent of the impact being dependent on when the project is implemented. Volume to capacity is a measure of the saturation flow rate which should ideally be below 0.9.Three different scenarios have been presented on the basis of anticipated traffic level increases as a result of delays in commencing with construction:

Table 10.18 Traffic Operations at Intersection of R27 (TR 77/1) / R45 (TR 21/2) during Construction

Measures of Effectiveness	**Intersection Type**					
	Stop Controlled					
	Existing 2016 Scenario Without the project		**Future 2018 Scenario Construction**		**Future 2019 Scenario Construction**	
	Peak Hour		**Peak Hour**		**Peak Hour**	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**
Levels of Service (LOS)	A	A	A	A	A	A
Delay (Sec) Overall	6.9	7.0	6.9	7.5	7.1	7.7
Volume/Capacity (V/C) Ratio	0.208	0.248	0.324	0.384	0.341	0.404

Table 10.19 Traffic Operations at Intersection of R27 (TR 77/1) / TR 85/1 during Construction

Measures of Effectiveness	**Intersection Type**					
	Stop Controlled					
	Existing 2016 Scenario Without the project		**Future 2018 Scenario Construction**		**Future 2019 Scenario Construction**	
	Peak Hour		**Peak Hour**		**Peak Hour**	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**
Levels of Service (LOS)	A	A	A	A	A	A
Delay (Sec) Overall	4.1	4.2	6.0	6.3	6.1	6.4
Volume/Capacity (V/C) Ratio	0.104	0.142	0.328	0.376	0.340	0.389

Table 10.20: Traffic Operations at Intersection of TR 85/1 / OP7644 During Construction

Measures of Effectiveness	Intersection Type			
	Stop Controlled			
	Future 2018 Scenario		**Future 2019 Scenario**	
	Peak Hour		**Peak Hour**	
	AM	**PM**	**AM**	**PM**
Levels of Service (LOS)	A	A	A	A
Delay (Sec) Overall	5.3	5.2	5.3	5.3
Volume/Capacity (V/C) Ratio	0.338	0.322	0.346	0.328

Therefore it is anticipated that the significance of the impact will be **negligible** and that the LOS of the three intersections will remain categorised as Level A. The vulnerability of the receptor is anticipated to be Low given that current service levels and access to the area is good. This impact is of short term duration and reversible. It is anticipated that decommissioning impacts will reflect those of the construction phase. See *Box 10.13.*

Proposed Mitigation

Although within an acceptable LOS in terms of capacity, the volume of construction traffic is considered to be intensive truck traffic and will need to be managed both in terms of surface damage as well as signage and marshalling at the delivery yard and at the site entrance. A road condition survey will need to be conducted prior to construction in order to gauge the damage to the road as a result of the intensive heavy traffic. Most of the damage is likely to occur within the proximity to the access to the site.

Planned turning lanes on the OP7644 are proposed for the development. These should be approved by the Road Authority. Minibus taxi embayment should also be provided on either side of the OP7644. Road condition survey to be undertaken.

Box 10.13 Impact on Traffic Levels during Construction

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low

Impact Magnitude: Low

- **Extent:** Local
- **Duration:** Short term
- **Scale:** Low
- **Frequency:** Constant
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): NEGLIGIBLE
IMPACT SIGNIFICANCE (POST-MITIGATION): With mitigation this impact remains **NEGLIGIBLE**

10.9.2 Impact on Traffic Levels during Operation

Impact Description

Traffic levels are expected to increase in the area of the site during the operational phase of the project with the commuting of employees to and from work each day. Additional vehicle movements during peak periods are anticipated to be in the order of 177 person trips during the peak hour or 80 cars, the equivalent of five minibus taxis and one bus. The cars may enter the site and park in the open areas during construction.

The minbus taxis and buses may collect and dispatch passengers in the vicinity of the site. Site traffic distribution will be as anticipated during the construction phase of the project, although some heavy vehicle movements may remain.

Impact Assessment

Predictions of the LOS at the project affected intersections is provided in the *Table 10.21*, *Table 10.22* and *Table 10.23* below, with the extent of the impact being dependent on when the project is implemented. Two different scenarios have been presented on the basis of anticipated traffic level increases as a result of the delay in commencing with operation:

Table 10.21 Traffic Operations at Intersection of R27 / R45 during Operation

Measures of Effectiveness	Intersection Type			
	Stop Controlled			
	Existing 2016 Scenario		Future 2020 Scenario	
	Peak Hour		Peak Hour	
	AM	PM	AM	PM

Levels of Service (LOS)	A	A	A	A
Delay (Sec) Overall	6.9	7.0	7.1	7.4
Volume/Capacity (V/C) Ratio	0.208	0.248	0.273	0.334

Table 10.22: Traffic Operations at Intersection of R27 / TR 85/1 during Operation

Measures of Effectiveness	Intersection Type			
	Stop Controlled			
	Existing 2016 Scenario		Future 2020 Scenario	
	Peak Hour		Peak Hour	
	AM	PM	AM	PM
Levels of Service (LOS)	A	A	A	A
Delay (Sec) Overall	4.1	4.2	4.7	4.8
Volume/Capacity (V/C) Ratio	0.104	0.142	0.173	0.221

Table 10.23: Traffic Operations at Intersection of TR 85/1 / OP7644 during Operation

Measures of Effectiveness	Intersection Type	
	Stop Controlled	
	Future 2020 Scenario	
	Peak Hour	
	AM	PM
Levels of Service (LOS)	A	A
Delay (Sec) Overall	1.6	1.7
Volume/Capacity (V/C) Ratio	0.143	0.112

Therefore it is anticipated that the magnitude of the impact will be low to medium and that the Level of Service of the three intersections will remain categorised as Level A. The vulnerability of the receptor is anticipated to be Low given that current service levels and access to the area is good. See *Box 10.14.*

This impact is expected to be long term in duration, but following the life of the project, traffic levels will return to pre-construction levels (i.e. reversible).

Proposed Mitigation

Planned turning lanes on the OP7644 are proposed for the development. These should be approved by the Road Authority. Minibus taxi embayments should also be provided on either side of the OP7644.

Box 10.14 Impact on Traffic Levels during Operation

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low

Impact Magnitude: Low to medium

- **Extent:** Local
- **Duration:** Long term
- **Scale:** Low
- **Frequency:** Constant
- **Likelihood:** n/a

IMPACT SIGNIFICANCE (PRE-MITIGATION): MINOR
IMPACT SIGNIFICANCE (POST-MITIGATION): With mitigation this impact remains **MINOR**

10.9.3 Residual Impacts

A summary for the impact on traffic levels and road conditions as a result of the Project is provided in *Table 10.24*.

Table 10.24 Pre- and Post- Mitigation Significance for the Traffic and Road Condition Impacts

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Impact on traffic levels during Construction	Construction	Negligible	Negligbile
Impact on traffic levels during Operation	Operation	Minor	Minor

10.10 EMPLOYMENT CREATION, SKILLS ENHANCEMENT AND LOCAL BUSINESS OPPORTUNITIES

The Project is expected to generate positive impacts on the local economy and livelihoods in terms of:

- employment and skills enhancement; and

- local business opportunities through the procurement of goods and services.

Positive impacts will be primarily associated with the construction phase and therefore temporary in nature. The termination of construction contracts will occur once construction activities are completed. Workers who have relocated to the area for the Project are likely to leave the area in search of other opportunities, especially if they are permanent employees of contractors and subcontractors.

Those who have worked on the Project will have an advantage when seeking alternative jobs on similar projects due to the experience and any training received through this Project. The area is characterised by a number of new industrial developments and is earmarked for other gas power projects which may offer alternative employment opportunities. This is considered within the cumulative impacts *Section 7.17*.

10.10.1 Construction and Decommissioning: Employment, Skills Enhancement and Local Business Opportunities

Impact Description

The construction phase will last approximately 48 months in duration (Phase One 15 -18 months; Phase Two 18 - 20 months) and it is expected that approximately 450 direct employment opportunities will be available during the peak of construction. The breakdown of skills required during the construction phase will be as follows:

- Skilled labour: 58 percent;
- Semi-skilled labour: 20 percent; and
- Unskilled labour: 22 percent.

Table 10.25 Estimated Employment Positions Available During Construction

Employment Position	Number of Positions
Admin	12
Engineers	8
Technicians	40
Skilled	210
Semi skilled	80
Unskilled	100
Total	**450**

It is assumed that the majority of skilled workforce will come from outside the Area of Direct Influence and Area of Indirect Influence, but that many of them will be South African. Given that almost half the population in the SBLM have some level of skills training, it is anticipated that many semi-skilled positions will be available to the local workforce, and that unskilled positions will also be available to the local workforce.

Indirect employment through the construction supply chain will be limited as the major components of the power plant are highly specialised and will be manufactured outside of South Africa. However, much of the balance of plant infrastructure for the Project will be procured within South Africa and where possible, from within the Local Municipality. Local procurement is going to benefit the hospitality and service industries primarily, such as accommodation, catering, cleaning, transport and security services. Local businesses will benefit during the construction phase as there will be increased spending within the area by the wage labour who will have improved buying power while employed by the Project.

Those who are able to secure employment on the Project will have the opportunity to improve their skills and experience through on-the-job training, and will thereby improve their opportunities for future employment.

Given that Saldanha Bay is ear-marked for further industrial development, with a focus on the oil and gas sector, the upskilling of the local workforce will put them in a favourable position to secure future employment.

Employment numbers during decommissioning are not known at this stage, but it is expected that the make-up of the workforce will be similar to the construction phase.

Impact Assessment

The creation of local employment opportunities, skills enhancement and local business opportunities will be a direct, indirect and induced impact. The duration will be short-term, for the duration of the construction phase and work contracts will vary in length, based on the type of work being performed. Employment will be created for South Africans at a local and regional level depending on skills and capacity availability, as such the extent will be regional. For those who are able to secure employment on the Project the scale will be medium, as they secure an income for the duration of their contract. The frequency of the impact will be constant for the duration of the construction phase. The magnitude of the impact will be positive.

Given the capacity of the local workforce to fill unskilled and semi-skilled employment positions, together with the opportunity to increase skills and work experience, the vulnerability is medium.

The significance of the impact is rated as **Moderate (+ve)**.

Proposed mitigation/ enhancement

The objective of mitigation is to optimise opportunities for employment of local people, wherever possible, or alternatively that employment of South Africans is prioritised over foreigners.

The following measures will be implemented to ensure that employment of local people is maximised:

- The Project will establish a recruitment policy which prioritises the employment of South African and local residents (originating from the Local Municipality) over foreigners. Criteria will be set for prioritising local residents and then other South Africans as part of the recruitment process.

- All contractors will be required to recruit in terms of the Project's recruitment policy, where practical.

- The Project will meet with the Local Municipality (and other appropriate institutions such as the Sakekamer) to access any available skills/employment-seekers database for the area. This database is to be updated and made available to the appointed contractors.

- The Project will advertise job opportunities and criteria for skills and experience needed through local media, at least three months ahead of recruitment. This information should also be provided to all relevant authorities, community representatives and organisations on the interested and affected party database.

- The recruitment policy and procedure should promote the employment of women as a means of ensuring that gender equality is attained.

- On-the-job performance and training will be monitored through performance reviews. Training needs will be identified and provided by the Project.

- No employment will take place at the entrance to the site. Only formal channels for employment will be used.

A local procurement policy will be implemented to ensure that local procurement is maximised, the policy will include:

- Reasonable targets for using local suppliers.

- A clause of none discrimination on any grounds of gender, ethnicity, religion.

- Criteria for monitoring local procurement and reporting on supplier performance management.

- Clearly communicate the criteria and tendering process prior to the commencement of construction activities; and

- The procurement policy and tendering requirements must be easily accessible to potential suppliers.

The following management measures will be implemented to enhance skills development and on-the-job training:

- Develop internal training 'certification' or reference letter provisions to those who receive internal training.

- Training plans will be developed according to each permanent employee' work agreement and relevant to their job description.

Residual impacts

A summary for the impact the construction and decommissioning phases of the Project is present below.

Table 10.26 Pre- and Post- Mitigation Significance for Employment Creation, Skills Enhancement and Local Business Opportunities

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Employment Creation, Skills Enhancement and Local Business Opportunities	Construction and Decommissioning	Moderate (+ve)	Moderate (+ve)

Table 10.27 Pre- and Post- Mitigation Significance for Employment Creation, Skills Enhancement and Local Business Opportunities during Construction

Nature and Type: Direct, indirect and induced positive impact

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium

Impact Magnitude: Positive

- **Extent:** Regional
- **Duration:** Short Term
- **Scale:** Large
- **Frequency:** Constant
- **Reversibility:** N/A
- **Likelihood:** N/A

IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE POSITIVE
IMPACT SIGNIFICANCE (POST-MITIGATION): Enhancement measure will ensure the impact remains **MODERATE POSITIVE.**

10.10.2 *Operation: Employment, Skills Enhancement and Local Business Opportunities*

Impact Description

The power plant will be operated on a 24 hour, 7 days a week basis for the duration of the operation phase. It is anticipated that there will be approximately 95 employment positions available during this phase. As the plant will operate 24 hours a day, three full-time shifts will be created per day, and the breakdown of the skills required will be as follows:

- Skilled labour: 65 - 70 percent;
- Semi-skilled labour: 15 - 20 percent; and
- Unskilled labour: 10 - 15 percent.

A further breakdown of the employment opportunities is provided in *Table* 10.28.

Table 10.28 Estimated Employment Positions Available During Operation

Position	**Number of Positions Available**
Admin	4
Security	15
Warehouse and Stores	6
Medical	6
Plant Control	15
Engineers	9
Technicians	9
Skilled	9
Unskilled	9
Tuition and Training	4
Quality Control, Water	3
Canteen	6
Total	**95**

Similar to the construction phase, local workers are expected to be qualified to fill unskilled and semi-skilled positions at first, whilst a limited number of people may be sufficiently qualified for skilled positions. Semi-skilled and skilled positions will initially be recruited from elsewhere in the region and South Africa. Over time, however, local workers will be able to fill more of the semi-skilled and skilled positions as training will be provided by the Project to the local workforce, which will improve skills levels relevant to the Project.

During the operation phase the contracts that were in place during the construction phase will be terminated and procurement opportunities will be centred around maintenance activities, and providing goods and services to the Project. For those companies that meet eligibility criteria, become approved suppliers and enter the supply chain, there will be long-lasting and sustained benefits to the businesses and their employees through increased experience, capacity and training. As such, during the operation phase there will be opportunity for local business growth and development

Impact Assessment

The creation of local employment opportunities, skills enhancement and local business opportunities will be a direct, indirect and induced impact. The duration will be long-term, for the duration of the operation phase. Employment will be created for South Africans at a local and regional level depending on skills and capacity availability, as such the extent will be regional. For those who are able to secure employment or procurement contracts with the Project the scale will be large, as they secure long-term, stable income. The frequency will be constant for the duration of the operation phase. The magnitude of the impact will be Positive.

Given the limited employment and procurement opportunities during the operation phase, together with the lack of appropriate skills in the ADI, the vulnerability is low.

The significance of the impact is rated as **Minor (+ve)**.

Proposed mitigation/ enhancement

The mitigation/ enhancement measure provided for the construction phase, will apply to the operation phase.

Residual impacts

A summary for the impact during the operation phases of the project is presented below.

Table 10.29 Pre- and Post- Mitigation Significance for Employment Creation, Skills Enhancement and Local Business Opportunities

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Employment Creation, Skills Enhancement and Local Business Opportunities	Operation	Minor (+ve)	Minor (+ve)

Table 10.30 Pre- and Post- Mitigation Significance for Employment Creation, Skills Enhancement and Local Business Opportunities during Operation

Nature and Type: Direct, indirect and induced positive impact

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low

Impact Magnitude: Positive

- **Extent:** Regional
- **Duration:** Long Term
- **Scale:** Large
- **Frequency:** Constant
- **Reversibility:** N/A
- **Likelihood:** N/A

IMPACT SIGNIFICANCE (PRE-MITIGATION): MINOR POSITIVE
IMPACT SIGNIFICANCE (POST-MITIGATION): Enhancement measures will ensure the impact remains **MINOR POSITIVE.**

10.11 IMPACTS ON COMMUNITY HEALTH AND SAFETY

The presence of the Project could affect the health, safety and security of the communities in the area of influence as a result of worker-community interactions, in-migration to the area, increased incomes in the local community that may be used for drugs, alcohol and prostitution, the risk of injury associated with construction and decommissioning activities, increased pressure on health care resources and changes to the environment. Any community concerns or perceptions with regard to reduced health and physical safety and security by the community need to be addressed.

There are numerous ways in which the development of the Project could impact on community and individual levels of health. The term "health" is used broadly to include physical and mental health and well-being. The expected impacts on community health, safety and security as a result of construction, operation and decommissioning of the Project are:

- Impacts associated with the presence of the Project workforce.
- Impacts associated with an influx of jobseekers.
- Impact on human health due to air emissions.

10.11.1 Construction, Operation and Decommissioning: Impacts Associated with the Presence of the Workforce and Jobseekers

Impact Description

An increase in disposable income within the Project area (among Project workers, both local and external) has been observed to result in a change in spending habits and behaviour resulting in increase in alcohol and drug abuse, increased incidences of prostitution and casual sexual relations, which poses a threat to community health and safety. Anticipated impacts associated with the presence of the workforce are:

- Increased incidence of alcohol and drug use;
- Increase in the spread of HIV/ Aids and other STIs;
- Increased incidence of teenage or unwanted pregnancies; and
- Increase in prostitution.

It is estimated that there will be approximately 450 people employed during the peak construction phase. The Project will seek to maximise the employment of local people, thereby reducing the size of the external workforce in the ADI, however an external workforce will be required. The external workforce (largely comprised of semi-skilled and skilled workers) will be housed with the ADI, as onsite worker accommodation is not feasible for health and safety reasons given the Project site's close proximity to Saldanha Steel.

Experience from large infrastructure projects elsewhere in South Africa has shown that increased disposable income within the local workforce may result in increased incidences of illegal activities or antisocial behaviours such as prostitution and casual sexual relations as well as increased levels of substance abuse. Abuse of alcohol (and drugs, should this occur) often correlates with increased levels of criminal behaviour and violence (e.g. domestic violence) while under the influence of the substance. Such behaviour increases the number of people indirectly affected by, or vulnerable to, alcohol and drug abuse; and casual sexual relations could lead to an increased incidence of HIV/AIDS.

Further, it has been shown that members of an external workforce are likely to father children with local women while they are living in the Project Area. Given the temporary nature of the work, it is possible that both the women and children will be abandoned when the construction phase ends and the contractors move on, leaving single female-headed households.

A further impact associated with an influx of jobseekers is the potential for social tension, and increased competition for employment. The distribution of employment opportunities between locals and in-migrants often leads to tension and conflict, especially when locals perceive the migrants to be taking their jobs. Competition for jobs has been raised as a concern by some stakeholders.

Impact Assessment

The impacts related to the presence of the workforce and jobseekers in the Project Area will be indirect and negative as the presence of a mostly male workforce, with an increased disposable income may adversely impact on health, safety and security of the local community through a likely increase in illegal or antisocial behaviour. The impact will be experienced at a local level, within the ADI. While the workforce will be in the Project area for a limited time during the construction phase, jobseekers may stay in the area. Those affected by antisocial behaviour, such as the victims of abuse, women with unwanted pregnancies and people living with HIV/ AIDS, the duration of the impact will be long-term. The scale of the impact will be large for those affected as it will lead to a fundamental change in their life, and/ or health status, particularly for those affected by violence, unwanted pregnancies or HIV/ AIDS. For those affected, the impact will be largely irreversible. The frequency of the impacts will not be uniform, but may be felt often. Given the above, the magnitude of the impact is considered medium.

The external workforce will be housed within the Saldanha Bay area, and will interact with the local community. The local workforce will come from residential areas within the ADI such as Diazville, White City and Saldanha.

Teenage pregnancies are already of concern in the region, and according to the WCDM, there has been a general increase in the numbers of recorded teenage pregnancies. The WCDM further notes that violence and substance abuse are also common in the District and that the HIV/ AIDS is increasing (see *Chapter 7*). In light of this, the vulnerability of receptors is considered medium, however, teenage girls are considered to be highly sensitive to this impact.

The significance of the impact is rated as **Moderate negative** overall, but the significance will be of **high** negative to those affected by unwanted pregnancies and HIV/ AIDS.

During the operation phase, there will be limited employment opportunities and the external construction workforce will likely leave the area. The number of local people with disposable income will decrease, as will the impacts associated with this. This impact will not be felt during the operation phase.

Proposed mitigation/ enhancement

The Project will develop an induction programme, including a Code of Conduct, for all workers directly related to the Project. A copy of the Code of Conduct is to be presented to all workers and signed by each person. The Code of Conduct must address the following aspects:

- respect for local residents and customs;
- zero tolerance of bribery or corruption;
- zero tolerance of illegal activities by construction personnel including: unlicensed prostitution; illegal sale or purchase of alcohol; sale, purchase or consumption of drugs; illegal gambling or fighting;
- no alcohol and drugs policy during working time or at times that will affect ability to work;
- description of disciplinary measures for infringement of the Code and company rules. If workers are found to be in contravention of the Code of Conduct, which they signed at the commencement of their contract, they will face disciplinary procedures that could result in dismissal.

The Project will implement a grievance procedure that is easily accessible to the local community, through which complaints related to contractor or employee behaviour can be lodged and responded to. The Project will respond in a serious manner to any such complaints. Key steps include:

- Circulation of contact details of 'grievance officer' or other key Project contact;
- Awareness raising among the local community regarding the grievance procedure and how it works; and
- Establishment of a grievance register to be updated and maintained by the Project.

The Project will develop and implement an HIV/AIDS policy and information document for all workers directly related to the Project. The information document will address factual health issues as well as behaviour change issues around the transmission and infection of HIV/AIDS.

Residual impacts

The implementation of the above mitigation measures would ensure that the construction phase significance is reduced to **Minor-Moderate** significance. A summary for the impact the construction phase of the Project is present below.

Table 10.31 Pre- and Post- Mitigation Significance for Impacts Associated with the Presence of the Workforce and Jobseekers

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Impacts Associated with the Presence of a Workforce	Construction and Decommissioning	Moderate (-ve)	Minor - Moderate (-ve)

Table 10.32 Pre- and Post- Mitigation Significance for Impacts Associated with the Presence of a Workforce and Jobseekers

Nature and Type: Indirect negative impact
Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium
Impact Magnitude: Medium
• **Extent:** Local • **Duration:** Permanent • **Scale:** Large • **Frequency:** Constant • **Reversibility:** Irreversible • **Likelihood:** N/A
IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE NEGATIVE **IMPACT SIGNIFICANCE (POST-MITIGATION): MINOR - MODERATE NEGATIVE**

10.11.2 Construction, Operation and Decommissioning: Pressure on Social Infrastructure and Services

Impact Description

It is generally accepted that large-scale infrastructure projects attract job-seekers into the Project Area. The Project is expected to stimulate in-migration as job-seekers enter the area with the intention of securing employment on the Project. In-migration of people will be further stimulated by possibility of business opportunities linked to the provision of goods and services to the Project, and by real or perceived opportunities arising from the general increase in economic activity in the area.

It is likely that a number of people will continue to stay in the area irrespective of whether they are able to secure employment and these people may move their families to the area. There is the possibility that people will return to their place of origin or move on to seek employment elsewhere if there are no employment opportunities for them, or when the construction phase is complete.

The expected impacts associated with an influx of jobseekers are:

- Pressure on existing social infrastructure – particularly housing, education and health facilities

The presence of the Project is likely to increase the rate of in-migration into the area, as people are attracted to the area in the hope of securing employment. The increase in population is expected to add pressure on existing infrastructure and services; specifically on housing services. Housing delivery has been slow in the SBLM and the housing backlog has been steadily increasing since 2001. The number of households on the waiting list for housing is currently estimated at 8,179 and the number of households affected by the housing backlog is 6,730 (Saldanha Bay Local Municipality IDP, 2012). In-migrants will likely seek housing in Wards 3 and 4, where the SBLM is struggling to keep up with the local housing demand. This could be further exacerbated if job seekers decide to relocate their families to the area.

An influx of jobseekers and their families would place pressure on health and education facilities. SBLM has 14 medical facilities, but there are only two clinics located in the Saldanha Bay area (one in Ward 4 and the other in Ward 3). These already understaffed clinics would be placed under pressure to cope with the increase in population within their catchment.

Impact Assessment

The impacts related to in-migration of job seekers in the Project area will be indirect as it relates to the local government and population. The impacts will be negative as they will place pressure on infrastructure and services and the local government, who will have to provide the services should the influx occur.

The impact will be experienced at a local level, within the ADI. The impacts will be long-term despite the fact that the period of influx may be limited to the construction phase, the associated impacts will continue to occur into the future. The scale of the impact will be medium, as the Project is not expected to attract large volumes of in-migration and the degree of change for local population will therefore be notable but will not dominate over existing conditions. The frequency of the impacts will not be uniform, but will felt often until in-migration stabilises and upgrades to infrastructure are undertaken. The impact is revisable as social infrastructure and services can be improved to address the impact. Given the information presented above, the impact will be medium in magnitude.

The population within the SBLM has been increasing at a rate greater than expected which has been attributed to the in-migration of people seeking economic opportunities. There is an existing housing backlog in the SBLM, and health services are under pressure. Therefore, the vulnerability of receptors is considered medium.

Therefore, the significance of the impact is rated as **Moderate negative,** the level of in-migration, and movement of job-seekers cannot be accurately predicted.

During the operational phase, there will limited employment opportunities and the Project is unlikely to attract further job seekers.

Proposed Mitigation Measures

The Project will implement a grievance procedure that is easily accessible to the local community, through which complaints related to contractor or employee behaviour can be lodged and responded to. The Project will respond in a serious manner to any such complaints. Key steps include:

- Circulation of contact details of 'grievance officer' or other key Project contact.
- Awareness raising among the local community regarding the grievance procedure and how it works.
- Establishment of a grievance register to be updated and maintained by the Project.

Implement management measures associated with the prioritisation of local labour, as outlined in *Section 10.10.1*

Residual impacts

The implementation of the above mitigation measures would ensure that the construction phase significance remains of Moderate significance. A summary for the impact the construction phase of the Project is presented below.

Table 10.33 Pre- and Post- Mitigation Significance for Impacts Associated with Pressure on Social Infrastructure and Services

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Impacts Associated with an Influx of Workers and Jobseekers	Construction	Moderate (-ve)	Moderate (-ve)

Table 10.34 Pre- and Post- Mitigation Significance for Impacts Associated Pressure on Social Infrastructure and Services

Nature and Type: Indirect negative impact

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium

Impact Magnitude: Medium

- **Extent:** Local
- **Duration:** Long term
- **Scale:** Medium
- **Frequency:** Often
- **Reversibility:** Reversible
- **Likelihood:** N/A

IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE NEGATIVE
IMPACT SIGNIFICANCE (POST-MITIGATION): MODERATE NEGATIVE

10.11.3 *Construction and Decommissioning Phase: Impact on Human Health due to Air Emissions and Dust Generation*

Impact Description

Most construction and decommissioning activities generate dust, which settles on surrounding properties and land, and is often more of a nuisance 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 creation of dust associated with vehicle traffic will be limited as most of the roads in the ADI are paved.

Impact Assessment

The impacts on human health due to air emissions and dust generation will be a direct, negative impact. The duration will be short-term, for the duration of the construction phase. The extent of the impact will be local, as the pollutants will be limited in dispersion and will occur onsite and around the main transport routes. Based on the outcomes of the Air Quality Specialist Report, *Section 10.3 of the EIR, and Annex D,* air emissions generated as a result of construction phase activities not expected to have an adverse effect on health, therefore the degree of change experienced by individuals will be negligible and the scale of the impact will be small. The impact is considered reversible. The frequency of the impact will vary depending on construction activities, but it will be often for the duration of the construction phase. Given the above factors, the magnitude of the impact is considered small.

The vulnerability of receptors is considered low as the Project site is located in an industrial area with no sensitive receptors located adjacent to the site. People living along transport routes have access to health care and would be able to seek medical attention if their health was adversely affect by air emissions.

Therefore it is anticipated that the significance of the impact will be **negligible.**

Mitigation

All of the mitigation measures outlined in *Section 10.3 of the EIR, and Air Quality Specialist Report*, *Annex D* must be implemented by the Project.

In addition, the Project will develop and implement a Grievance Mechanism to address stakeholder concerns related to the Project in a timely manner.

Residual Impact

The implementation of mitigation measures will ensure that the impact remains of negligible significance.

Table 10.35 Pre- and Post- Mitigation Significance for Impact on Human Health due to Air Emissions and Dust Generation

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Impact on Human Health due to Air Emissions and Dust Generation	Construction	Negligible	Negligible

Table 10.36 Pre- and Post- Mitigation Significance for Impact on Human Health due to Air Emissions and Dust Generation

Nature and Type: Direct, negative impact

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium

Impact Magnitude: Low

- **Extent:** Local
- **Duration:** Short-term
- **Scale:** Small
- **Frequency:** Often
- **Reversibility:** Reversible
- **Likelihood:** N/A

IMPACT SIGNIFICANCE (PRE-MITIGATION): NEGLIGABLE
IMPACT SIGNIFICANCE (POST-MITIGATION): NEGLIGABLE

10.11.4 *Operations Phase: Impact on Human Health due to Air Emissions*

Impact Description

The operation of the power plant will result in emissions due to the operation of combustion sources mainly the turbines and generators, which could result in decreases in air quality. Emissions of air pollutants from the ArcelorMittal CCGT power plant will result during operations through the combustion of LNG or CNG resulting in NO_X, CO and CO_2 emissions and some methane (CH_4). Increased emissions of any of these pollutants can result in negative implications for human health. Respiratory diseases and cardiovascular diseases are most likely to result. In order to protect human health, air quality standards have been established and emissions below these standards are considered to have a negligible impact on the health of communities.

Exhaust emissions from Project associated 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.

Impact Assessment

The impacts on human health due to air emissions and dust generation will be a direct, negative impact. The duration will be long-term, for the duration of the operation phase. The extent of the impact will be local, as the pollutants will be limited in dispersion, occurring onsite and adjacent to the site, as well as the main transport routes. Based on the outcomes of the Air Quality Specialist Report, *Section 10.3 of the EIR, and Annex D,* for all pollutants the predicted ambient concentrations are well below the respective National Ambient Air Quality Standards (NAAQS). Therefore, air emissions generated as a result of the operation phase is not expected to have an adverse effect on health - the degree of change experienced by individuals will be negligible and the scale of the impact will be small. The impact is considered reversible. The frequency of the impact will be constant, as the power plant will operate 24 hrs a day, 7 days a week. Given the above factors, the magnitude of the impact is considered medium.

The vulnerability of receptors is considered low as the Project Site is located in an industrial area with no sensitive receptors located adjacent to the site. People living along transport routes have access to health care and would be able to seek medical attention if their health was adversely affect by air emissions.

Therefore it is anticipated that the significance of the impact will be **Minor (-ve).**

Mitigation

All of the mitigation measures outlined in *Section 10.3 of the EIR, and Air Quality Specialist Report, Annex D* must be implemented by the Project.

In addition, the Project will develop and implement a Grievance Mechanism to address stakeholder concerns related to the Project in a timely manner.

Residual Impact

The implementation of mitigation measures will ensure that the impact remains of Minor significance.

Table 10.37 Pre- and Post- Mitigation Significance for Impact on Human Health due to Air Emissions and Dust Generation

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Impact on Human Health due to Air Emissions and Dust Generation	Operation	Minor (-ve)	Minor (-ve)

Table 10.38 Pre- and Post- Mitigation Significance for Impact on Human Health due to Air Emissions and Dust Generation

Nature and Type: Direct, negative impact

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low

Impact Magnitude: Medium

- **Extent:** Local
- **Duration:** Long-term
- **Scale:** Small
- **Frequency:** Constant
- **Reversibility:** Reversible
- **Likelihood:** N/A

IMPACT SIGNIFICANCE (PRE-MITIGATION): MINOR
IMPACT SIGNIFICANCE (POST-MITIGATION): MINOR

10.12 *INCREASED NUISANCE FACTORS AND CHANGE IN SENSE OF PLACE*

The Project Site is located within an industrial area, adjacent to the Saldanha Steel facility. The land immediately surrounding the site it utilised for industrial purposes, grazing or is vacant land. Within the broader area, much of the surrounding land to the north and east is utilised for agriculture, nature reserves and recreational activities, residential and holiday homes. There are existing visual intrusions around the Project Site, such as power lines, railway pylons, industrial and port facilities, therefore, the landscape should not be seen as pristine.

The Project will introduce a gas-fired power plant and associated infrastructure such as a substation and Operation and Maintenance (O&M) buildings into the area, within close proximity to existing industrial infrastructure. The construction and operation of the Project will lead to an increase in ambient noise, the generation of dust and increased traffic volumes, all of which have the ability to alter the sense of place of the existing environment.

10.12.1 *Construction, and Decommissioning Phase: Increased Nuisance Factors and Change in Sense of Place*

Impact Description

Impacts associated with air quality, traffic and noise have been assessed by specialists and are discussed in *Section 10.9 of the EIR, the Traffic Assessment Report (Annex D), the Noise Impact Assessment Report (Annex D) and Air Quality Specialist Report (Annex D).*

The Project will cause nuisance of the communities in the ADI due to noise, dust and vibration, as well as increased traffic volumes during construction and decommissioning.

Noise levels are expected to increase as a result of construction activities on site such as trucks that deliver construction equipment and materials; earthworks using heavy machinery, and site preparation, or piling activities if required.

Additional vehicle movements during peak periods are anticipated to be in the order of 600 person trips during the peak hour or 275 cars, the equivalent of 18 minibus taxis and two buses. The minbus taxis and buses will collect and dispatch the workforce in the vicinity of the site, including areas in the ADI (such as Ward 3 and 4) and AII (such as Vredenburg).

The anticipated ambient noise levels during the construction phase of the Project has been modelled and based on the results thereof, it is anticipated that the change in ambient noise levels will be negligible during construction. The construction phase sound levels may impact on the ambient noise levels for an area of 2 500 m from the Project Site, the Site located in an industrial area and ambient noise levels are not going to exceed the 35 dBA guideline at any of the identified receptors.

The increase in traffic volumes will be notable during peak traffic times in the morning and afternoon, and may frustrate other road users, but the increase in traffic will be manageable through the implementation of mitigation measures.

Dust associated with the Project will be largely limited to the Project site.

While each of the above mentioned impacts are considered to be largely manageable, the combined effect of the noise, dust and traffic impacts are likely to have a negative impact on the sense of place for some stakeholders.

Impact Assessment

The impacts associated with increased nuisance factors and change in sense of place during construction and decommissioning will be a direct, negative impact. The duration will be short-term, for the duration of the construction phase. The extent of the impact will be local, limited to the site and immediate surrounds, as well as the local transport routes.

The scale of the impact will be medium. The impact is considered reversible. The frequency of the impact will vary depending on construction activities, but it will be often as it relates to nuisance factors, and constant as it relates to sense of place. Given the above factors, the magnitude of the impact is considered medium.

The vulnerability of receptors is considered small to medium, as traffic volumes in the area are low, and road users will find the increased traffic volumes frustrating. The construction phase sound levels may impact on the ambient noise levels for an area of 2 500 m from the Project site.

Therefore it is anticipated that the significance of the impact will be **Moderate negative.**

Mitigation

All of the mitigation measures outlined in *Section 10.9 of the EIR, the Traffic Assessment Report, the Noise Impact Assessment Report and Air Quality Specialist Report (Annex D)* must be implemented by the Project.

In addition, the Project will develop and implement a Grievance Mechanism to address stakeholder concerns related to the Project in a timely manner.

Residual Impact

The implementation of mitigation measures will result in the impact being of Minor significance.

Table 10.39 Pre- and Post- Mitigation Significance for Increased Nuisance Factors and Change in Sense of Place

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Nuisance due to Noise, Dust and Vibration during Construction and Decommissioning	Construction	Moderate (-ve)	Minor (-ve)

Table 10.40 Pre- and Post- Mitigation Significance for Increased Nuisance Factors and Change in Sense of Place during Construction and Decommissioning

Nature and Type: Direct, negative impact

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium

Impact Magnitude: Medium

- **Extent:** Local
- **Duration:** Short-term
- **Scale:** Medium
- **Frequency:** Often to constant
- **Reversibility:** Reversible
- **Likelihood:** N/A

IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE NEGATIVE
IMPACT SIGNIFICANCE (POST-MITIGATION): MINOR NEGATIVE.

10.12.2 Operation Phase: Increased Nuisance Factors and Change in Sense of Place

Impact Description

The Project will cause nuisance to the communities in the ADI due to noise, dust and vibration, as well as increased traffic volumes during operation. This will affect the communities and households closest to the Project site and along the main access roads, as well as along the routes used to transport the workforce to and from the site on a daily basis.

During operation, the power plant will operate 24 hours a day, seven days a week. It is anticipated that the change in ambient noise levels will be negligible during Phase 1 of the project and low during Phase 2, with the 35dBA ambient guideline been slightly exceeded at two sensitive receptors. This noise will have a more constant characteristic and will be perceived as a humming sound. Operational phase sound levels may impact on the ambient noise levels for an area of 3,000 m from the proposed activity.

The Project associated traffic will decrease during the operations phase as there will be fewer people employed by the Project during this phase. Additional vehicle movements are associated with the commuting of employees to and from work each day. Additional vehicle movements during peak periods are anticipated to be in the order of 177 person trips during the peak hour or 80 cars, the equivalent of 5 minibus taxis and one bus.

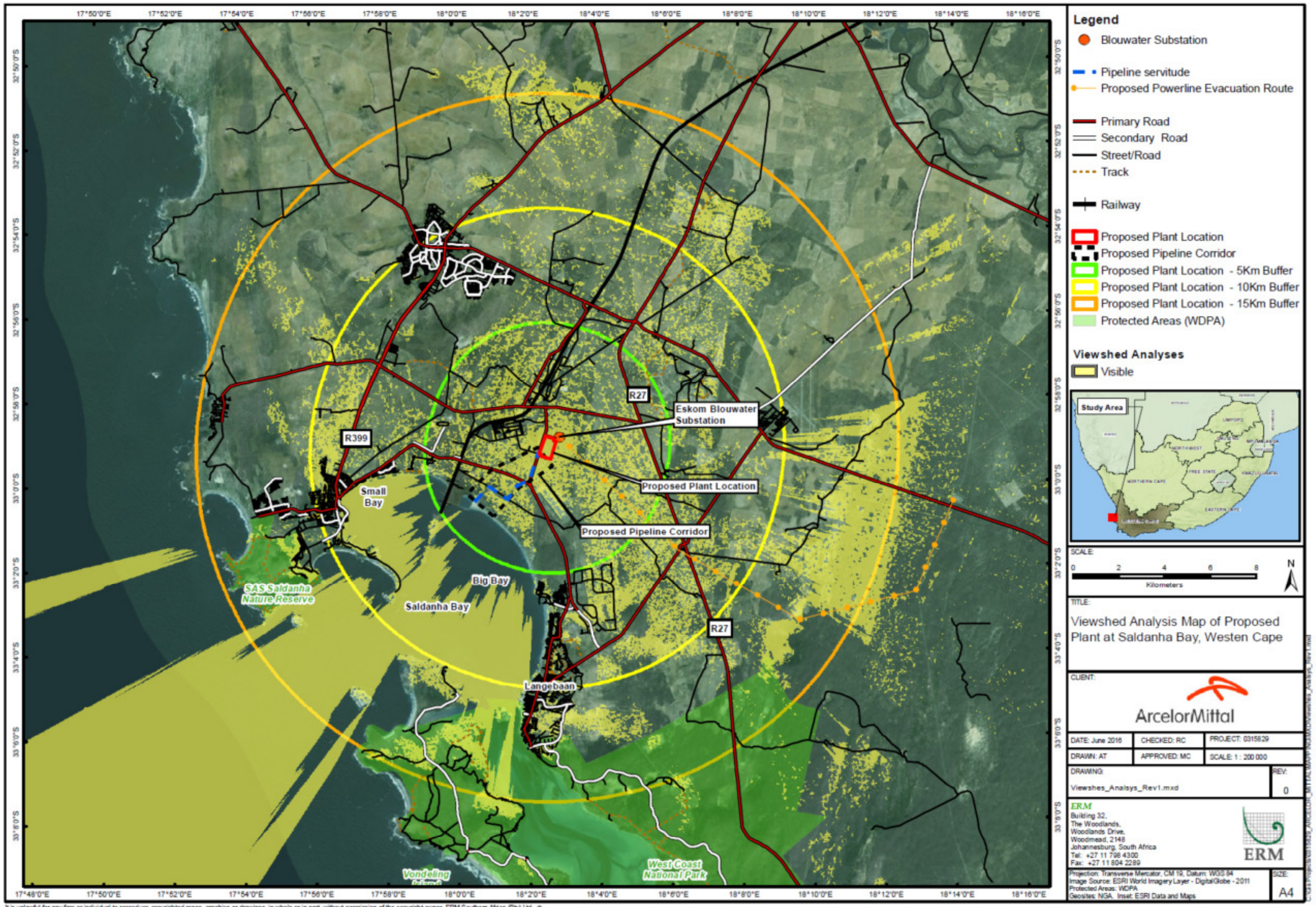
The presence of the Project may alter the visual character of the landscape during the operation phase. While the Project Site is located in an industrial area, there are a number of tourism and recreational areas in the border surrounding areas, as listed above. *Figure 10.14* provides an analysis of the view shed of the Project, i.e. it indicated, based on topography and landscape features, where the Project will be visible from. It does not take into account how visible the how Project will be based on distance from the Project. Based on *Figure 10.14* the Project may be partially visible from some sensitive areas, such as Langebaan, Mykanos, the West Coast National Park. It will also be visible from surrounding residential areas. Based on a Visual Impact Assessment for a similar power plant facility with an estimated height of 40 m in Saldanha Bay (M. Cilliers (PrLArch.) & D. Townshend (BL (UP)), it is noted that the vanishing threshold [(1)] is estimated at 8 km away during the day and 16 km away at night. The proposed facility is located in proximity to the following potentially affected receptors:

- 7 km from Blouwater Bay residential area;
- 8 km from Louwville residential area;
- 6.5 km from Mykonos tourism and recreational facilities;
- 6.5 km from the West Coast Fossil Park;
- 10 km from Langebaan residential area;
- 10 km from Langebaan Weg;
- 13 km from SAS Saldanha Contractual Nature Reserve;
- 14 km from Jacobsbaai residential area; and
- 20 km from the West Coast National Park.

The Project will be visible from a number of tourism and recreational areas, as well as residential area. Given the distance between the Project and the potential receptors (largely in excess of 6 km), it can be concluded that while the Project will be visible, it will not dominate the landscape or detract from the receptors experience in of the area

(1) This is the distance where no discernible impact is observed, even if the proposal is technically still visible.

Figure 10.14 View Shed for the Saldanha Steel Gas-fired Power Plant, not taking into Account Vanishing Threshold



Impact Assessment

The impacts due to increased nuisance factors and change in sense of place during operation will be a direct, negative impact. The duration will be long-term, for the duration of the operation phase. The extent of the impact will be local, limited to the site and immediate surrounds, as well as the local transport routes. It is anticipated that the change in ambient noise levels will be negligible during Phase 1 of the project and low during Phase 2, with the 35dBA ambient guideline being slightly exceeded at two sensitive receptors. The Project will be visible from a number of tourism and recreational areas, as well as residential area. Given the distance between the Project and the potential receptors (largely in excess of 6 km), it can be concluded that while the Project will be visible, it will not dominate the landscape or detract from the receptors experience in of the area. Never-the-less, for those receptors impacted by for increased nuisance factors and change in sense of place the scale of the impact will be medium.

The impact is considered irreversible. The frequency of the impact will be constant for the duration of the operation phase. Given the above factors, the magnitude of the impact is considered medium.

The vulnerability of receptors is considered medium as most sensitive receptors are located in quiet areas, with low ambient noise levels, low traffic volumes, and are people who are attracted to the area for outdoor and recreational activities (particularly in the case of those visiting parks and tourism facilities).

Therefore it is anticipated that the significance of the impact will be **Moderate (-ve).**

Mitigation

The ability to which visual impacts can be managed is limited by the size of the facility and the industry standards governing setbacks and fire control. However, the following measures should be implemented to minimise the impact of lighting at night:

- Lighting should be limited to areas where it is required.
- Lights should be directional and avoid light spillage.
- Low-level lights should be used over flood lights along walkways.

All of the mitigation measures outlined in *Section 10.9 of the EIR, the Traffic Assessment Report the Noise Impact Assessment Report and Air Quality Specialist Report (Annex D)* must be implemented by the Project.

In addition, the Project will develop and implement a Grievance Mechanism to address stakeholder concerns related to the Project in a timely manner.

Residual Impact

The implementation of mitigation measures will result in the remaining of **Moderate negative** significance.

Table 10.41 Pre- and Post- Mitigation Significance for Increased Nuisance Factors and Change in Sense of Place during Operation

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Increased nuisance factors and change in sense of place operation	Operation	Moderate (-ve)	Moderate (-ve)

Table 10.42 Pre- and Post- Mitigation Significance for Increased Nuisance Factors and Change in Sense of Place Operation

Nature and Type: Direct, negative impact

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium

Impact Magnitude: Medium

- **Extent:** Local
- **Duration:** Long-term
- **Scale:** Medium
- **Frequency:** Constant
- **Reversibility:** Reversible
- **Likelihood:** N/A

IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE NEGATIVE
IMPACT SIGNIFICANCE (POST-MITIGATION): MODERATE NEGATIVE.

10.13 WORKER HEALTH AND SAFETY AND RIGHTS

Workers' rights including occupational health and safety need to be considered to avoid accidents and injuries, loss of man-hours, labour abuses and to ensure fair treatment, remuneration and working and living conditions.

These issues will be considered not only for workers who are directly employed by the Project but also contractors (including sub-contractors) and workers within the supply chain. The main risks in relation to worker's management and rights are associated with the use of contractors and subcontractors and the supply chain.

The Project is expected create 450 direct employment opportunities during the peak of the construction period, which will be approximately 48 months in duration. The majority of workers will be engaged by the EPC contractor and will consist of a semi-skilled to skilled workforce. The operation phase is planned for a lifespan of 25 - 30 years and will involve around 95 permanent site employees including skilled and semi-skilled staff.

The expected impacts on worker rights and H&S as a result of construction, operation and decommissioning activities and Project operation are as follows:

- Risk to workers H&S due to hazardous construction and decommissioning activities;
- Risk to workers H&S due to hazardous operation activities; and
- Violation of workers' rights.

This impact assessment is based on the assumption that no specific Project H&S policies, procedures and training provisions are in place for construction workers (both of EPC Contractor and subcontractors) as limited information is available on this at the current Project stage.

10.13.1 Construction and Decommissioning Phase: Risk to Workers' H&S due to Hazardous Construction Activities

Impact Description

The construction activities will involve the following main activities (in order of occurrence):

- Site preparation including levelling;
- Piling of the foundations;
- Concrete works in scope of building construction;
- Construction of fuel supply arrangements;
- Construction of the powerline; and
- Underground pipeline laying.

Details of the activities associated with decommissioning are not yet detailed but will involve removal of all installed infrastructure.

These activities will involve the operation of heavy equipment and trucks, working at height, working in confined spaces, construction traffic, use of electric devices, handling of hazardous materials and other hazardous activities. Due to the nature of the activities being undertaken during construction and decommissioning, worker H&S is a key risk with the potential for accidents that may result in injuries and fatalities as well as lost man-hours.

Within South Africa, worker health and safety falls under the ambit of the Department of Labour, and is primarily governed through the Occupational Health and Safety Act (OSHA) (Act No. 83 of 1993). Employees working informally and those with limited or without awareness of their rights (for example, migrant workers, or those newly entering the labour market) are likely to be most at risk of working in unsafe conditions.

Impact Assessment

The impact on worker health and safety from the Project will be a direct, negative impact. The duration will be short-term, for the duration of the construction phase. The extent of the impact will be regional, as it will affect those directly employed by the Project, as well as people employed in the supply chain. The scale of the impact will be large for anyone adversely affected by a health and safety incident on the Project, as they may experience a temporary loss of work time, or in the worst-case scenario may be rendered permanently unable to work. In most instances, this impact is considered reversible, as incidences can be addressed through medical intervention where required and health and safety can be constantly improved to avoid future incidences. The frequency of the impact will not be uniform, but will likely occur often the duration of the construction phase. The magnitude of the impact is therefore considered Medium.

The vulnerability of the workers to this impact is considered low, as there are laws in place in South Africa to protect worker rights. However, migrant workers, or those newly entering the labour market may not be aware of their rights, and people may be willing to compromise their rights to secure employment in light of high unemployment rates.

The impact is therefore considered to be of Minor - Moderate negative significance.

Mitigation

- The Project will comply with all applicable South African legislation in terms of health and safety, and worker rights, which will include access to workmans compensation for loss of income resulting from an onsite incident.

- As part of the contractor and supplier selection process the Project will take into consideration performance with regard to worker management, worker rights, health and safety as outlined in South African law, international standards and the Project's policies.

- The Project will provide support to contractors and subcontractors to ensure that labour and working conditions are in line with South African law through capacity building.

- Workers will be provided with primary health care and basic first aid at construction camps /worksites.

- Facilities and operations will be developed, planned and maintained such that robust barriers are in place to prevent accidents. All employees have the duty to stop any works if adequate systems to control risks are not in place.

- In line with the worker code of conduct employees should not be under the influence of intoxicants which could adversely affect the ability of that employee to perform the work or adversely affect the health and safety of other employees, other persons or the environment.

- The Project will provide of Personal Protective Equipment (PPE), training and monitoring as well as ongoing safety checks and safety audits.

Residual Impact

Following the implementation of mitigation measures the impact significance will be (post-mitigation) of Minor negative significance**.**

Table 10.43 Pre- and Post- Mitigation Significance for Risk to Workers' H&S due to Hazardous Construction Activities

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Risk to Workers' H&S due to Hazardous	Construction	Minor to Moderate (-ve)	Minor (-ve)

Table 10.44 Pre- and Post- Mitigation Significance for Risk to Workers' H&S due to Hazardous Construction and Decommissioning Activities

Nature and Type: Direct, negative impact

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low to Medium

Impact Magnitude: Low

- **Extent:** Regional
- **Duration:** Short-term
- **Scale:** Large
- **Frequency:** Often
- **Reversibility:** Reversible
- **Likelihood:** N/A

IMPACT SIGNIFICANCE (PRE-MITIGATION): MINOR to MODERATE NEGATIVE
IMPACT SIGNIFICANCE (POST-MITIGATION): Enhancement measures will ensure the impact remains **MINOR NEGATIVE.**

10.13.2 Operation Phase: Risk to Workers' H&S due to Hazardous Operation Activities

Please note: For the operation of the Project the mitigation and prevention measures outlined above for construction (Section 10.13.1) are considered as embedded controls.

Impact Description

Hazardous activities during the operation phase and regular maintenance activities will include, but not be limited to; the operation of heavy equipment and trucks, use of electrical devices including high voltage, working at height, maintenance of high pressure pipework and vessels and handling of hazardous materials. During these activities the workers will be at risk for accidents and injury.

Impact Assessment

The impact on worker health and safety as a result of the Project will be a direct, negative impact. The duration will be long-term, for the duration of the operation phase. The extent of the impact will be regional, as it will affect those directly employed by the Project, as well as people employed in the supply chain. The scale of the impact will be large for anyone adversely affected by a health and safety incident on the Project, as they may experience a temporary loss of work time, or in the worst-case scenario may be rendered permanently unable to work. In most instances, this impact is considered reversible, as incidences can be addressed through medical intervention where required and health and safety can be constantly improved to avoid future incidences. The frequency of the impact will not be uniform, but will likely occur occasionally the duration of the operation phase. The magnitude of the impact is therefore considered small.

The vulnerability of the workers to this impact is considered low, as there are laws in place in South Africa to protect worker rights and most employees will be highly skilled engineers and technicians, who have likely been educated around their rights and H&S practices.

The impact is therefore considered to be of minor significance.

Mitigation

The implementation of mitigation measures defined for the construction phase will continued throughout the operation phase with consideration in the health and safety management system of the specific risks associated with operation and maintenance activities and the new size and structure of the workforce. In this regard, mitigation measures outlined in *Section 10.13.1* above are applicable to the operation.

Residual Impacts

The implementation of mitigation measures will ensure that the significance remains of minor negative significance.

Table 10.45 Pre- and Post- Mitigation Significance for Risk to Workers' H&S due to Hazardous Operation Activities

Impact	Project Phase	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Risk to Workers' H&S due to Hazardous Operation Activities	Operation	Minor (-ve)	Minor (-ve)

Table 10.46 Pre- and Post- Mitigation Significance for Risk to Workers' H&S due to Hazardous Operation Activities

Nature and Type: Direct, negative impact

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low

Impact Magnitude: Low

- **Extent:** Regional
- **Duration:** Long Term
- **Scale:** Large
- **Frequency:** Rare
- **Reversibility:** Reversible
- **Likelihood:** N/A

IMPACT SIGNIFICANCE (PRE-MITIGATION): MINOR NEGATIVE
IMPACT SIGNIFICANCE (POST-MITIGATION): Enhancement measures will ensure the impact remains **MINOR NEGATIVE.**

10.14 *IMPACTS ON ARCHAEOLOGY AND PALAEONTOLOGY*

This Section discusses the potential impacts on heritage resources resulting from the establishment of the gas-fired power plant including physical effects on sites and features of cultural heritage interest and broader landscape.
The expected impacts on cultural heritage resources as a result of construction, operation and decommissioning of the Project are:

- Impacts to Pre-colonial & Colonial Archaeology
- Impacts to Graves and Cairns
- Impacts to buried Palaeontology

10.14.1 *Construction, Operation and Decommissioning: Impacts to Pre-colonial & Colonial Archaeology*

Impact Description

The site clearance, excavation of foundations, road construction, laying of the pipeline and other construction activities have the potential to destroy or damage archaeological and palaeontological resources. The key threat to pre-colonial archaeological remains is the potential impacts to sub-surface remains and these are difficult to predict and to mitigate. The impacts are likely to be most severe during the construction period although indirect impacts may occur during the operational phase of the Project.

Archaeological sites are non-renewable, it is therefore, important that they are identified and their significance assessed prior to development. The main cause of impacts to archaeological sites is direct, physical disturbance of the material itself and its context as an archaeological site is highly dependent on its geological and spatial context.

Impact Assessment

The impacts to pre-colonial & colonial archaeology during construction, operation and decommissioning will be a direct, negative impact. The duration will be permanent as it relates to the loss of pre-colonial & colonial archaeology. The extent of the impact will be local, limited to the Project footprint. The scale of the impact will be medium. The impact is considered irreversible. The frequency of the impact will vary depending on construction activities, but it anticipated that it would be rare given nature of the baseline. Given the above factors, the magnitude of the impact is considered low.

The vulnerability of receptors is considered low as no pre-colonial or colonial period archaeological sites were found during a comprehensive field survey along the pipeline, and in the area identified for the power plant.

Therefore it is anticipated that the significance of the impact will be **Minor negative.**

Mitigation

Should any human burials, archaeological or palaeontological materials (fossils, bones, artefacts etc.) be uncovered or exposed during earthworks or excavations, they must immediately be reported to the Heritage Western Cape must be notified (Telephone: 021 483 9685).

After assessment and if appropriate a permit must be obtained from the SAHRA or HWC to remove such remains.

Residual Impact

The implementation of mitigation measures will result in the impact being of Negligible significance.

Table 10.47 Pre- and Post- Mitigation Significance for Impacts to Pre-colonial & Colonial Archaeology

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Impacts to Pre-colonial & Colonial Archaeology	Construction	Minor (-ve)	Negligible

10.14.2 *Construction, Operation and Decommissioning: Impacts to Graves and Cairns*

Impact Description

The site clearance, excavation of foundations, road construction, laying of the pipeline and other construction activities have the potential to destroy or damage archaeological resources. Graves are typically considered to be of high heritage significance. They are best avoided by development. An extensive consultation process is required if exhumation is considered.

Human remains are protected by a number of legislations including the Human Tissues Act (Act No 65 of 1983), the Exhumation Ordinance of 1980 and the National Heritage Resources Act (Act No 25 of 1999). In the event of human bones being found on site, Heritage Western Cape HWC must be informed immediately and the remains removed by an archaeologist under an emergency permit.

Impact Assessment

Impacts to graves and cairns during construction, operation and decommissioning will be a direct, negative impact. The duration will be permanent as it relates to the loss of graves and cairns. The extent of the impact will be local, limited to the Project footprint. The scale of the impact will be medium. The impact is considered irreversible. The frequency of the impact will vary depending on construction activities, but it anticipated that it would be rare given nature of the baseline. Given the above factors, the magnitude of the impact is considered low.

The vulnerability of receptors is considered low as no evidence of graves or stone cairns were found within the Project footprint.

Therefore it is anticipated that the significance of the impact will be **Minor negative.**

Mitigation

Should any human burials, archaeological or palaeontological materials (fossils, bones, artefacts etc.) be uncovered or exposed during earthworks or excavations, they must immediately be reported to the Heritage Western Cape must be notified (Telephone: 021 483 9685).

After assessment and if appropriate a permit must be obtained from the SAHRA or HWC to remove such remains.

Residual Impact

The implementation of mitigation measures will result in the impact being of Negligible significance.

Table 10.48 Pre- and Post- Mitigation Significance for Impacts to Pre-colonial & Colonial Archaeology

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Impacts to Pre-colonial & Colonial Archaeology	Construction	Minor (-ve)	Negligible

10.14.3 Construction, Operation and Decommissioning: Impacts to buried Palaeontology

Impact Description

The site clearance, excavation of foundations, road construction, laying of the pipeline and other construction activities have the potential to destroy or damage palaeontological resources.

A fossil record along the entire project area does not exist. However, based on the distribution and nature of known sites, sufficient information is available to make at least general assumptions of what may be expected in many areas. It is noted, however, that sub-surface palaeontological potential cannot properly be assessed superficially without digging.

It is entirely possible that excavations into sediments not normally accessible to palaeontologists will be encountered in sub-surface deposits of the Langebaan and Velddrif Formations. However, rather than treating this as a negative, implementation of appropriate management may enable observations otherwise impossible to be made and provide opportunities to recover important fossil material.

Portions of the proposed project area have been heavily disturbed by agriculture and these surfaces have been adequately covered during the foot survey, without revealing Palaeontological or Pleistocene archaeological remains other than terrestrial molluscs and insect burrows; these latter are ubiquitous and will have no effect on the project.

Table 10.49 Impact Characteristics: Impacts to buried Palaeontology

Characteristic	Description
Activity	Construction, operation and decommissioning activities.
Aspect	The site clearance, excavation of foundations, road construction, laying of the pipeline
Impact	Construction activities particularly have the potential to destroy or damage palaeontological resources
Impact Type	Indirect negative impact
Resource or Receptor	Palaeontological resources

Impact Assessment

Impacts to buried Palaeontology during construction, operation and decommissioning will be a direct, negative impact. The duration will be permanent as it relates to the loss of palaeontological resources. The extent of the impact will be local, limited to the Project footprint. The scale of the impact will be large. The impact is considered irreversible. The frequency of the impact will vary depending on construction activities, but it anticipated that it would be rare given nature of the baseline. Given the above factors, the magnitude of the impact is considered large.

The vulnerability of receptors is considered high, despite the fact that no palaeontological or Pleistocene archaeological remains were observed on the surface, sub-surface findings may be revealed through Project activities.

Therefore it is anticipated that the significance of the impact will be **Major negative.**

Mitigation

- Sub-surface excavations should be monitored by a palaeontologist or archaeologist with appropriate palaeontological knowledge. The frequency of this to be worked out a priori with the contractor to minimise time spent on site.
- Any material recovered will be lodged in the Cenozoic collections of Iziko South African Museum.
- If any palaeontological material is uncovered, permit for the disturbance and removal of palaeontological material will be required from the Western Cape Provincial Heritage Agency.
- Training in the nature and value of palaeontological and archaeological remains should be provided to project staff and equipment operators.
- Should anything of a palaeontological nature be encountered on site by the Contractor (or any other party), e.g. bones or wetland deposits, work is to be stopped in that area immediately, and the OM / Principal Agent notified. Failure to do so will result in a penalty and this must be carefully explained to workers during the Environmental Education Programme undertaken by the OM.

- In the event of palaeontological material being encountered, the OM will demarcate the area and notify the appointed specialist (palaeontologist/ archaeologist with appropriate experience) who will view the material and ascertain whether further study of the area is required.
- Should the specialist confirm a genuine fossil or sub-fossil and recommend further study of the area, work in the applicable area is to cease until further notice while arrangements are put in place. Heritage Western Cape (HWC) is to be informed immediately by the OM (Telephone: 021 483 9685).

Residual Impact

The implementation of mitigation measures will result in the impact being of Negligible significance.

Table 10.50 Pre- and Post- Mitigation Significance for Impacts to buried Palaeontology

Impact	**Project Phase**	**Significance (Pre-mitigation)**	**Residual Impact Significance (Post-mitigation)**
Impacts to buried Palaeontology	Construction	Major (-ve)	Negligible

10.15 Risk Assessment

10.15.1 Introduction

The major hazards considered in a risk assessment are generally one of three types: flammable, reactive or toxic. With reference to the Project, only flammable hazards which may result from the loss of containment of the flammable Natural Gas being transferred in the pipelines (during operation), or the Propane from storage at the power station (highest concentrations during the second year of construction, but continued risk during operation), have been identified. Flammable hazards may manifest as high thermal radiation from fires and overpressures following explosions that may cause direct damage, building collapse, etc. These hazards pose a risk to current and future land uses and individuals.

Impacts that have been assessed as part of this section of the report therefore are:

- Land use planning impact for the construction phase;
- Risk to individuals for the construction phase;
- Land use planning risk posed by the pipelines during the operational phase;
- Land use planning risk posed by the propane storage facility during the operational phase; and
- Risk to individuals for the operational phase.

This introduction sets out the relevant legislation and guidelines for the assessment of these impacts and provides the baseline context which informs the assessment of all of these.

Relevant legislation and guidelines

The Occupational Health and Safety Act in South Africa offers the Major Hazard Installation regulations which govern major accidents in South Africa. These regulations do not currently offer criteria with which to assess the acceptability of developments from a major accident risk perspective. Therefore the risk criteria used are based on those adopted by the Health and Safety Executive (HSE) in the United Kingdom. This methodology is internationally recognised and accepted as a basis for risk management.

The HSE has developed different sets of risk criteria for different applications. One role that the HSE fulfils in the UK is to advise on development of land in the vicinity of existing major hazard installations. For this purpose the HSE uses its so-called land use planning (LUP) criteria. Another set of criteria is used by the HSE to judge the acceptability of risk from existing major hazard installations. These are known as risk tolerability criteria.

The individual risk tolerability criteria will also be used to assess whether the risks posed by the Natural Gas pipelines or Propane generator are acceptable to individuals in the vicinity of the pipeline servitude.

Land Use Planning Around Hazardous Installations

A three zone system is applied in the HSE approach - Inner Zone, Middle Zone and Outer Zone, with the outermost extent of the Outer Zone referred to as the Consultation Distance (CD). In combination with this, land-uses are classified according to Sensitivity Level, with Sensitivity Level 1 (typically places of work) being the least sensitive and Sensitivity Level 4 (typically large schools or hospitals) being the most sensitive. A set of rules (in the form of a 'decision matrix') is applied to determine which land-uses are appropriate for which zones.

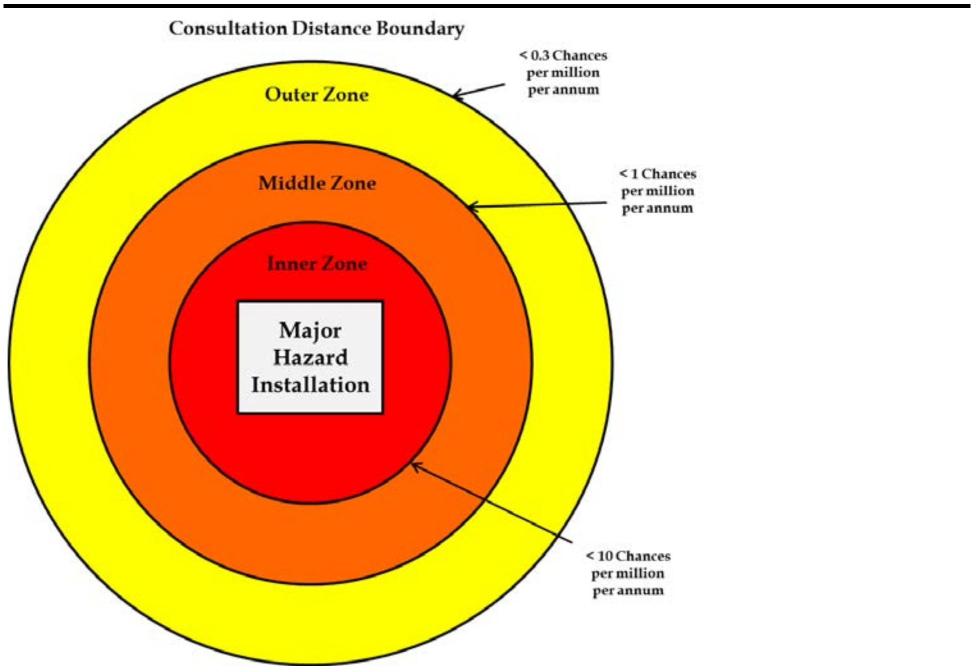
In practice, the zones are related to the risk of an individual being exposed to a dangerous dose or load which would "...cause severe distress to almost everyone, many [would] require medical treatment, some [would] be seriously injured and highly vulnerable people might be killed". This approach appreciates the general public's aversion not only to fatality but also to injury and other distress (i.e. the concept of harm), and is distinct from approaches solely related to fatality.

The zones for an individual being harmed from exposure to flame/heat, explosion overpressure, toxic gas or asphyxiant (i.e. a specified frequency of receiving a dangerous dose) have been set to correspond to the following risk levels:

- Inner Zone - 10 chances per million per year (1×10^{-5});
- Middle Zone - 1 chance per million per year (1×10^{-6}); and
- Outer Zone (Consultation Distance) - 0.3 chances per million per year (3×10^{-7}).

Examples of the various zones for major hazard sites are shown in *Figure 10.15.*

Figure 10.15 Land Use Planning Consultation Zones around Hazardous Sites



In November 2001 the UK HSE modified its zoning criteria. These are summarised in *Table 10.51* with proposed developments categorised as either 'advise against' (AA) or 'don't advise against' (DAA).

Table 10.51 Land-use Sensitivity to Risk

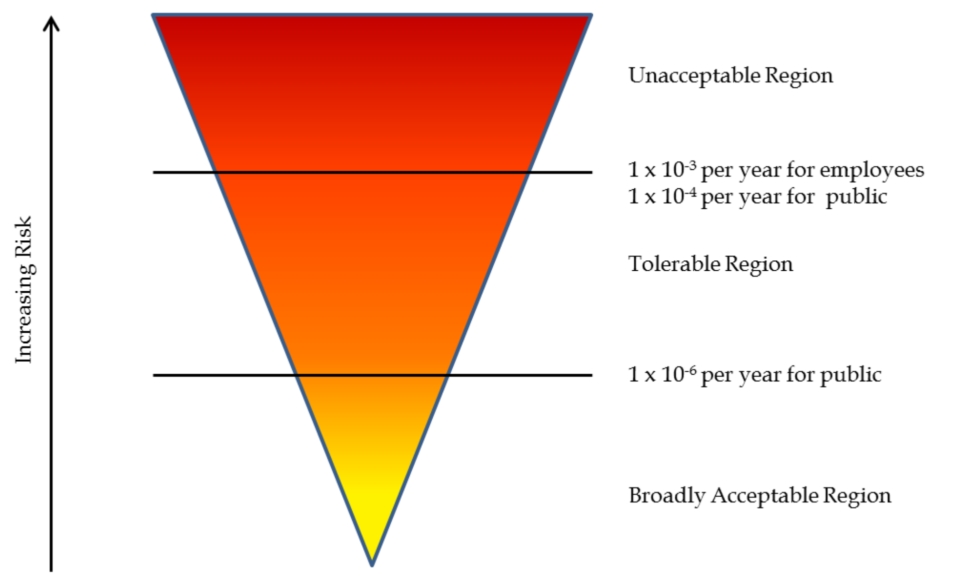
Level of Sensitivity	Inner Zone	Middle Zone	Outer Zone
1. The normal working public	DAA	DAA	DAA
2. The general public at home	AA	DAA	DAA
3. Vulnerable members of the public (schools, hospitals, etc.)	AA	AA	DAA
4. Large examples of No 3 & large outdoor examples of No 2 (i.e. recreational areas)	AA	AA	AA

Individual risk tolerability criteria

The HSE risk tolerability criteria are used to judge the acceptability of the risks from existing MHIs or pipeline servitudes. In the HSE tolerability of risk framework [1], risk levels are divided into three bands of increasing risk, as shown in *Figure 10.16.*

In the lowest band, within the 'broadly acceptable' region, the risk is considered to be insignificant and adequately controlled. Risks that are within the 'unacceptable' level fall into the uppermost band. In such cases, either action should be taken to reduce the risk levels, or the activity giving rise to the risk should be halted. Between the unacceptable and broadly acceptable regions, the risk is considered to be tolerable if it is As Low As Reasonably Practicable (ALARP). The risk is ALARP when the cost of any further risk reduction measures would be grossly disproportionate to (i.e. much greater than) the benefits gained.

Figure 10.16 HSE Risk Criteria Framework



The individual risk is the risk to which a hypothetical person (usually with defined characteristics and behaviour pattern) is exposed. The HSE criteria[1] are stated in terms of individual risk of fatality for two types of hypothetical person: a person who is engaged in the industrial activity under consideration (e.g., an employee); and a person who is not involved in the activity (e.g., a member of the public).

The HSE has provided individual risk values corresponding to the boundaries between the different regions indicated in *Figure 10.16*. These are summarised in *Table 10.52.*

(1) HSE (2001). Reducing Risks, Protecting People. HSE Books, C100.

Table 10.52 Individual Risk Criteria

Level	Individual Risk to Personnel Engaged in the Activity (/yr)	Individual Risk to People not Engaged in the Activity (/yr)
Unacceptable	Greater than 1 in 1,000 (10^{-3})	Greater than 1 in 10,000 (10^{-4})
Broadly Acceptable	No greater than 1 in 1,000,000 (10^{-6})	No greater than 1 in 1,000,000 (10^{-6})

Baseline conditions

Typically, quantitative risk assessments (QRAs) require information regarding the ambient temperatures, wind speed, wind direction and stability class.

Site-specific wind speed data were obtained for the Port of Saldanha. It is understood that to date no weather stations in South Africa measure both wind speed and atmospheric stability categories. Therefore, ERM selected the following stability classes and wind speed scenarios as being considered representative for modelling purposes:

- C4 – meaning a stability class of C (slightly unstable conditions) where the wind speed is greater than 4 m/s.

- C8 - meaning a stability class of C (slightly unstable conditions) where the wind speed is greater than 8 m/s.

The above weather scenarios reflect a conservative daytime weather condition.

- F2 – meaning a stability class of F (moderately stable) where the wind speed is less than or equal to 2 m/s. This class is often used by the US Environmental Protection Agency for determining worse case scenarios for vapour cloud dispersion consequence analysis. F2 gives a conservative night time weather condition.

Selecting the above categories gives an average and a 'worst case' condition for the risk assessment study.

The average ambient temperature and humidity for Saldanha Bay were obtained from www.weatherbase.com. A summary of the data is as follows:

- Average ambient temperature is 15.9 °C; and
- Average relative humidity is 78 %.

The area around the proposed Natural Gas pipelines' route and CCGT power plant site includes the following land uses:

- Sensitivity Level 1: The Saldanha Port area and the access road running adjacent to the CCGT power plant site as this is a single lane road; and

- Sensitivity Level 2: MR559 which is crossed by the pipelines as this is a dual carriageway.

The following built-in mitigation has been considered in this assessment:

- Multiple (at least two) safety systems will be implemented for Propane offloading. Such systems include wheel chocks, interlock brakes, interlock barriers, etc. In addition the site will implement an effective pull away mitigation system and inspection and pressure/leak tests to prevent transfer system leaks and bursts.

Based on the Risk Assessment undertaken (see *Annex D*), the following potential impacts have been assessed in this section:

- Land Use Planning Impact for the Construction Phase;
- Risk to Individuals for the Construction Phase;
- Land Use Planning Impact for the Operational Phase for the Natural Gas Pipelines;
- Land Use Planning Impact for the Operational Phase for the Propane Generator Installations; and
- Risk to Individuals for the Operational Phase.

Proposed Mitigation

The following mitigation is proposed for the Natural Gas pipelines and the Propane storage in order to minimise potential impacts. Impacts are assessed in the sections that follow.

<u>Mitigation measure(s) for the proposed Natural Gas Pipelines</u>

The following proposed engineering design features that reduce risks should be implemented:

- The pipelines should be designed to an international standard such as:
    - BS EN 14161: Petroleum and natural gas industries – Pipeline transportation systems;
    - ASME B31.8 Gas Transmission and Distribution Piping Systems; or
    - Other internationally recognised standards.

- The pipelines' wall thickness should be designed to accommodate the maximum operating pressure of 90 barg with a suitable safety factor;

- Isolation valves should be located at least at either end of the pipelines but ideally at intervals such that in the event of a leak only small amounts of Natural Gas would be released;

- Leak prevention systems such as cathodic protection and pipeline coatings suitable for the ground conditions should be implemented;

- The pipelines should include an emergency shutdown system that will shut emergency isolation valves and depressurise the pipelines safely;
- Areas of road crossing shall include specific protection measures to account for the weight from road traffic;

- A Leak detection system should be considered for the pipelines;

- The installation of non-return valves on the pipelines should be considered;

- Depth of burial of the pipelines along their length should be equal to, or greater than the minimum depth of burial specified;

- Potential other risk reduction measures include concrete sheathing, tiles above pipelines, marker tape above pipelines, route marker posts etc; and

- Emergency response plan for the pipeline must be compiled with the user of the pipelines and the Local Authority together.

The following protective measures should be put in place to reduce the risks:

- Third party interference protection measures should be included. These should differentiate between accidental interference (which can be protected against with safety marker tape, regular aboveground pipeline markers, etc) and deliberate interference (which can be protected against with regular pipeline surveys, ground disturbance early warning systems, etc);

- All Natural Gas processing areas should be equipped with gas detectors with appropriate logic that can initiate emergency shutdown of Natural Gas operations and even the pipelines if necessary;

- All of the automatic safety systems shall be designed so that they can also be manually activated.

Specific mitigation measures identified by the specialist include:

- Ensuring compliance with all statutory requirements (i.e. pipeline designs);

- Ensuring compliance with applicable South African National Standards (i.e. SANS 10087, etc.);

- Incorporating applicable guidelines or equivalent international recognised codes of good design and practice into the designs;

- Completing recognised processes of hazard analysis processes (HAZOP, FMEA, SIL, LOPA etc.) for the proposed CCGT power plant prior to construction to ensure design and operational hazards have been identified and adequate mitigation has been considered;

- Ensure any amendments to the current design specifications are captured in amendments to the EIA and relevant specialist studies; and

- Ensuring a Major Hazard Installation (MHI) risk assessment is carried out for the facility after detailed designs have been completed for the pipelines and CCGT power plant in accordance with the Major Hazard Installation regulations;

Mitigation measure(s) for the proposed Propane generator installations on the CCGT power plant site

The following proposed engineering design features that reduce risks should be implemented:

- The installation must comply with all the requirements of SANS 10087-3:2015 *The handling, storage, distribution and maintenance of liquefied petroleum gas in domestic, commercial, and industrial installations Part 3: Liquefied petroleum gas installations involving storage vessels of individual water capacity exceeding 500 L*;

- The Propane storage vessel shall be fitted with pressure relief valves, which would only lift when the vessel has reached its maximum operating pressure or level;

- All piping shall be rated to accommodate the required operating pressure of the system and allow for pressure relief to a safe area;

- All pressure relief systems should vent away from the generator air intake system;

- The Propane vessel shall be filled with sparge pipes in the vapour space to limit reverse flow to the off-loading point as well as preventing vessel stresses due to uneven temperature;

- All instrumentation and electrical equipment shall be specified in accordance to the Hazardous Area classification as per SANS 10108;

- Off-loading of Propane shall be done on a fully-automated system to prevent overfilling;

- Off-loading safety systems such as earthing of the road tanker are required;

- Emergency shutdown (ESD) shall be provided that would automatically shut down systems such as feed or off-loading pumps and emergency shut off valves in the event of an emergency; and

- Emergency shutdown should be initiated by local operators, CCGT control room operators as well as by gas detectors where appropriate.

The following protective measures should be put in place to reduce the risks:

- Active or passive fire protection on the Propane storage bullet in line with SANS 10087-3:2015;

- Propane road tanker offloading deluge system to cool equipment in the event of a fire if required by SANS 10087-3:2015;

- Gas detectors with appropriate logic which can initiate emergency shutdown;

- All of the automatic safety systems shall be designed so that they can also be manually activated;

- Procedures should ensure at least one person be present during Propane offloading;

Specific mitigation measures identified by the specialist include:

- Ensuring compliance with applicable South African National Standards (i.e. SANS 10087-3:2015, etc.);

- Incorporating applicable guidelines or equivalent international recognised codes of good design and practice into the designs;

- Completing recognised processes of hazard analysis processes (HAZOP, FMEA, SIL and LOPA etc.) for the proposed CCGT power plant prior to construction to ensure design and operational hazards have been identified and adequate mitigation has been considered;

- Ensure any amendments to the current design specifications are captured in amendments to the EIA and relevant specialist studies; and

- Ensuring a Major Hazard Installation (MHI) risk assessment is carried out for the facility after detailed designs have been completed for the pipelines and CCGT power plant in accordance with the MHI regulations.

10.15.2 Risk Assessment: Land Use Planning Impact for the Construction Phase

Impact Description

This impact will pose the maximum risk in the second year of the construction phase of the project when there will be the highest usage of the propane storage facility. Natural gas will not yet be in use on the Project site at that time and thus there will be no risk posed by the pipelines during this phase of the Project.

The main hazards associated with potential releases of Propane from the Propane storage facility are jet fires (immediate ignition), flash fires (delayed ignition) and explosions (delayed ignition of the gas or vapour in a confined space). The hazards may be realised due to leaks/failures in the Propane storage vessel, off-loading road tankers or associated equipment, all of which can release significant quantities of flammable materials on failure. This would result in human exposure via thermal radiation and overpressures.

As the planned construction period in the second year is expected to consume the most Propane, this scenario has been modelled for the assessment of this impact.

Impact Assessment

Risk model outcome

The Land Use Planning risk contours for the Propane generator operations during the second year of construction are shown in *Figure 10.17*.

The risk associated with the increased Propane consumption during the second year of construction results in an area outside the power plant site falling within the 1×10^{-5} contour and therefore falling within the Inner Zone. This area extends approximately 110 m to the west and 40 m to the north of the CCGT site boundary. Therefore no Level 2, Level 3 or Level 4 developments should be allowed within this area during the second year of construction.

From the figure it can be seen that an area outside the power plant site falls within the 1×10^{-6} contour and therefore is within the Middle Zone. This area extends approximately 120 m to the west and 50 m to the north of the CCGT site boundary. Therefore no Sensitivity Level 3 or Level 4 developments should be allowed within this area during the second year of construction. No Sensitivity Level 3 or 4 land uses exist in the surrounding area.

From the figure it can be seen that an area outside the power plant site falls within the 3×10^{-7} contour and therefore is within the Outer Zone. This area extends approximately 140 m to the west and 60 m to the north of the CCGT site boundary. Therefore no Sensitivity Level 4 developments should be allowed within this area during the second year of construction. No Sensitivity Level 4 land uses exist in the surrounding area.

The current land uses within these areas result in the risk level being classified as 'don't advise against' during the second year of construction according to the land use planning criteria. Future land uses around the CCGT power plant site within the second year of construction should adhere to those of *Table 10.51* for risk contours presented in *Figure 10.17*.

The hazards as described above, would result in a direct negative type of impact on the natural vegetation, structures, employees and people in the immediate area. The duration would be temporary as such hazards would be of short duration and only happen occasionally, if at all. The extent for the impact is local.

The scale of the hazard effects of a dangerous dose as defined earlier, from the Propane generator installations are as follows:

- Jet Fire: 173 m;
- Flash Fire: 239 m;
- Vapour Cloud Explosion: 13 m; and
- Boiling Liquid Evaporating Vapour Explosion / Fireball: 114 m.

If facilities and equipment are designed to the prescribed specifications and standards, the likelihood of such an event occurring is considered **unlikely**.

The area surrounding the proposed CCGT power plant site is similarly unused with the exception of a small access road. Therefore, this land use sensitivity is also categorised as low.

Box 10.15 Land Use Planning Impact for the Construction Phase

Nature and Type: Negative direct

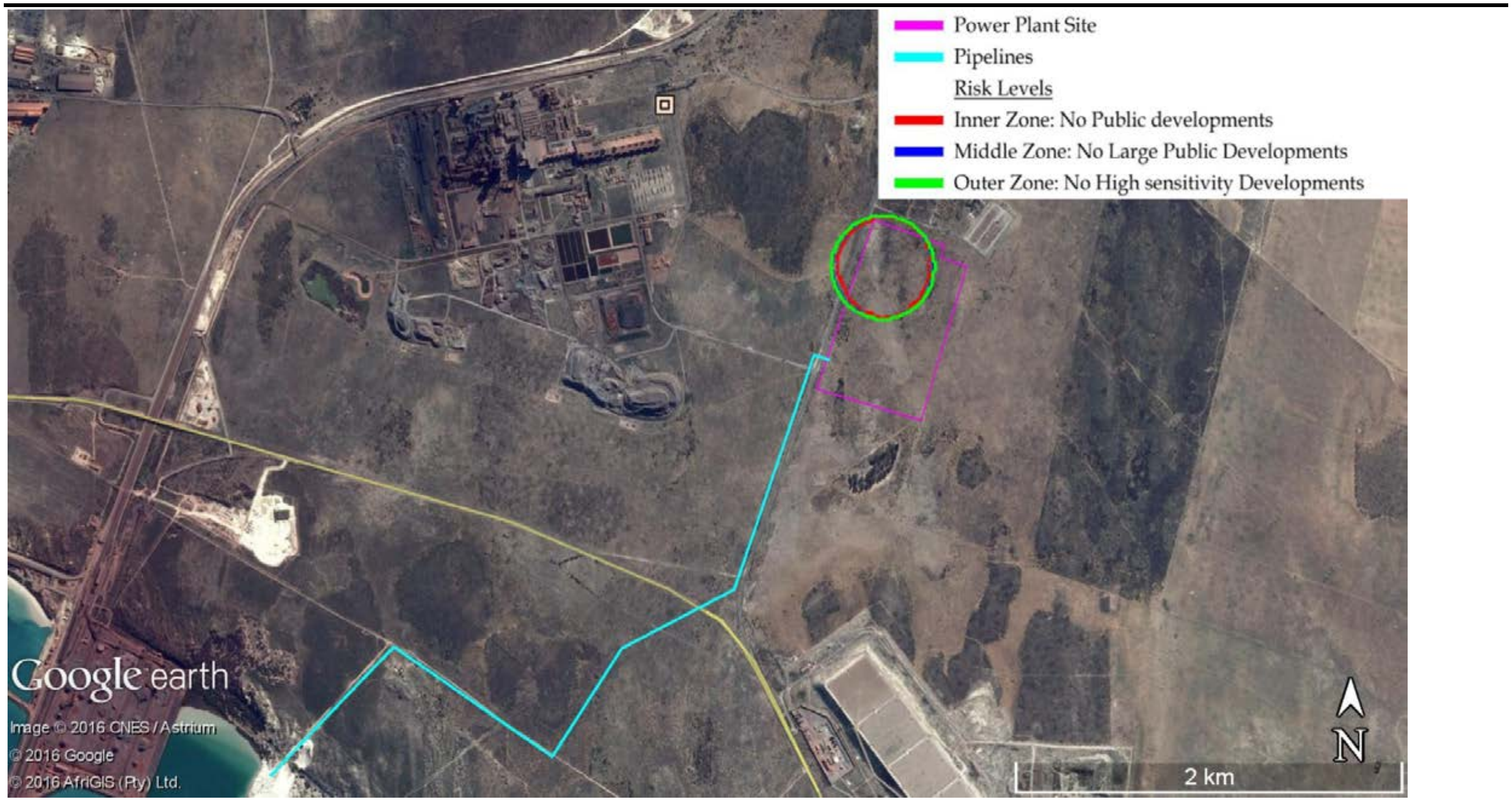
Sensitivity/Vulnerability/Importance of Resource/Receptor: Low

Impact Magnitude: Low

- **Extent:** Local
- **Duration:** Temporary
- **Scale:** The largest hazard effects to Dangerous Dose are 239 m. The largest land use restriction extends 140 m to the west and 60 m to the north of the CCGT site boundary, centred on the Propane generator.
- **Likelihood:** Unlikely

IMPACT SIGNIFICANCE (PRE-MITIGATION): NEGLIGIBLE
IMPACT SIGNIFICANCE (POST-MITIGATION): With mitigation, as detailed in Section 10.15.1, this impact remains **NEGLIGIBLE**

Figure 10.17 Contours for Land Use Planning for Saldanha Steel Natural Gas Pipelines and Propane backup generator with High Propane Consumption during the Second Year of Construction



10.15.3 *Risk Assessment: Risk to Individuals for the Construction Phase*

Impact Description

The main hazards associated with potential releases of Propane from the Propane storage facility are jet fires (immediate ignition), flash fires (delayed ignition) and explosions (delayed ignition of the gas or vapour in a confined space). The hazards may be realised due to leaks/failures in the Propane storage vessel, off-loading road tankers or associated equipment, all of which can release significant quantities of flammable materials on failure. This would result in human exposure via thermal radiation and overpressures.

As the planned construction period in the second year is expected to consume the most Propane and therefore presents the highest risk for the construction phase of the Project, this scenario has been modelled for the assessment of this impact.

Impact Assessment

<u>Risk model outcome</u>

Individual risks are by definition specific to individuals and need to take into account the extent and circumstances under which exposure arises. For instance, the risk will depend on the amount of time the individual spends outdoors as well as the time they may spend indoors which will afford them some protection. Risks are calculated for hypothetical persons located outdoors and indoors.

The risk contours presented in this section represent Location Specific Individual Risk (LSIR).It should be noted that the LSIR relates to an individual who is permanently exposed 24 hours a day 365 days a year. This is therefore an overestimate of the individual risk to personnel or public who may be present at these locations.

Individual risks of fatality contours for persons located outdoors and indoors at 1×10^{-6}, 1×10^{-5}, 1×10^{-4} and 1×10^{-3} for the Propane installation were calculated.

The areas surrounding the proposed developments that fall between the 1×10^{-6} contour and the 1×10^{-4} contour are small areas to the north and west of the CCGT power plant site. As the risk exceeds 1×10^{-6} but does not exceed the 1×10^{-4} risk level, the LSIR for the pipelines and Propane backup generator for persons located outdoors in these areas is not considered intolerable. The risks can only be considered tolerable if they can be demonstrated by the site to be As Low As Reasonably Practicable (ALARP).

The 1×10^{-4} contour exists for the area centred on the Propane backup generator. This contour does not extend offsite, therefore only workers involved in the construction and operation of the CCGT power plant are exposed to this risk level and this is not considered intolerable according to the risk criteria. The risks can only be considered tolerable if they can be demonstrated by the site to be As Low As Reasonably Practicable (ALARP).

The 1 x 10^{-3} LSIR contour do not exist for individuals located outdoors, therefore the risk is below these levels.

Areas located beyond the 1 x 10^{-6} contour would be considered 'broadly acceptable'. The risks posed to areas located between the 1 x 10^{-6} contour and the 1 x 10^{-4} contour would be considered tolerable if they can be proved to be ALARP by the Propane installation operator. The risks posed to non-Natural Gas operational personnel and establishments as well as sensitive areas within the 1 x 10^{-4} contour are considered intolerable. The LSIR contours for individuals located outdoors and indoors for the proposed Propane backup generator during the second year of construction are shown in *Figure 10.18* and *Figure 10.19* respectively.

Figure 10.19 represents the LSIR for hypothetical persons located indoors for the Propane generator during the second year of construction. Areas located off the power plant site have an individual risk higher than 1 x 10^{-6}. As the risk exceeds 1 x 10^{-6} but does not exceed 1 x 10^{-4}, the LSIR for the Propane backup generator for persons located outdoors in these areas is not considered intolerable according to the risk criteria. The risks can only be considered tolerable, however, if they can be demonstrated by the site operator to be ALARP.

The 1 x 10^{-3} LSIR contour does not exist for individuals located indoors, indicating that the risk is lower than this level.

The general public sensitivity is categorised as medium while worker sensitivity is categorised as low, given that workers are more aware of the risks and adequately prepared to handle them as a result of emergency planning, PPE etc.

The hazards, as described above, would result in a direct negative type of impact on the natural vegetation, structures, employees and people in the immediate area. The duration would be temporary as such hazards would be of short duration and only happen occasionally, if at all. The extent for the impact is local.

The scale of the hazard effects of a Dangerous Dose as defined earlier from the Propane generator installations are as follows:

- Jet Fire: 173 m;
- Flash Fire: 239 m;
- Vapour Cloud Explosion: 13 m; and
- Boiling Liquid Evaporating Vapour Explosion / Fireball: 114 m.

Figure 10.18 Contours for Individual Risk of Fatality for Saldanha Steel Propane Storage Facility during the Second Year of Construction – Persons Located Outdoors

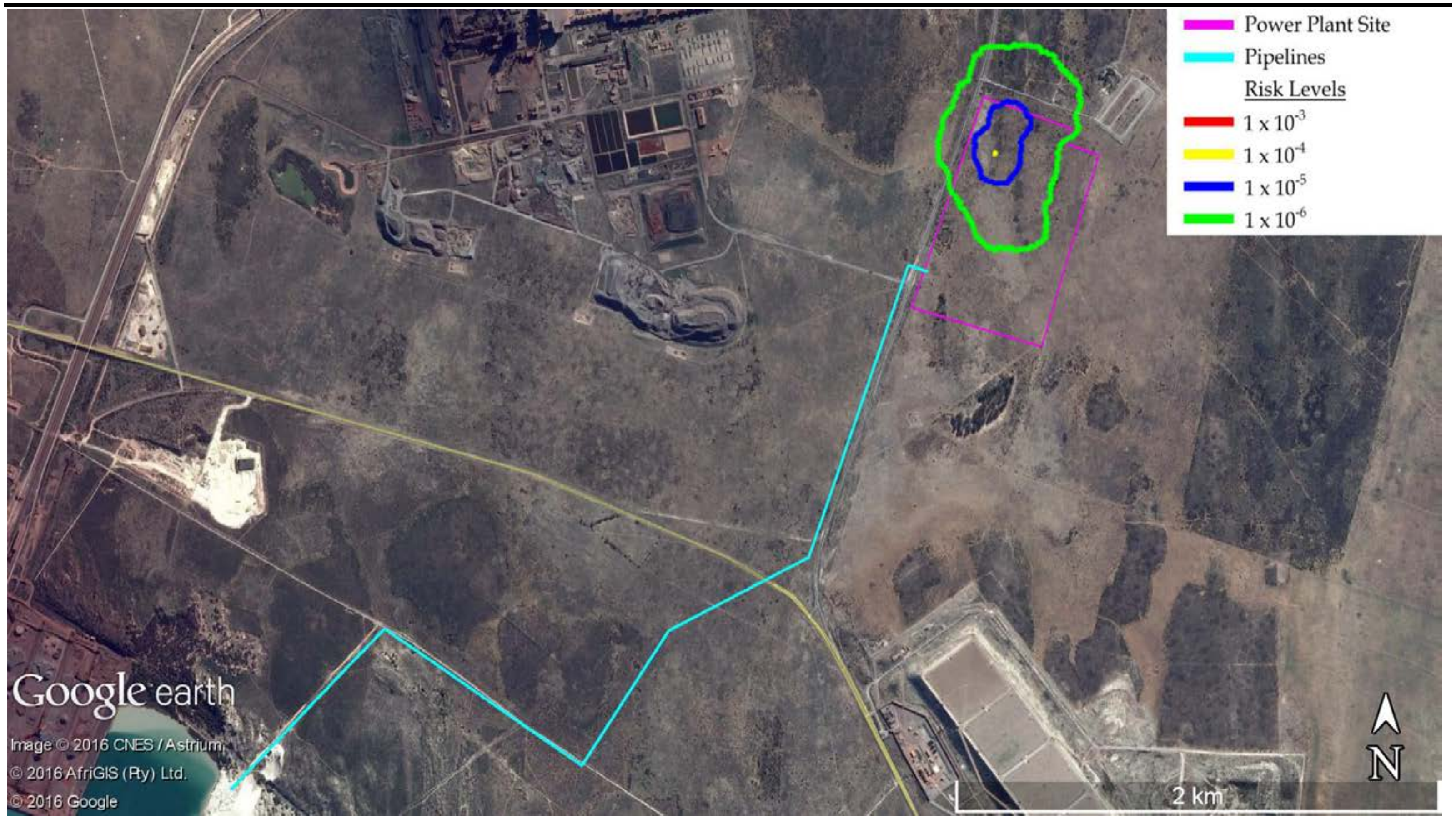


Figure 10.19 Risk Contours for Individual Risk of Fatality for Saldanha Steel Propane Storage Facility during the Second Year of Construction – Persons Located Indoors

If facilities and equipment are designed to the prescribed specifications and standards, the likelihood of such an events occurring is considered **unlikely**.

Box 10.16 Risk Assessment: Risk to Individuals for the Construction Phase

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium for Public Area; Low for Workers;

Impact Magnitude: High

- **Extent:** Local
- **Duration:** Temporary
- **Scale:** The largest hazard effects to Dangerous Dose are 239 m. The largest LSIR contours extend 360 m to the west, 320 m to the north and 80 m to the east of the CCGT site boundary, centred on the Propane generator. The area considered intolerable for the general public extends 60 m to the north of the CCGT site boundary. An area centred on the Propane generator is considered intolerable for workers.
- **Likelihood:** Unlikely

IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE
IMPACT SIGNIFICANCE (POST-MITIGATION): With mitigation, as detailed in Section 10.15.1, this impact remains **MODERATE**

10.15.4 Risk Assessment: Land Use Planning Impact for the Operational Phase for the Natural Gas Pipelines

Impact Description

The main hazards associated with potential releases of natural gas from the pipelines are jet fires (immediate ignition), flash fires (delayed ignition) and explosions (delayed ignition of the gas or vapour in a confined space). This would be caused by leaks/failures in the pipelines. This would result in human exposure via thermal radiation and overpressures.

Impact Assessment

Risk model outcome

The LUP risk transect for the pipelines in the general public area are shown in *Figure 10.20* and in the Transnet Port Authority (TPA) area are shown in *Figure 10.21*. Third party activity in the TPA area is likely to be lower than elsewhere along the pipeline route due to strict access controls. A modifier has therefore been added to reduce the likelihood of third party activity.

Figure 10.20 Risk Transect for the General Public for Land Use Planning for Saldanha Steel Natural Gas Pipelines

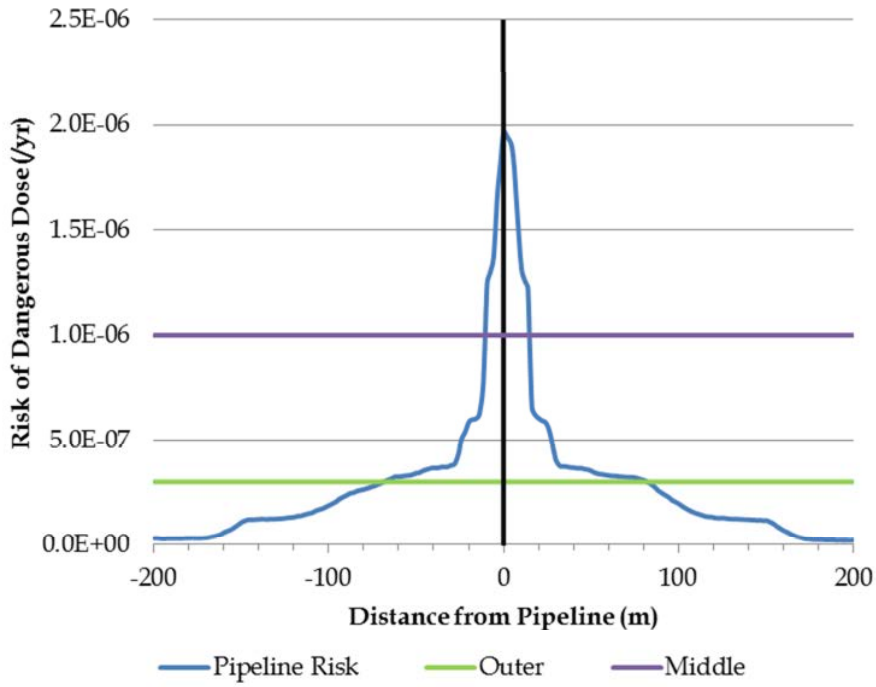
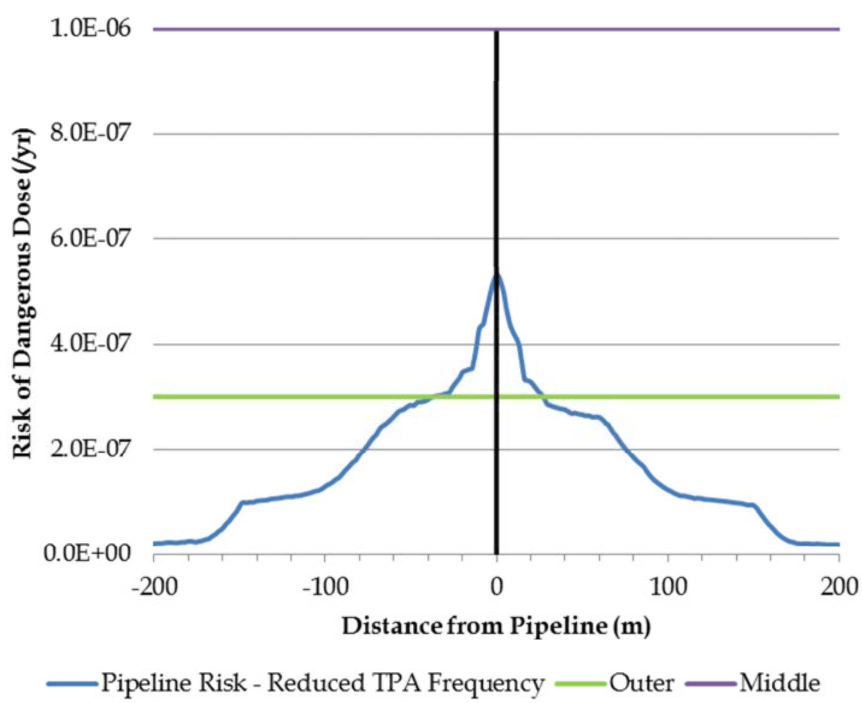


Figure 10.21 Risk Transect for Land Use Planning for Saldanha Steel Natural Gas Pipelines with Reduced TPA Frequency in the Port Area



The area of the Natural Gas pipelines that is accessible to the general public has a risk level within the Middle Zone which is approximately 10 m to either side of the pipelines. Therefore no Level 3 or Level 4 developments should be allowed within 10 m of the centre line of the pipeline servitude. No Sensitivity Level 3 or 4 land uses exist in the surrounding area.

The area of the pipeline that is accessible to the public has a risk level within the Outer Zone which is approximately 68 m to either side of the pipelines. Therefore no Level 4 developments should be allowed within 68 m of the centre line of the pipeline servitude. No Sensitivity Level 4 land uses exist in the surrounding area.

The area surrounding the pipelines' servitude within the port boundary is understood to be zoned for industrial use and therefore classified as Sensitivity Level 1.

Based upon the current land uses around the proposed Natural Gas pipelines' route, the risk level would be classified as 'don't advise against' according to the land use planning criteria. Therefore the current land uses can be considered tolerable. Future land uses around the Natural Gas pipelines should adhere to those of *Table 10.51* for the pipelines' risk transects presented in *Figure 7.1* and *Figure 10.21*.

The hazards, as described above, would result in a direct negative type of impact on the natural vegetation, structures, employees and people in the immediate area.

The duration would be temporary as such hazards would be of short duration and only happen occasionally, if at all. The extent for the impact is local.

The scale of the hazard effects of a Dangerous Dose as defined earlier from the Natural Gas pipelines are as follows:

- Jet Fire: 156 m;
- Flash Fire: 676 m; and
- Gas Cloud Explosion: 57 m.

If facilities and equipment are designed to the prescribed specifications and standards, the likelihood of such an event occurring is considered **unlikely**.

The area surrounding the Natural Gas pipelines' servitude is currently open land with the exception of MR559. A portion of this servitude also passes through an area owned by the Port. As these areas are not currently inhabited and future land use within the Port is understood to be categorised as Industrial, the land use sensitivity in these areas is categorised as low.

Box 10.17 Land Use Planning Impact: Operation Phase: Natural Gas Pipelines

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low

Impact Magnitude: Low

- **Extent:** Local
- **Duration:** Temporary
- **Scale:** The largest hazard effects of Dangerous Dose are to 676 m. The largest land use restriction extends 140 m from the pipeline due to proposed bends which increase the risk in these areas. Risk transects indicate the normal pipeline area restrictions extend 68 m from the centre of the Natural Gas pipelines' servitude.
- **Likelihood:** Unlikely

IMPACT SIGNIFICANCE (PRE-MITIGATION): NEGLIGIBLE
IMPACT SIGNIFICANCE (POST-MITIGATION): With mitigation, as detailed in Section 10.15.1, this impact remains **NEGLIGIBLE**

10.15.5 Risk Assessment: Land Use Planning Impact for the Operational Phase for the Propane Generator Installations

Impact Description

Risks associated with flammable hazards during the operation phase of the project as a result of the propane storage facility at the power station will exist. Risks are anticipated to be reduced from that experienced during the Construction Phase due to smaller quantities of propane been utilised in the plant.

Impact Assessment

Risk model outcome

The Land Use Planning risk contours for the Propane generator operations during normal operation are shown in *Figure 10.22*.

From the figure it can be seen that an area outside the power plant site falls within the 1×10^{-6} contour and therefore is within the Middle Zone. This area extends approximately 90 m to the west and 50 m to the north of the CCGT site boundary. Therefore no Sensitivity Level 3 or Level 4 developments such as those described in *Table 10.51* should be allowed within this area during normal operation. No Sensitivity Level 3 or 4 land uses exist in the surrounding area.

From the figure it can be seen that an area outside the power plant site falls within the 3×10^{-7} contour and therefore is within the Outer Zone. This area extends approximately 120 m to the west and 60 m to the north of the CCGT site boundary. Therefore no Sensitivity Level 4 developments such as those described in *Table 10.51* should be allowed within this area during normal operation. No Sensitivity Level 4 land uses exist in the surrounding area.

The current land uses within these areas result in the risk level being classified as 'don't advise against' during normal operation according to the land use planning criteria. Future land uses around the CCGT power plant site during normal operation should adhere to those of *Table 10.51* for risk contours presented in *Figure 10.22*.

The hazards, as described above, would result in a direct negative type of impact on the natural vegetation, structures, employees and people in the immediate area. The duration would be temporary as such hazards would be of short duration and only happen occasionally, if at all. The extent for the impact is local.

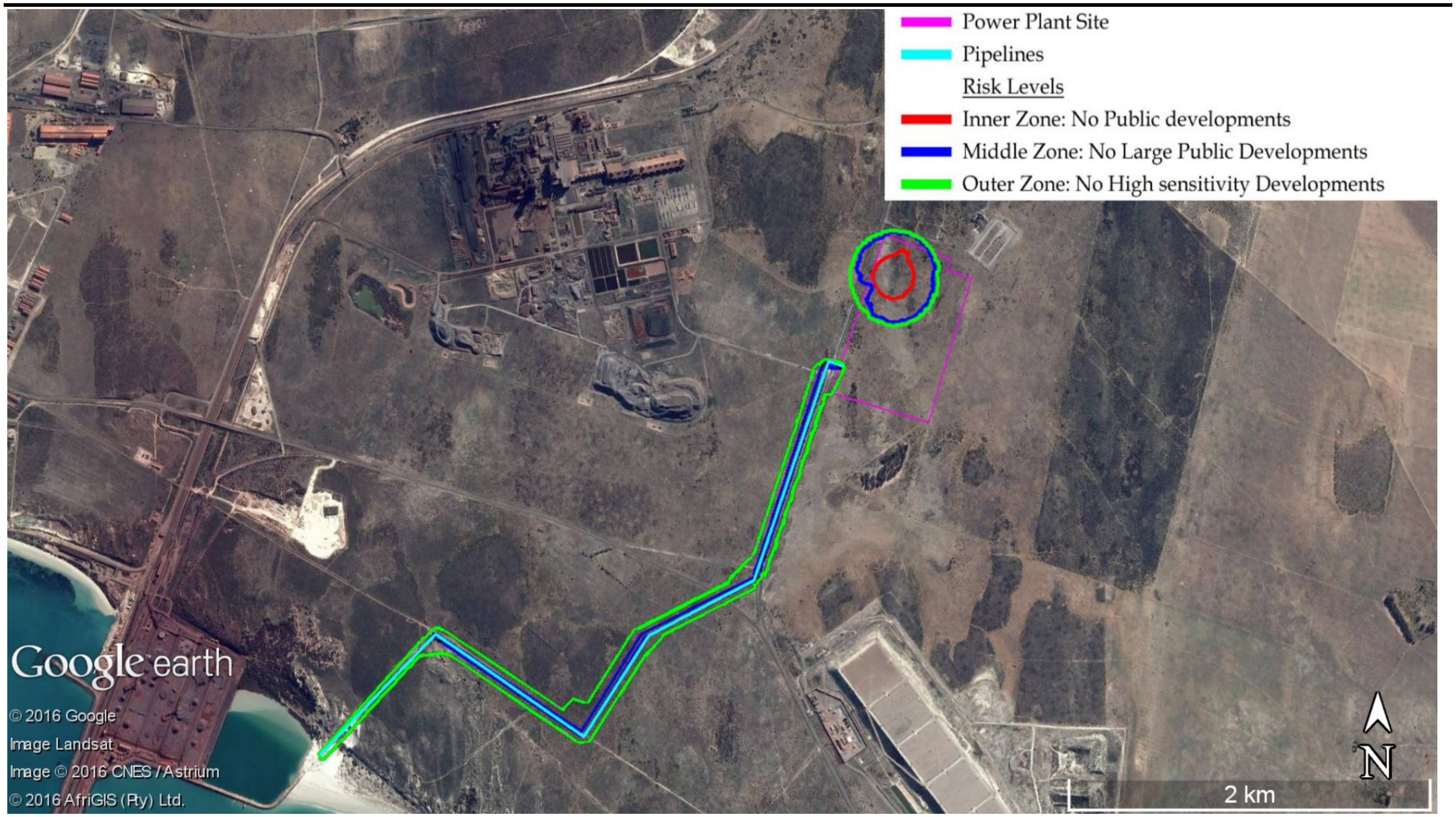
The scale of the hazard effects of a Dangerous Dose as defined earlier from the Propane generator installations are as follows:

- Jet Fire: 173 m;
- Flash Fire: 239 m;
- Vapour Cloud Explosion: 13 m; and
- Boiling Liquid Evaporating Vapour Explosion / Fireball: 114 m.

If facilities and equipment are designed to the prescribed specifications and standards the likelihood of such an events occurring is considered unlikely.

The area surrounding the proposed CCGT power plant site is similarly unused with the exception of a small access road. Therefore this land use sensitivity is also categorised as low.

Figure 10.22 Contours for Land Use Planning for Saldanha Steel Natural Gas Pipelines and Propane backup generator with Normal Power Plant Operation Propane Consumption



Box 10.18 Land Use Planning Impact: Operation Phase: Propane Generator Installations

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Low

Impact Magnitude: Low

- **Extent:** Local
- **Duration:** Temporary
- **Scale:** The largest hazard effects of Dangerous Dose are to 239 m. The largest land use restriction extends 140 m to the west and 60 m to the north of the CCGT site boundary, centred on the Propane generator.
- **Likelihood:** Unlikely

IMPACT SIGNIFICANCE (PRE-MITIGATION): NEGLIGIBLE
IMPACT SIGNIFICANCE (POST-MITIGATION): With mitigation, as detailed in Section 10.15.1, this impact remains **NEGLIGIBLE**

10.15.6 Risk Assessment: Risk to Individuals for the Operational Phase

Impact Description

The main hazards associated with potential releases of Propane from the Propane storage facility are jet fires (immediate ignition), flash fires (delayed ignition) and explosions (delayed ignition of the gas or vapour in a confined space). The hazards may be realised due to leaks/failures in the Propane storage vessel, off-loading road tankers or associated equipment, all of which can release significant quantities of flammable materials on failure. This would result in human exposure via thermal radiation and overpressures.

The main hazards associated with potential releases of natural gas from the pipelines are jet fires (immediate ignition), flash fires (delayed ignition) and explosions (delayed ignition of the gas or vapour in a confined space). This would be caused by leaks/failures in the pipelines. This would result in human exposure via thermal radiation and overpressures.

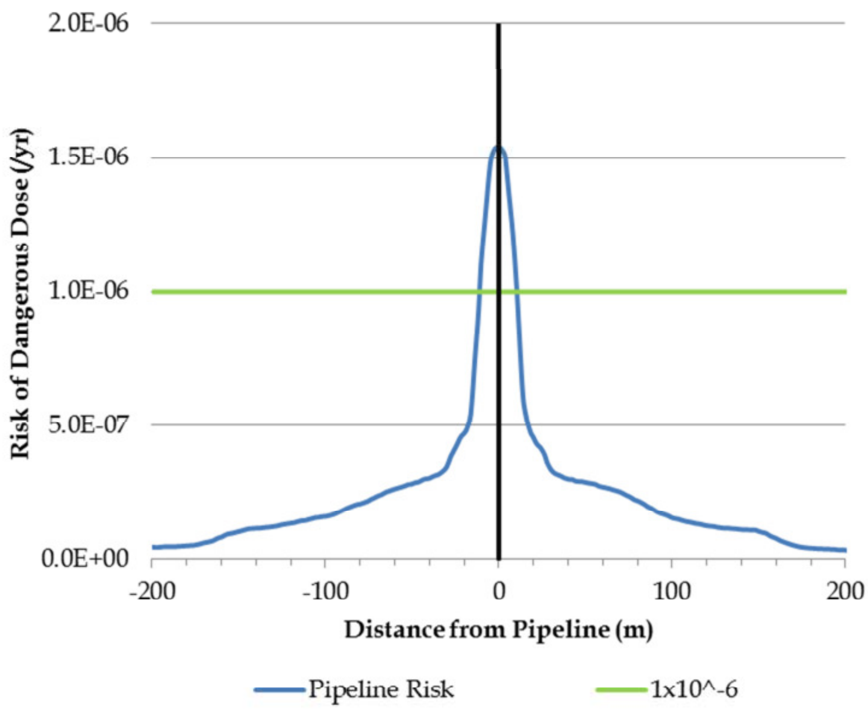
Impact Assessment

Risk model outcome

Risk transects representing the LSIR transect for hypothetical persons located outdoors and indoors for the pipelines were calculated for the areas accessible to the general public as well as those within the Port boundary. Only the transects for persons located outdoors for the area accessible to the general public were found to exceed 1×10^{-6} and therefore all other LSIR transects were excluded from further analysis.

Figure 10.23 represents the LSIR risk transect for hypothetical persons located outdoors for the Natural Gas pipelines. This transect is taken for the area accessible to the general public.

Figure 10.23 Risk Transect for Individual Risk of Fatality for Saldanha Steel Natural Gas Pipelines – Persons Located Outdoors



From *Figure 10.23* it can be seen that the individual risk of fatality exceeds the 1 x 10^{-6} contour. This extends approximately 10 m on either side of the pipeline's route. As the risk in this area exceeds 1 x 10^{-6} but does not exceed 1 x 10^{-4}, the LSIR for the pipelines for persons located outdoors along the pipeline route is not considered intolerable according to the risk criteria. The risks within this area can only be considered tolerable if they can be demonstrated by the site operator to be ALARP.

The LSIR contours for individuals located outdoors and indoors for the proposed Natural Gas pipelines and Propane backup generator developments during normal operation are shown in *Figure 10.24* and *Figure 10.25* respectively.

Figure 10.24 represents the LSIR for hypothetical persons located outdoors for the proposed Natural Gas pipelines and Propane backup generator developments during normal Propane backup generator operation. Areas located off the power plant site have an individual risk higher than 1 x 10^{-6}. As the risk exceeds 1 x 10^{-6} but does not exceed the 1 x 10^{-4} risk level, the LSIR for the pipelines and Propane backup generator for persons located outdoors in these areas is not considered intolerable according to the risk criteria. The risks can only be considered tolerable if they can be demonstrated by the site operator to be ALARP.

The 1 x 10^{-3} and 1 x 10^{-4} LSIR contours do not exist for individuals located outdoors, therefore the risk is below these levels.

Figure 10.25 represents the LSIR for hypothetical persons located indoors for the proposed pipelines and Propane backup generator developments during normal Propane backup generator operation. Areas located off the power plant site have an individual risk higher than 1 x 10^{-6}. As the risk exceeds 1 x 10^{-6} but does not exceed 1 x 10^{-4} the LSIR for the pipelines and Propane backup generator for persons located indoors in these areas is not considered intolerable according to the risk criteria. The risks can only be considered tolerable if they can be demonstrated by the site operator to be ALARP.

The 1 x 10^{-3} and 1 x 10^{-4} LSIR contours do not exist for individuals located indoors, therefore the risk is below these levels.

Figure 10.24 Risk Contours for Individual Risk of Fatality for Saldanha Steel Natural Gas Pipelines and Propane Developments during Normal Operation – Persons Located Outdoors

Figure 10.25 Risk Contours for Individual Risk of Fatality for Saldanha Steel Natural Gas Pipelines and Propane Developments during Normal Operation – Persons Located Indoors

Considering individuals, it is understood that the area surrounding the Natural Gas pipelines' servitude is not permanently inhabited as no homes, work places or other gathering areas exist in the vicinity. The general public does however have access to the area surrounding the servitude (with the exception of the Port property). Therefore the sensitivity of the general public in the area surrounding the Natural Gas pipelines' servitude is categorised as medium. For workers involved in the construction phase or operational phase of the CCGT power plant project, the sensitivity is categorised as low. This is due to these individuals being aware of the risks and being more adequately prepared to handle them as a result of emergency planning , PPE, etc.

A similar situation exists for the proposed CCGT power plant site and surrounding area. The general public sensitivity is categorised as medium while worker sensitivity is categorised as low. The hazards, as described above, would result in a direct negative type of impact on the natural vegetation, structures, employees and people in the immediate area. The duration would be temporary as such hazards would be of short duration and only happen occasionally, if at all. The extent for the impact is local.

The scale of the hazard effects of a Dangerous Dose as defined earlier from the Propane generator installations are as follows:

- Jet Fire: 173 m;
- Flash Fire: 239 m;
- Vapour Cloud Explosion: 13 m; and
- Boiling Liquid Evaporating Vapour Explosion / Fireball: 114 m.

The scale for the pipeline would be:

- Jet Fire: 156 m;
- Flash Fire: 676 m; and
- Gas Cloud Explosion: 57 m.

If facilities and equipment are designed to the prescribed specifications and standards, the likelihood of such an event occurring is considered **unlikely**.

Box 10.19 Location Specific Individual Risk Impact: Operation Phase: Natural Gas Pipelines and Propane Generator Installations

Nature and Type: Negative direct

Sensitivity/Vulnerability/Importance of Resource/Receptor: Medium for Public Area; Low for Workers;

Impact Magnitude: High

- **Extent:** Local
- **Duration:** Temporary
- **Scale:** The largest hazard effects of Dangerous Dose are to 676 m. The largest LSIR contours extend 110 m to the west and 240 m to the north of the CCGT site boundary, centred on the Propane generator.
- **Likelihood:** Unlikely

IMPACT SIGNIFICANCE (PRE-MITIGATION): MODERATE
IMPACT SIGNIFICANCE (POST-MITIGATION): With mitigation, as detailed in Section 10.15.1, this impact is reduced to **MODERATE**

10.15.7 *Residual*

If mitigation measures as described above are implemented, the residual impact significance will change to for the construction phase as described in *Table 10.53* as the only receptors will be workers involved in the construction and operation of the CCGT power plant and their sensitivity is classed as **low.** The residual risk from the operation phase will remain the same.

Table 10.53 Pre- and Post- Mitigation Significance: Quantitative Risk Assessment

Impact	Phase	Pre- and Post- Mitigation Significance:	Residual Significance (Post-mitigation)
Natural Gas Pipelines, LUP Assessment	Construction	Negligible	Negligible
Propane Generator, LUP Assessment	Construction	Negligible	Negligible
Natural Gas Pipelines and Propane Generator, LSIR Assessment	Construction	Moderate	Moderate
Natural Gas Pipelines, LUP Assessment	Operation	Negligible	Negligible
Propane Generator, LSIR Assessment	Operation	Negligible	Negligible

Natural Gas Pipelines and Propane Generator, LSIR Assessment	Operation	Moderate	Moderate

10.16 *CUMULATIVE IMPACTS*

The Project is located in an area ear-marked for further industrial development. The National Department of Energy, through its Gas to Power Programme, is investigating the feasibility of development of a gas-fired power station in the Saldanha Bay area. In addition, the IDZ is being promoted as an oil and gas hub and industrial development is being encouraged in the area.

The preceding impact assessment assessed the impacts associated with the Project largely in isolation. It is important to, assess cumulative impacts associated with a proposed development and there also is a legislated requirement in South Africa to do so. The cumulative impacts are discussed below.

10.16.1 *Cumulative Impacts of the Socioeconomic Environment*

Economy, Employment and Skills

The development of large scale industrial projects will result in increased direct and indirect employment during the construction and operation of each of the projects. The nature and extent of the benefits will depend on the employment strategy of the various developers and the extent to which they are committed to maximise local employment.

There may be overlap between the construction phases of the Project with the other developments, or they may run consecutively. Either way, this will result in a significant uplift in local employment directly and indirectly through the procurement of goods and services. Furthermore, those that have been employed by one of the developers may be in better position to find employment with the other developers as they will have increased their skills and experience. As such, the potential for cumulative positive benefits associated with economy, employment and skills development is considered to be higher than for the Project alone.

The operation of the developments outlined will occur over the same period of time and will be located in close proximity as such the economic, employment and skills development opportunities outlined will be greater for all the projects combined then just for the Project development.

It should be noted that expectations regarding economic development, employment and skills development will be high amongst stakeholders in the local community and as such, in the event that one developer does not meet expectations, there is the potential for all developers to be the target of this negative feedback.

Based on the above the cumulative impacts of the various proposed industrial projects on the economy, employment opportunities and skills development within the communities is expected to be ***positive***.

Community Health Safety and Security

The presence of an external workforce for the combined projects housed within the communities and construction camps could increase the spread of communicable diseases and STIs such as HIV/AIDS. The profile of these diseases will be influenced by the existing health profile of communities within the area of influence of the project and that of the workers, which is difficult to predict for the various projects.

Increased air emissions as a result of the Project and other power plants as well as additional risks of industrial accidents and explosions will result in cumulative impacts on community health and safety. These increases put additional pressure on existing health infrastructure and pose risks to health and safety of general road users, traders and pedestrians (especially school children whose schools are also close to the roads along transport routes). Increased traffic will, in turn, increase levels of noise and dust generated in the area.

While the Project alone is not expected to attract vast numbers of jobseekers to the area, the development of multiple projects is likely to attract people seeking employment opportunities, particularly in light of a declining agricultural sector in the West Coast District Municipality, and given that Saldanha Bay is already seen as an economic hub. An influx of jobseekers will lead to increased competition for employment which may contribute locally to social tension and conflict within the local communities.

Mitigation measures implemented by the Project will help to minimise the risk of disease transmission and reduce emissions not only as a result of the Project but also due to the all the developments. However, the potential impact on community health, safety and security remains and is rated as ***moderate.***

Pressure on Social Infrastructure and Services

Related to the above, the influx of jobseekers together with presence of the workforce associated with each Project could place additional pressure on the delivery of social infrastructure and services, in particular housing. This is largely related to the unskilled workforce, as it is expected that the skilled and semi-skilled workforce would be able to enter the housing market.

Projects that bring a large external unskilled workforce in the area and do not provide accommodation will be increasing the burden on the provision of low cost housing. The SBLM is faced with a housing backlog, and healthcare facilities are under pressure.

Mitigation measures implemented by the Project, particularly a commitment to employing local labour will help to minimise this impact, however, the potential impact on social infrastructure and services remains that of moderate, as the Project cannot influence how other developments employ or house their workforce.

Traffic and Transportation

The construction phase will require large amounts of material and equipment to be transported to the Project site. It is expected that the other projects in the area will use similar transport routes which will place pressure on the local road network especially during the construction phases of the projects. This is likely to occur concurrently or at least overlap with the associated overlap in construction traffic movements.

As such there is increased potential for accidents and disruption to the road traffic network for local users associated with the increase in traffic movements from overlapping construction traffic.

It is expected that the traffic management plan developed for the Project will consider other traffic movements associated with the development of the enclave which will help to mitigate this impact, however it is still considered likely to result in a ***moderate*** impact overall due to the high likelihood of accidents occurring.

Mitigation Measures to Address Cumulative Socio-Economic Impacts

- It is recommended the Project investigates opportunities to work with other developers to develop a collaborative approach to training, employment and skills development for the local population, starting now in the run up to Project construction. This may include developing a coordinated standard set of requirements for service providers (eg required labour numbers of carpenters, welders, Heavy Goods Vehicle drivers, etc. and the minimum qualifications required for these) and making the communities aware of these requirements. The developers should also plan and implement a coordinated approach to community skills development based on these requirements.

- The Project should engage with other developers to ensure that community education and awareness campaigns in relation to health, safety and security are developed and implemented collaboratively to avoid duplication of effort.

- The Project should engage with its neighbours to develop combined emergency response plans which take into account all the proposed developments and the community. This should consider combined use of security personal and risks from unplanned events.

- The Project should work with the other developers in the area and the Government to ensure that there is a combined and integrated traffic management plan including road safety and movement of heavy goods with a particular focus on the construction phase.

10.16.2 *Cumulative Air Quality Impact*

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) a chlorine, caustic soda and hydrochloric acid in Saldanha Bay, and iii) 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 (Aurecon, 2013). CO was not assessed. For the power plant using LNG and Best Available Technology for power generation the NO_X and CO 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.

11 ENVIRONMENTAL MANAGEMENT PROGRAMME

11.1 OVERVIEW

ArcelorMittal (hereafter the 'Project Company') has appointed Environmental Resources Management (Pty) Ltd (hereafter ERM) to prepare the Environmental Management Programme (EMPr) for the development of a proposed 1507 MW gas fired power plant. The Project is to be developed on a green field site owned by ArcelorMittal within the IDZ of Saldanha Port. The site is located less than 1 km to the east of the existing ArcelorMittal Saldanha Steel, immediately adjacent to the Blouwater substation.

The aim of the EMPr is to provide a set of guidelines and actions aimed at addressing potential environmental risks and impacts associated with the construction, operation and decommissioning phases of the project, and will be included in contract documentation between the Project Company and its contractors. The EMPr also provides assurance to regulators and stakeholders that their requirements with respect to environmental and socio-economic performance will be met, and provides a framework for compliance auditing and inspection programs. It becomes a legally binding document on the environmental authorisation of the Project.

11.2 DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONER

ERM was appointed by the Project Company as the Environmental Assessment Practitioner (EAP) to undertake the Environmental Impact Assessment and application for environmental authorisation for the proposed CCGT gas fired power plant. ERM and the specialists appointed by ERM have no financial ties to nor are they a subsidiary, legally or financially, of the Project Company. Remuneration for the services by the Project Company in relation to the EIA and EMPr is not linked to approval by any decision-making authority and ERM has no secondary or downstream interest in the development.

ERM is a leading global provider of environmental, health, safety, risk, social consulting, and sustainability services. ERM has over 150 offices in more than 40 countries and territories with a staff complement in excess of 5,000 people. ERM is committed to providing a consistent, professional, quality service that creates value for our clients in the mining, oil and gas, power, manufacturing, chemical and pharmaceutical, ports and infrastructure sectors. Over the past three years we have worked for more than 50 percent of the Global Fortune 500 companies delivering innovative solutions for business and selected government clients, helping them understand and manage the sustainability challenges they face.

ERM has been involved in projects across every country in Africa for over 36 years, and in 2003 established a permanent presence in Sub-Saharan Africa to meet the growing needs of our clients. ERM is one of the largest sustainability consulting firms in the region with offices in Kenya (Nairobi), Mozambique (Maputo) and South Africa (Cape Town, Durban and Johannesburg). With over 180 dedicated staff involved in environmental and social projects throughout the continent, ERM offers clients effective, cost-conscious solutions using experienced local and global expertise.

Details of the EAPs are provided in *Table 11.1* below.

Table 11.1 Details of Environmental Assessment Practitioners

Name	Stuart Heather-Clark
Responsibility	Partner in Charge
Qualification	MPhil Environmental Science and BSc Civil Engineering
Professional registration	Certified EAPSA
Experience in years	18
Experience	Experience in EIA in South Africa and various African countries.

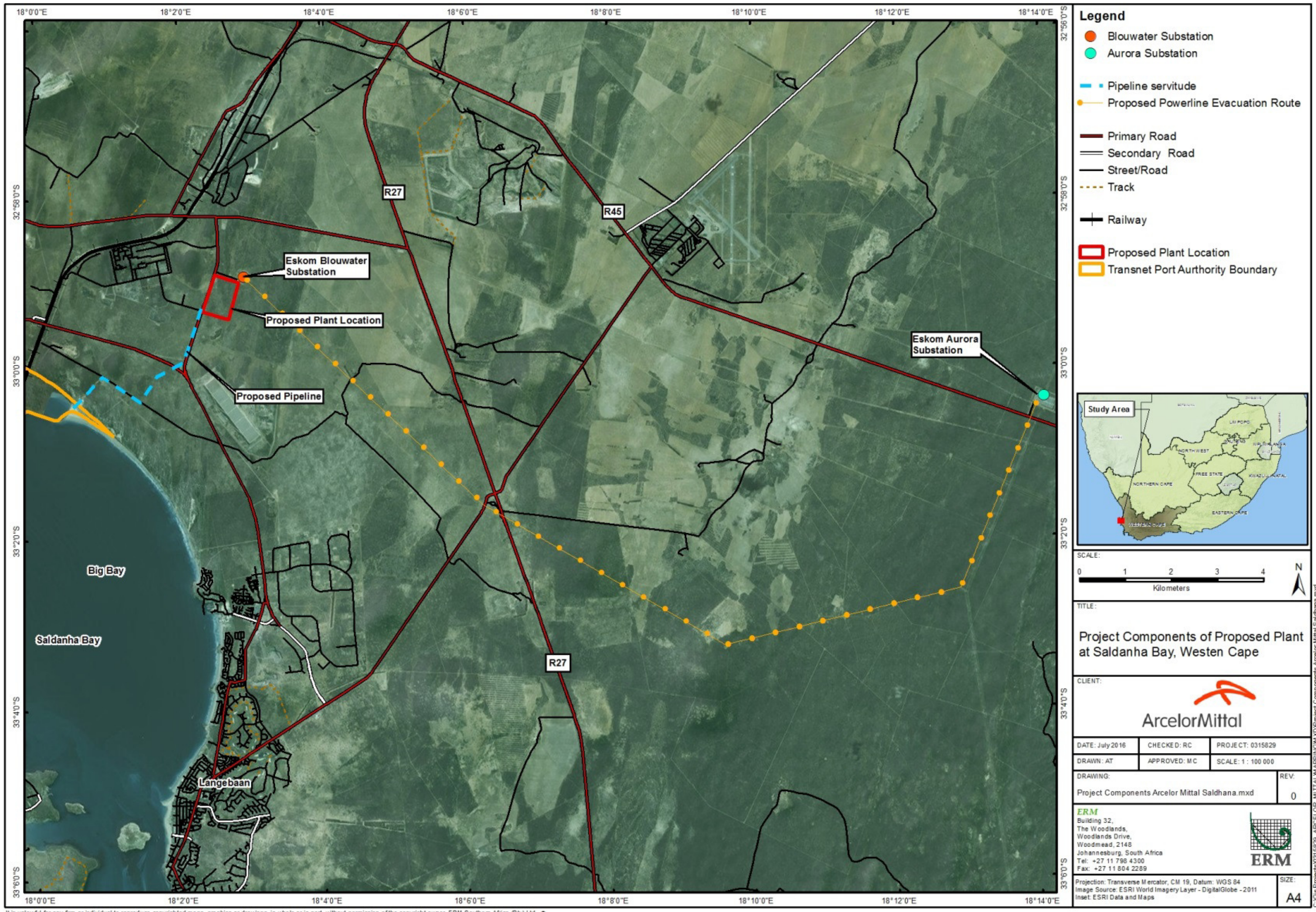
Name	Stephan Van Den Berg
Responsibility	Project Manager
Qualification	BSc (Hons)
Experience in years	9 years
Experience	Experience in EIA in South Africa and various African countries.

11.3 SITE LOCATION AND DESCRIPTION

The Project is to be developed on a green field site owned by ArcelorMittal, approximately 5 km northeast of the Port of Saldanha (*Figure 11.1*). 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 (2011).

Please refer to *Chapter 3* of this report for further details.

Figure 11.1 Location of Proposed Development Site



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11.4 *OVERVIEW OF THE PROPOSED PROJECT*

The International Power Consortium South Africa (IPCSA) has developed a solution to Saldanha Steel's requirement for stable, economical electricity over the long term. This solution consists of a 1507 MW (net capacity) Combined Cycle Gas Turbine (CCGT) power plant to be erected adjacent to ArcelorMittal's Saldanha Steel site.

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 Bankable Feasibility Study (BFS) completion.

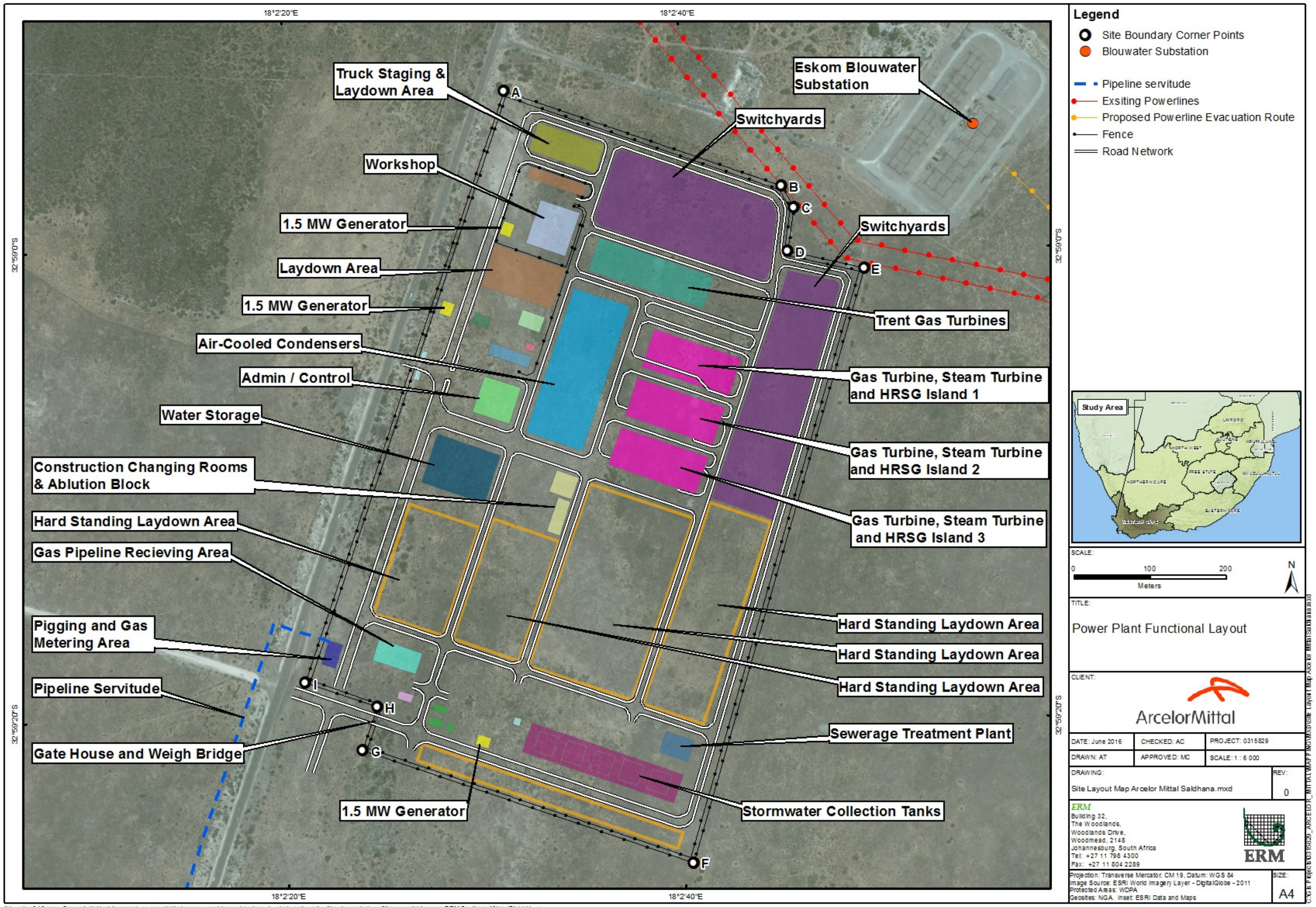
The Project will require Liquefied Natural Gas (LNG) as its main fuel supply and will consume about 76 Million Gigajoules of natural gas per year. LNG will be supplied by ship to the Port of Saldanha, where it will be regasified and then offloaded via a submersible pipeline either from a mooring area located off shore or a berthing location in the Port in Saldanha. Initial discussions have been held with Transnet National Ports Authority (TNPA) in Saldanha in this regard [(1)].

The Project will supply the power needs of ArcelorMittal Saldanha Steel (+/- 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.

Figure 11.2 shows the proposed plant layout. Current plans include six Trent 60 DLE (low NOx) 50 MW (installed gross capacity) gas turbines in open cycle and three identical but independent 435MW SCC5 4000F (installed gross capacity) single shaft generating trains in combined cycle.

(1) The supply of fuel and import facilities have not been considered in this EIA. The Department of Energy initiated a project in 2015 to permit the construction of an LNG import terminal at the Port of Saldanha, it was understood that individual developers were not required to undertake the EIA for this component. Should this information change, a separate EIA for the import of gas will be undertaken.

Figure 11.2 Power Plant Functional Layout Plan



11.5 STRUCTURE OF THE EMPR

The structure of the EMPr is indicated *Table 11.2*.

Table 11.2 Structure of the EMPr

Section	Heading	Content
Section 11.1-11.5	Introduction	Background information regarding the Site, Project Development and the EMPr.
Section 11.6	Implementation of the EMPr	Provides details of the communication and organisational structures within which the EMPr will be implemented, responsibilities of key role players, and provides the terms of reference for the construction team and Environmental Control Officer who will be utilised for all phases of the Project (ECO).
Section 11.7—11.16	Mitigation and Monitoring Measures	Mitigation and Monitoring measures for the Planning and Design, Construction, and Operational phases of the plant.

11.6 IMPLEMENTATION OF THE EMPR

11.6.1 Introduction

The EMPr details the mitigation measures which must be implemented during the development of the proposed Project and assigns responsibilities for specific tasks. The EMPr is applicable to all work activities during the pre-construction, construction, operation and decommissioning of the proposed gas fired power plant. It is an open-ended document implying that information gained during pre-construction, construction, operational and decommissioning activities and/or monitoring of procedures on the Site could lead to changes in the EMPr.

11.6.2 Environmental and Social Management System

An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by client/proponent, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders (see *Figure 11.3*). Drawing on the elements of the established business management process of "plan, do, check, and act," the ESMS entails a methodological approach to managing environmental and social risks and impacts in a structured way on an ongoing basis. A good ESMS appropriate to the nature and scale of the project promotes sound and sustainable environmental and social performance, and can lead to improved financial, social, and environmental outcomes.

The main elements of this approach comprise the following:

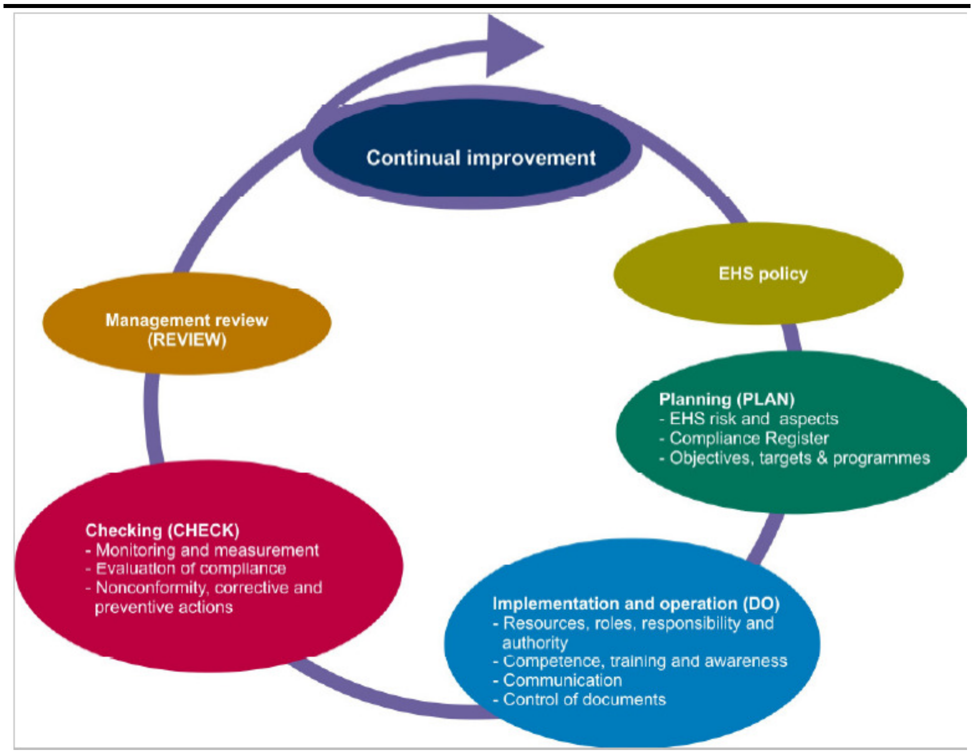
- **Planning**: Establishing actionable steps and key performance indicators, necessary to deliver results in compliance with regulations and obligations.

- **Doing**: Implementation of actionable steps, and assigning responsibilities for undertaking or implementing these requirements.

- **Checking**: Monitoring and measuring performance against key performance indicators, and other requirements, and reporting of the results.

- **Acting**: Taking actions to continually improve performance of the ESMP through the training of personnel and auditing of results.

Figure 11.3 Elements of an Environmental and Social Management System



11.6.3 Roles and Responsibilities

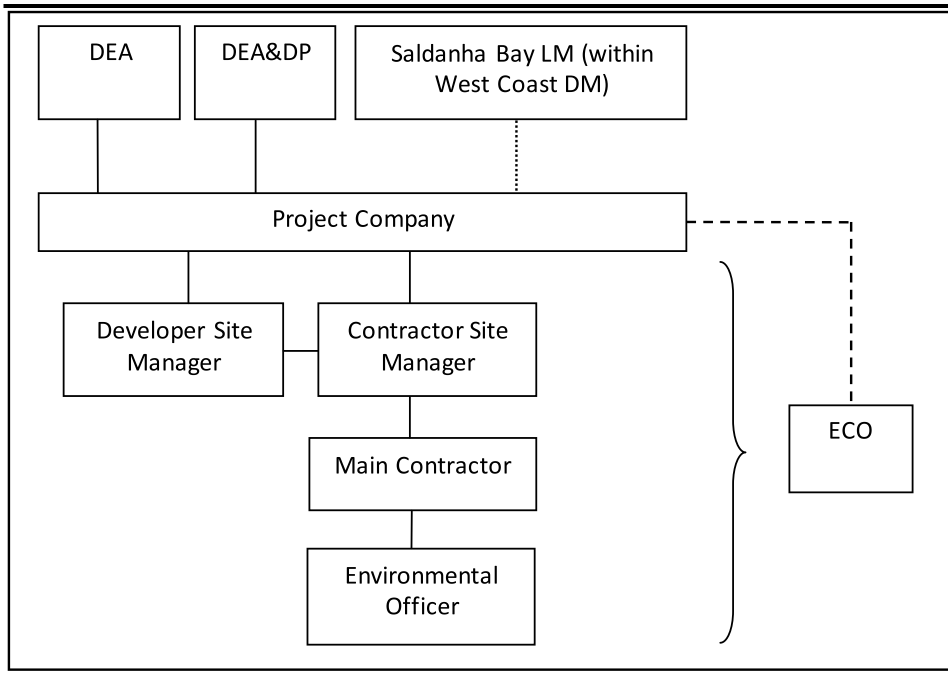
The key role-players during the construction, operation and decommissioning phases of the plant, for the purposes of environmental management, include but are not limited to:

- the Project Company;
- Site Manager;
- Main Contractor;
- Environmental Control Officer (ECO); and

- Representatives of the relevant authority/ies.

Lines of communication and reporting between the various parties are illustrated in *Figure 11.4* below.

Figure 11.4 Roles and Responsibilities: Lines of Communication and Reporting



11.6.4 Communication Channels

Site Meetings during the Construction Phase

The ECO is required to attend regular meetings with the Project management team to facilitate the transfer of information and to update all parties on the environmental compliance of the project as a whole. The ECO will minute the discussions, and specifically any decisions arising relating to environmental management actions and responsibility.

The ECO will compile a summary report outlining the main construction activities relating to the environment, aspects of non-compliance, and document agreed environmental actions and dates of achieving compliance by the Main Contractor (MC). The summary report will form part of the construction phase EMPr records.

The following people should attend these meetings:

- Project Company's Representative;
- Site Managers (SM);
- ECO; and

- MC’s representative.

Environmental Education and Awareness

The MC, in consultation with the ECO, shall arrange for a presentation to site staff to familiarise them with the environmental requirements of the construction phase of the EMPr within seven days from the commencement date of construction. This presentation should take cognisance of the level of education, designation and language preferences of the staff. General site staff would commonly receive a basic environmental awareness presentation or talk highlighting general environmental and social “do’s and don’ts” (i.e. environmental induction), including good housekeeping practices. This information would be provided throughout construction in the form of regular toolbox (refresher) talks.

Management level staff on the Site, e.g. Site agents and foremen, who require more detailed knowledge about the environmental sensitivities on site and the construction phase requirements of the EMPr, will benefit from a separate and more detailed presentation of these issues. If required, the ECO may call upon the services of a professional trainer or environmental consultant to present the technical contents of the EMPr.

Environmental education of staff can be assisted by compilation of posters placed in staff venues e.g. canteens and site offices.

Method Statements

The MC must compile and provide Method Statements to the ECO and SM for approval prior to the commencement of construction activities. Method statements will be required for specific activities that are deemed or identified to pose a risk to the environment and/or which require site specific detail beyond that contained in the EMPr or when requested by the SM or ECO.

A Method Statement is a dynamic document in that modifications are negotiated between the MC and the ECO/project management team, as circumstances unfold. Changes to, and adaptations of, Method Statements can be implemented with the prior consent of all parties. All Method Statements will form part of the construction phase of the EMPr documentation and are subject to the terms and conditions contained within the construction phase of the EMPr.

Note that a Method Statement is a starting point for understanding the nature of the intended actions to be carried out and allows for all parties to review and understand the procedures to be followed in order to minimise risk of harm to the environment.

A Method Statement describes the scope of the intended work in a step-by-step description, in order for the ECO and the SM to understand the MC’s intentions. This will enable them to assist in devising any mitigation measures, which would minimise environmental impact during these tasks.

For each instance where it is requested that the MC submit a Method Statement to the satisfaction of the SM and ECO, the format must clearly indicate the following:

- What - a brief description of the work to be undertaken;
- How - a detailed description of the process of work, methods and materials;
- Where - a description/sketch map of the locality of work (if applicable);
- When - the sequencing of actions with due commencement dates and completion date estimates;
- Who – The person/s responsible for undertaking the works described in the Method Statement; and
- Why – a description of why the activity is required.

ECO Diary/Logbook Entries

The ECO will maintain a Site diary or logbook that relates to environmental issues as they occur on the Site for record keeping purposes. Recorded issues will form part of feedback presented at Project meetings by the ECO.

Site Memo Entries

Site memos, stipulating recommended actions required to improve compliance with the EMPr by the MC will be issued by the ECO to the PM, who in turn will ensure that the MC is informed of the recommended instruction.

Comments made by the ECO in the Site Memo book are advisory and all consequential Site Instructions required may only be issued by the PM. Site Memos will also be used for the issuing of stop work orders to the MC for activities deemed to pose immediate and serious risk of unnecessary damage to the environment.

Dispute Resolution

Any environmentally related disputes or disagreements during the construction phase will firstly be referred to the SM or alternatively to the Department of Environmental Affairs (DEA) if no resolution on the matter is reached. Similarly, disputes or disagreements during the operations phase can be referred to the operational SM or the DEA if required.

Community Relations

The Project Company must continue to engage with stakeholders throughout the construction and operation phases. Communication with local communities and other local stakeholders will be a key part of this engagement process and will require the Project Company and MC to work closely together during the construction period. This should be facilitated through a Stakeholder Engagement Plan (SEP) which would be developed prior to construction.

The objectives of communication and liaison with local communities are the following.

- To provide residents in the vicinity of the Site and other interested stakeholders with regular information on the progress of work and its implications.

- To monitor the implementation of mitigation measures and the impact of construction on communities via feedback from affected stakeholders in order to ensure that the mitigation objectives achieved.

- To manage any disputes between the Project Company, the contractors and local communities.

Grievance Procedure

The Project Company must develop a grievance procedure as part of the SEP to ensure fair and prompt resolution of problems arising from the project. The grievance procedure should be underpinned by the following principles and commitments:

- Implement a transparent grievance procedure, and disseminate key information to directly impacted stakeholders.

- Seek to resolve all grievances timeously.

- Maintain full written records of each grievance case and the associated process of resolution and outcome for transparent, external reporting.

The responsibility for the resolution of grievances will lie with the Project Company and its contractors.

Social Responsibilities

The Project Company and MC must encourage and implement wherever possible the procurement of locally based labour, skills and materials.

- The Project will establish a recruitment policy which prioritises the employment of South African and local residents (originating from the Local Municipality). Criteria will be set for prioritising local residents and then other South Africans as part of the recruitment process.

A local procurement policy will be implemented to ensure that local procurement is maximised, the policy will include:

- Reasonable targets for using local suppliers.
- a clause of none discrimination on any grounds of gender, ethnicity, religion.
- Criteria for monitoring local procurement and reporting on supplier performance management.
- Clearly communicate the criteria and tendering process prior to the commencement of construction activities; and
- The procurement policy and tendering requirements must be easily accessible to potential suppliers.

The following will be implemented to enhance skills development and on-the-job training:

- Training plans will be developed according to each permanent employee' work agreement and relevant to their job description.
- Develop internal training 'certification' or reference letter provisions to those who receive internal training.

11.7 MITIGATION AND MONITORING MEASURES

Mitigation and monitoring measures are presented in this section (*Table 11.3*) and reflect the relevant phase of applicability which may include:

- Planning and Design Phase (Pre-construction);
- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

Mitigation and monitoring measures presented in the tables below have been prescribed by the EIA and specialist studies. The EMPr will require updating with conditions of the Environmental Authorisation and on the basis of the results of any monitoring programmes.

Table 11.3 Environmental Mitigation Measures

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
General									
General	Ensure legal compliance	Finalise layout of all components and submit to DEA for approval.	X				Approval of Final Layout	Project Company	Prior to commencement of construction
		Obtain any additional environmental permits required (e.g. AEL; permit to remove protected plant species etc.)	X				Permits as issued	Project Company	Prior to commencement of construction
		An upfront training session must be held to ensure all relevant personnel are aware of the provisions contained in the EMPr, any Environmental Authorisation, License or Permit issued and all agreed Method Statements	X				Training Records	Project Company and ECO	Once off at the start then as new personnel are hired
		Notify all registered I&APs and key stakeholders of the Environmental Authorisation and appeal procedure.	X				Proof of Notification	Project Company and appointed environmental consultant	Within 14 days of receipt of EA (EIA Regulations, 2014)
		Notify DEA prior to commencement of the activity.		X			Proof of Notification	Project Company and appointed environmental consultant	Timeframe stipulated in the EA
		Ensure that the EA and approved EMPr are available at the site.		X	X	X	Visual Inspection	Project Company and Contractors	Documents to be on site throughout Project life-cycle.
		EA and EMPr to form part of the contract with the Contractors appointed to construct the plant.	X	X			Signed commitment from all contractors	Project Company and Contractors	Contract signed prior to commencement of construction
	Audit Requirements	Appoint an independent ECO, who has expertise in the field, for the construction phase. The ECO will have the responsibility to ensure that the		X			Appointment of ECO	Project Company	Prior to commencement of construction

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		mitigation/rehabilitation measures and recommendations referred to in the EA are implemented and to ensure compliance with the provisions of the EMPr.							
		The ECO must maintain the following on site: • A daily site diary; • Copies of all reports submitted to the DEA; and • A schedule of current site activities including the monitoring of such activities.		X	X		Site Diary; copies of all reports and a project schedule	ECO	Throughout construction phase
		The Project Company must submit an environmental audit report upon completion of the construction and rehabilitation activities.		X			Environmental Audit Report	Project Company and ECO	Upon completion of construction and rehabilitation activities.
Surface Water & Groundwater									
Impact on Surface and Groundwater	Implementation of Stormwater management principles to address runoff from disturbed portions of the site through appropriate design measures	Update and refine the Stormwater Management Plan (refer to *Section 11.14*) with engineering specifications.	X				Update of the Stormwater Management Plan	Project Company and civil engineers	Prior to construction during detailed design phase
		Implement energy dissipation structures where concentrated flows ensue.	X				Final SWMP	Project Company and civil engineers	Measure to be included in Final Design and implemented during construction
		Implement appropriate measures to trap sediment at sources where areas are going to be disturbed (e.g. construction materials laydown area). Mitigation measures could include sediment fences and erosion control blankets.	X				Final SWMP	Project Company and civil engineers	Measure to be included in Final Design and implemented during construction
		Design road networks to prevent the accumulation of high energy surface					Final SWMP and	Project Company	Measure to be

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		flows by specifying surface cross drains at regular intervals, by constructing roads to natural ground level or by including sufficient drainage in the form of culverts					plant design	and civil engineers	included in Final Design and implemented during construction
		Workshop areas will be lined to prevent subsurface ingress of contaminants and drainage from these areas will not be allowed to drain into water courses.	X				Final Design	Project Company	Throughout period that workshops are present
		Maintain, where possible, the natural vegetation cover and facilitate re-vegetation of disturbed areas to stabilise the soil.		X			Visual Inspection	Project Company and Contractors	During construction phase
		Stabilise all earthen berm structures by specifying adequate compaction and revegetating.		X			Visual Inspection	Project Company and Contractors	During construction phase
		Exercise good excavation practises during the construction phase. Backfill and compact all material to acceptable standards as soon as possible after construction and facilitate re-vegetation of all disturbed areas as soon as possible after backfilling.		X		X	Visual Inspection	Project Company and Contractors	During construction phase
		Implement free draining platforms (if required) for the substations and transformers to prevent the risk of flooding of infrastructure.	X				Visual Inspection	Project Company and civil engineers	Measure to be included in Final Design and implemented during construction
		Establish earthen berms to protect infrastructure against flooding.		X			Visual Inspection	Project Company and Contractors	During construction phase
		Implement attenuation facilities of areas that are drained.	X	X			Visual Inspection	Project Company and civil engineers	Measure to be included in Final Design and implemented during

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
									construction
	General conditions to minimise water use during construction and operation of the plant	Where feasible, use of closed circuit dry cooling system should be planned for to prevent unacceptable adverse impacts.	X				Final Design	Project Company	Measure to be included in Final Design and implemented during construction
		Project design to include measures for adequate water collection, spill control, leakage control systems and water-saving equipment e.g. low-flow toilets.	X				Final Design	Project Company	Measure to be included in Final Design and implemented during construction
	Minimise impacts on surface and groundwater due to run-off, erosion, spills of hazardous substances etc.	Fuel, oil, used oil and chemicals must not be stored where there can be accidental leakage in to surface or ground water.		X	X	X	Method Statement for Storage of Hazardous Goods Visual Inspection	Project Company, Contractors	Throughout life cycle of the Project
		Construction vehicles and equipment will be serviced regularly and provided with drip trays, if required.		X		X	Maintenance records	Contractors	Throughout construction and decommissioning
		All surface water management infrastructure will be inspected and repairs made as soon as practically possible.			X				
Soils									
Impact on Soils	Minimise erosion, loss of topsoil and soil compaction during Project activities and try to conserve soil as a resource where practical and possible; or maximise the potential to re-use	Implement the Erosion Management Plan as per *Section 11.15*. This includes the following:	X	X	X	X		Project Company, Contractors and ECO	Throughout life cycle of Project
		Restrict removal of vegetation and soil cover to the development footprint.		X		X	Visual Inspection	Project Company, Contractors	Throughout construction and decommissioning
		Soil stockpiles must be protected from wind or water erosion through placement, vegetation or appropriate covering.		X		X	Visual Inspection	Contractors	Throughout construction and decommissioning

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
	soils	Excavations/trenches should be backfilled slightly higher than the natural ground level to accommodate some degree of settlement of the backfill material.		X		X	Visual Inspection	Contractors	Throughout construction and decommissioning
		Exercise good excavation practises - backfill and compact all material to acceptable standards as soon as possible after construction and facilitate re-vegetation of all disturbed areas as soon as possible after backfilling.		X			Excavation Method Statement	Contractors	Throughout construction
		Construction vehicles will remain on designated and prepared roads.		X		X	Visual Inspection	Project Company, Contractors	Throughout construction and decommissioning
		Maintain, where possible, the natural vegetation cover and facilitate re-vegetation of disturbed areas to stabilise the soil against erosion.		X			Visual Inspection	Contractors	Throughout construction
		Foundations and trenches must be backfilled with originally excavated materials as far as possible. Excess excavation materials must be disposed of only in approved areas or, if suitable, stockpiled for use in reclamation activities.		X			Visual Inspection	Contractors	Throughout construction
		Borrow materials must only be obtained from authorised and permitted sites.		X			Visual Inspection	Contractors	Throughout construction
		Although soil erosion is not considered significant, it might be necessary to implement control measures such as suitable location on flatter areas with low erosion potential and the rapid establishment of vegetation through seeding of the stockpiles, to promote and		X			Engineering Design	Contractors	Throughout construction

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		reserve indigenous seeds and (soil fertility) organic matter							
		Where space constraints are not limiting, topsoil stockpiles will be constructed as low and long facilities not higher than 2m, or where space constraints limit this, stockpiles will be constructed as terraced stockpiles.		X			Visual Inspection	Contractors	Throughout construction
		Compacted areas must have adequate drainage systems to avoid pooling and surface flow.		X	X	X	Final Design	Project Company, Contractors	Throughout construction and operational phases, and if applicable, decommissioning
		Rehabilitation activities must commence at work faces as soon as construction activities have concluded. Phased construction and progressive rehabilitation should be implemented where practicably possible.		X		X	Visual Inspection	Project Company, Contractors	Throughout construction and decommissioning phases
Flora									
Disturbance / destruction of flora due to clearing of vegetation during construction and operation	Limit the loss of flora species and ensure legal compliance	The pipeline construction corridor in the area between the High and Medium – High sensitivity areas will be minimised and kept as narrow as possible, and should ideally be less than 25m wide in this area, or 30m at most.	X	X			Final Design	Project Company, Contractors	Final design prior to construction and corridor restrictions to be implemented during construction.
		Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.		X			Visual Inspection	Contractors and ECO	Weekly
	v	The ECO will ensure that no disturbance occurs outside the approved development footprints of		X			Visual Inspection	ECO	Throughout construction phase

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		the power plant site or the pipeline route during construction.							
	Reduce the impact of the development of the Project on listed and protected plant species and their habitats during construction	Implement the Plant Rescue and Protection Plan as per *Section 11.10*. This includes:	X	X			Plant Rescue and Protection Plan	Project Company, Contractors	Prior to disturbance of any natural areas.
		Plant Search and Rescue will be undertaken in the entire pipeline development corridor south of the MR559, prior to any development. Search and Rescue will also be undertaken for selected species within the power plant footprint prior to development.		X				Appointed specialist	Prior to any vegetation clearing activities occurring, once permits have been obtained for removing plants (if necessary)
		All translocatable plant species will be bagged up and stored in a nursery for later use, once construction has been completed and rehabilitation is required.	X	X			Visual Inspection	Project Company, Contractors, Appointed specialist	Prior to any vegetation clearing activities occurring
		Replanting of these rescued specimens will be undertaken in the first autumn – winter (May – June) after construction has been completed, giving the plants maximum time to establish before the next summer dry period.					Replanting schedule	Project Company, Contractors, Appointed specialist	Post-construction, during rehabilitation
		Immediately after being transplanted, species should be adequately watered.		X				Project Company, Contractors, Appointed specialist	Following transplant
		The approved development footprint will be surveyed and clearly demarcated with wire or coloured rope, and strung with warning signs, prior to any construction.	X	X			Visual Inspection	Project Company, Contractors, Appointed specialist	Prior to any vegetation clearing activities occurring and implemented throughout construction phases

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		A Training and Awareness Programme will be developed for employees and contractors to allow for training with regard to the areas of High and Medium – High sensitivity. This will be undertaken in conjunction with an experienced botanist.	X	X			Training and Awareness Programme, Training Records	Project Company and Specialist	Prior to any activities of disturbance
	Maximise rehabilitation efforts to allow for the re-introduction of plant species: *General Management Principles*	Implement the Revegetation and Rehabilitation Plan as per *Section 11.11*, which includes:		X			Revegetation and Rehabilitation Plan	Project Company, Contractors	Revegetation and habitat rehabilitation plan to be finalised during planning and design phase and implemented through lifecycle of project.
		Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible.		X				Project Company, Contractors	Rehabilitation post-construction
		Once revegetated, areas should be protected to prevent trampling and erosion.		X				Project Company, Contractors	Rehabilitation post-construction
		No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated.		X			Visual Inspection	Project Company, Contractors	Rehabilitation post-construction
		Fencing should be removed once a sound vegetative cover has been achieved.		X			Visual Inspection	Project Company, Contractors	Rehabilitation post-construction
		Any runnels, erosion channels or wash-aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.		X			Visual Inspection	Project Company, Contractors	Rehabilitation post-construction
		The movement of people and vehicles		X	X		Visual Inspection	Project	Access to be

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		within rehabilitated areas must be restricted and controlled.						Company. Contractors	restricted throughout rehabilitation.
	Maximise rehabilitation efforts to allow for the re-introduction of plant species: *Topsoil Management Principles*	Topsoil should be retained on site in order to be used for site rehabilitation. Topsoil must be excavated to the correct depth. It is recommended that no more than the top 10cm of topsoil are stored and used for rehabilitation.		X			Visual Inspection	Project Company. Contractors	Rehabilitation post-construction
		Topsoil removed from the pipeline trench must be kept separate from other fill during the construction process, and must be replaced last, on the soil surface.					Visual Inspection	Project Company. Contractors	Rehabilitation post-construction
		Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil.		X			Visual Inspection	Project Company. Contractors	Rehabilitation post-construction
		If direct transfer is not possible, the topsoil should be stored separately from other soil heaps until construction in an area is complete. The soil should not be stored for a long time and should be used as soon as possible.		X			Visual Inspection	Project Company. Contractors	Rehabilitation post-construction
		Ideally stored topsoil should be used within a month and should not be stored for longer than three months. In addition, topsoil stores should not be too deep, a maximum depth of 1m is recommended to avoid compaction and the development of anaerobic conditions within the soil.		X			Visual Inspection	Project Company. Contractors	Rehabilitation post-construction
		If topsoil is stored on a slope then sediment fencing should be used downslope of the stockpile in order to		X			Visual Inspection		Rehabilitation post-construction

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		intercept any sediment, and runoff should be directed away from the stockpiles upslope.							
	Maximise rehabilitation efforts to allow for the re-introduction of plant species: *Transplant Principles*	Plants for transplant should preferably be removed from areas that are going to be cleared.		X			Visual Inspection	Project Company. Contractors	Rehabilitation post-construction
		Transplants should be placed within a similar environment from where they came in terms of aspect, slope and soil depth.		X			Visual Inspection	Project Company. Contractors	Rehabilitation post-construction
		Transplants must remain within the site and may not be transported off the site.		X			Visual Inspection	Project Company. Contractors	Rehabilitation post-construction
		Additional rehabilitation of the pipeline servitude south of the MR559 will be undertaken using relevant locally indigenous species that are additional to those used in the Search and Rescue process.		X			Visual Inspection	Appointed specialist (i.e. experienced horticultural contractor)	Rehabilitation post-construction
		Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level			X		Visual Inspection	Project Company. Contractors	As necessary
Introduction of alien invasive species	Manage alien plant infestation during all phases through implementation of the Alien Invasive Management Plan	Implementation of the Alien Invasive Management Plan (refer to *Section 11.9*); which includes:		X	X	X	Implementation of the Alien Invasive Management Plan	Project Company, Contractors and ECO	Throughout life cycle of the Project
		Lighter infested areas should be cleared first to prevent the build-up of seed banks.		X	X	X		Project Company, Contractors and ECO	Throughout life cycle of the Project
		No spraying of herbicide will be undertaken in rehabilitated areas as this kills numerous non-target species.		X	X	X		Project Company,	Throughout life cycle of the Project

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		The focus will be on removing (using CapeNature approved methodology) all alien invasive shrubs and large herbs, although in some cases it may be possible and necessary to also remove invasive alien grasses.						Contractors and ECO	
		Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.		X	X	X		Project Company, Contractors and ECO	During construction phase
		Clearing of vegetation is not allowed within 32m of any wetland, 80m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas.		X	X	X	Visual Inspection Written permission from ECO	Project Company, Contractors and ECO	During construction phase
		Alien invasive species (such as ryegrass or oats) or straw containing any such species will not be used for temporary soil stabilisation of the pipeline corridor.		X		X		Project Company and ECO	During construction phase
		Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.		X		X	Visual Inspection	Contractors and ECO	Weekly inspections of stockpiles
		Per the Alien Invasive Management Plan, document and record alien invasive plant management including: • alien plant distribution; • alien plant control measures implemented; and • evaluation of control success rate		X	X	X	• Alien plant distribution map • Record of clearing activities • Decline in documented	Project Company, Contractors and ECO	Throughout life cycle of the Project on a biannual basis

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
							alien abundance over time		
		Ongoing alien invasive plant management will be undertaken on a biannual basis within any undeveloped portions of the power plant site and within the full pipeline servitude.			X			Project Company	Biannual basis during operational phase
Fauna									
Loss of faunal habitat	Minimise impact to fauna during project activities as a result of habitat loss	Demarcate all areas to be cleared with construction tape or similar material.	X	X		X	Visual inspection	ECO and Contractors	Prior to clearance activities
		The ECO will provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment, especially in the vicinity of sensitive features.		X		X		ECO	During construction and decommissioning vegetation clearing activities.
		All vehicles are to remain on demarcated roads and no driving in the veld will be allowed. The exception to this will be along the pipeline route during construction when all vehicles should follow the same track.		X		X		ECO and Contractors	
		There will be no fuelwood collection permitted on the site.		X		X	Visual inspection and ongoing monitoring	ECO and Contractors	Throughout construction and decommissioning activities
		No fires will be allowed on-site.		X		X	Visual inspection and ongoing monitoring	ECO and Contractors	Throughout construction and decommissioning activities
		Sensitive habitat features will be avoided.	X	X			Visual inspection and ongoing monitoring	Project company and ECO	Prior to and during construction and

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
									operation activities
Direct Faunal Impact	Minimise direct impact to fauna during construction and decommissioning as a result of disturbance	All vehicles at the site will adhere to a low speed limit to avoid collisions with fauna such as tortoises.		X		X		ECO and Contractors	During construction and decommissioning
		Personnel will not be allowed to roam into the veld.		X		X	Visual inspection and ongoing monitoring	ECO and Contractors	During construction and decommissioning
		All personnel will undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition.		X		X	Training materials and records	ECO and Contractors	During construction and decommissioning
		No activity will be allowed in the veld between sunset and sunrise.		X		X	Visual inspection and ongoing monitoring	ECO and Contractors	During construction and decommissioning
		Any dangerous fauna (snakes, scorpions etc) that are encountered during construction will not be handled or molested by the construction staff and the ECO or other suitably qualified persons will be contacted to remove the animals to safety.		X		X		ECO and Contractors	During construction and decommissioning
		No litter, food or other foreign material will be thrown or left around the site and should be placed in demarcated and fenced rubbish and litter areas.		X		X	Visual inspection and ongoing monitoring	ECO and Contractors	During construction and decommissioning
		Holes and trenches will not be left open for extended periods of time and should only be dug when needed for immediate construction. Trenches that may stand open for some days, will		X		X	Visual inspection and ongoing monitoring	ECO and Contractors	During construction and decommissioning

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		have places where the loose material has been returned to the trench to form an escape ramp present at regular intervals to allow any fauna that fall in to escape.							
		If there is any part of the site that needs to be lit at night for security reasons, then this will be with low-UV emitting types which do not attract insects.		X		X	Visual inspection	ECO and Contractors	During construction and decommissioning
Habitat degradation during construction and operation	Minimise degradation of faunal habitats during project activities	Personnel will not be allowed to roam into areas not demarcated for construction, operation and decommissioning activities.		X	X	X	Visual inspection and ongoing monitoring	ECO, Contractors and Project Company	All phases of the project
		No activity will be allowed in the veld between sunset and sunrise.		X	X	X	Visual inspection and ongoing monitoring	ECO, Contractors and Project Company	All phases of the project
		No litter, food or other foreign material should be thrown or left around the site and will be placed in demarcated and fenced rubbish and litter areas.		X	X	X	Visual inspection and ongoing monitoring	ECO, Contractors and Project Company	All phases of the project
		All hazardous materials will be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site will be cleaned up in the appropriate manner as related to the nature of the spill.		X	X	X	Method Statement for Storage of Hazardous Goods Visual Inspection	ECO, Contractors and Project Company	All phases of the project
Avifauna									
Loss of avifaunal habitat due to clearing of vegetation during the construction phase	Minimise impacts on birds during construction and operational activities as a result of habitat loss	The temporal and spatial footprint of the development will be kept to a minimum. The boundaries of the development area are to be clearly demarcated.		X	X		Visual Inspection	Project Company, Contractors and ECO	Boundaries to be established prior to construction and maintained throughout construction phase
		Existing roads must be used as much		X		X	Visual Inspection	Project	Throughout

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		as possible for access during construction.						Company, Contractors and ECO	construction and decommissioning phases
		Site personnel are to receive adequate training with regard to minimising areas of disturbance and avifaunal impacts and proposed management.		X	X	X	Training Records	Project Company, Contractors and ECO	Once off at the start then as new personnel are hired
		Any bird nests that are found during the construction phase must be reported to the ECO.		X		X	Records of birds' nests	Project Company, Contractors and ECO	Throughout construction and decommissioning phases
Disturbance of avifauna from construction activities and operational maintenance activities	Minimise impacts on birds during construction and operational activities as a result of destruction and displacement.	Ensure that all new lines are marked with bird flight diverters. Bird-diverters must be securely fitted and be readily and cost effectivity installed. Diverters should be fitted in consultation with an avifaunal specialist.		X	X	X	Visual Inspection; Final Design	Project Company, Contractors and ECO	Throughout construction
		All new power infrastructure must be adequately insulated and bird friendly in configuration (i.e. to allow for perching or roosting without electrocution).	X				Final Design	Project Company	Prior to construction
		If any priority species identified in this report are observed to be roosting and/or nesting and breeding in the vicinity, the ECO will be notified.		X	X	X	Records of birds' nests	Project Company, Contractors and ECO	Throughout construction and decommissioning phases
		The laydown areas and site offices etc. will be as close to the site as possible.	X	X		X	Final Design	Project Company	Prior to construction
		Driving must take place on existing roads and a speed limit of 50 km/h must be implemented on all internal roads.		X	X	X	Visual Inspection	Project Company, Contractors	Throughout construction and decommissioning phases
		If birds are nesting on power			X		Visual Inspection	Project	During operations

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		infrastructure and cannot be tolerated due to operational risks of fire, electrical short or other problems, birds will be prevented from accessing nesting sites by using mesh or other means of excluding them. Birds will not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds already with eggs and chicks will be allowed to fledge their chicks before nests are removed. If there are any persistent problems with avifauna, then an avifaunal specialist will be consulted for advice on further mitigation.						Company, appointed specialist	phase
Noise									
Increased noise levels associated with construction and operation activities on site.	Reduce the impact of increased noise levels on the community and the workforce	Proper stack and ducting design, verified by finite element analysis of the various exhaust path sections.	X				Final Design	Project Company	During planning and design phase
		Incorporate sound attenuation lining within the flue stacks to nullify the potential amplification of pulsating exhaust disturbances.	X				Final Design	Project Company	During planning and design phase
		Buildings that will house noise generating equipment should be designed to incorporate sound attenuation.	X				Final Design	Project Company	During planning and design phase
		Increased stack diameter and reduced exhaust stack temperature through better, more efficient heat recovery and design of the heat recovery steam generators.	X				Final Design	Project Company	During planning and design phase
		Regular, scheduled maintenance of equipment, including exhaust and intake mufflers will be undertaken.		X	X	X	Maintenance Schedule and Log Book	Project Company; Contractors	As per maintenance schedule

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		Internally "steel-brush" the larger steam pipelines before being assembled to reduce total 'blow-out' time.		X			Final Design	Project Company; Contractors	During assembly of the steam pipelines
		Advise people close to the facility, of the times during which high noise levels would be generated during safety valve testing, and recommend ear safety procedures for workers if warranted.		X	X		Proof of notification	Project Company	A day in advance of safety valve testing
		Mechanical equipment with lower sound power levels must be selected to ensure that permissible occupation noise-rating limit of 85 dBA is not exceeded.		X		X	Equipment inventory	Project Company, Contractors and ECO	Equipment used during construction and decommissioning
		Site personnel (including construction workforce and operational personnel) must wear hearing protection where the 8-hour ambient noise levels exceed 75dBA.		X	X	X	Visual Inspection	Project Company, Contractors and ECO	Throughout life cycle of Project where ambient noise levels are exceeded
		Ensure that workers accessing the site conduct themselves in an acceptable manner as far as noise generation is concerned.		X	X	X	Records of environmental inductions	Project Company; Contractors	Throughout life cycle of Project
		On site construction activities are to be limited to daylight hours as far as possible. Should construction activities need to be undertaken outside of these times, landowners need to be consulted.		X		X	Construction Schedule; Working Hours	Contractors	During construction and decommissioning phases
		A grievance procedure will be established whereby complaints are recorded and responded to.		X	X	X	Grievance Register	Project Company, Contractors and ECO	Throughout life cycle of Project
Air Quality									

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
Decreased ambient air quality resulting from: • Land clearing activities • Road construction activities • Wind erosion from exposed areas • Activities associated with operation of the power plant	Appropriate design measures to minimise impacts on the ambient air quality Reduce PM_{10} concentrations and dustfall	Stack heights must be designed according to Good International Industry Practice (GIIP) to avoid excessive ground level concentrations and minimise impacts.	X				Final Design	Project Company	Detailed design phase
		Dust suppression techniques must be used before and during surface clearing, excavation and piling activities on all exposed surfaces. Such measures may include wet suppression, chemical stabilisation, the use of a wind fence, covering surfaces with straw chippings and re-vegetation of open areas.		X		X	Visual Inspection	Project Company, Contractors and ECO	Throughout construction and decommissioning phases
		Where necessary, stock piles of soil must be covered by suitable shade cloth or netting to prevent erosion, fugitive dust and to prevent the escape of dust during loading and transfer from site.		X			Visual Inspection	Project Company, Contractors and ECO	Throughout construction and decommissioning phases
		Loads of vehicles carrying dusty construction materials will be covered.		X		X	Visual Inspection	Project Company, Contractors	Throughout construction and decommissioning phases
		Loading and unloading bulk construction materials will be done in areas protected from the wind in calm conditions.		X		X	Visual Inspection	Contractors	Throughout construction and decommissioning phases
		Access to the construction site will be limited to construction vehicles only.		X		X	Visual Inspection	Contractors	Throughout construction and decommissioning phases
		Vehicle speed restrictions on the construction site will be imposed.		X		X	Visual Inspection	Contractors	Throughout construction and decommissioning phases

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		A maintenance programme for construction vehicles will be implemented to ensure optimum performance and reduced emissions		X		X	Maintenance Schedule	Contractors	Throughout construction and decommissioning phases
		Vehicles carrying dusty materials will be cleaned before leaving the site		X		X	Visual Inspection	Contractors	Throughout construction and decommissioning phases
		Servicing programs for all operational components of the facility must be developed and implemented according to design specifications and requirements.			X		Servicing programmes	Project Company	Servicing according to design specifications and requirements
		Critical components must be in stock to ensure the availability of spares in the event of mechanical faults.			X		Stock inventory	Project Company	Throughout operation
		Commitment to use only LNG or CNG as the primary fuel.			X			Project Company	Throughout operation
		Any complaints received from neighbours or site users regarding air quality must be reported to the Site Manager.		X	X	X	Grievance Register	Project Company, MC and ESO	Throughout life cycle of Project
		Annual stack emission testing for $S0_2$, NO_x and PM to monitor efficiency of mitigation measures must be undertaken. The licence conditions of the atmospheric emissions license (AEL) shall describe the monitoring which needs to be done; therefore no specific monitoring requirements is prescribed until the AEL is obtained.			X		Stack emission testing results	Project Company	Annually during operations
		An atmospheric emissions license (AEL) will be obtained as required in terms of the legislation and conditions of approval adhered to.	X	X	X	X	Air Emissions Licence	Project Company	AEL must be obtained before construction. Conditions therein must be adhered

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
									to throughout project lifecycle.
Climate Change									
		The plant's thermal efficiency will be maximised throughout the life of the plant in order to reduce the gas consumption and therefore GHG emissions per unit of electricity (i.e. kWh or MWh) generated.			X		A combined thermal efficiency and GHG management plan	Project Company	During operation
		A plant specific assessment informed by the operations and maintenance (O&M) requirements for the equipment in question, and assessments will be carried out upon final selection of the equipment and, subsequent to the commencement of operations, periodically.	X				Plant specific assessment report	Project Company	Prior to the commencement of construction
		The Project documents note the potential for converting at least two of the 42 MW Trent60 OCGTs in Phase 1 to combined cycle at a later stage for improved efficiency. The option to make such a change will be reviewed periodically and implemented when possible, and on as many of the six Trent60 turbines as is feasible.			X			Project Company	During operation following the commencement of Phase 2
		A combined thermal efficiency and GHG management plan will be developed to manage GHG emissions. Recommendations for aspects to be included in this plan are detailed in the Climate Change Specialist Study (see attached in *Annex D*).			X		A combined thermal efficiency and GHG management plan	Project Company	Prior to operation
		A detailed energy management plan including a baseline in accordance with SANS 50001will be prepared as			X		Energy management plan	Project Company	Prior to operation

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		required by the Department of Energy. The energy management plan will need to include a list of technically and financially viable measures that can be put in place to meet the savings potential.							
		The Project plans to make use of solar PV energy to meet some of the plant's auxiliary load requirements. Renewable energy can play a key role in the site's GHG emissions management plan and further opportunities to install more renewable capacity on-site will be investigated going forwards.			X			Project Company	During operation
Traffic									
Impact on traffic levels	Minimise traffic associated with the construction and operation of the Project	Implement the Traffic Management Plan (refer to *Section 11.13*); which includes the implementation of:		X	X	X	Traffic Management Plan	Project Company Contractors	Throughout the lifecycle of the Project
		Conduct a road condition survey in order to gauge the damage to the road as a result of the intensive heavy traffic.	X				Road Condition Survey	Project Company; appointed specialist	Prior to construction
		The risk assessment of the proposed improvements to OP7644 should be the subject of a Road Safety Audit (RSA).	X				Road Safety Audit	Project Company; appointed specialist	Detailed design stage
		All employees must attend an environmental training programme which will include details of approved access roads and speed limits.		X		X	Training Records	Contractors; ECO	Prior to construction and during duration of contract
		Adjacent landowners must be notified of the construction and operation		X	X	X	Proof of Notification	Project Company	Prior to construction and

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		schedule.							operation phases
		Flagging must be provided at access points to the site and must be maintained until construction is completed.		X		X	Visual Inspection	Contractors	During construction and decommissioning phases
		All vehicles must be maintained in good condition to ensure that they are road worthy.		X	X	X	Maintenance Records Vehicle inspections	Project Company; Contractors	Throughout the lifecycle of the Project
		Speed restrictions must be established and enforced over all traffic.		X	X	X	Method Statements; Speeding Register	Project Company; Contractors	Throughout the lifecycle of the Project
		The movement of all vehicles within the site must be on designated roadways.		X	X	X	Visual Inspection	Project Company; Contractors	Throughout the lifecycle of the Project
		All necessary transportation permits to be applied for and obtained from the relevant authorities prior to construction, including access to the site from OP7644 which will include the addition of proposed turning lanes.	X				Transportation Permits	Project Company; Contractors	Prior to construction
		If abnormal loads are required, the appropriate arrangements will be made to obtain the necessary transportation permits and the route agreed with the relevant authorities to minimise the impact of other road users.	X	X	X	X	Abnormal load permits	Project Company; Contractors	As and when required.
		A designated access point to the site must be created and clearly marked to ensure safe entry and exit.		X		X	Visual Inspection	Contractors	During construction and decommissioning phases
		Signs must be placed along construction roads and at the entrance to the site to identify speed limits,		X		X	Visual Inspection	Contractors	During construction and decommissioning phases

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		travel restrictions and other standard traffic control information and road markings.							
		Where possible, construction vehicles to avoid travelling on the public roadway during the morning and late afternoon commute time, to reduce the impact on other road users.		X		X	Method Statement	Contractors	During construction and decommissioning phases
Impact on road safety	Manage vehicles and machinery to reduce the impact of traffic incidents.	A public transport embayment will be provided downstream of the entrance to the power plant and on both sides of the OP7644.			X		Final Design	Project Company	To be constructed during construction phase and implemented during operation
		All internal and access roads that will be used during the operational phase of the Project must be maintained.			X		Visual Inspection Maintenance Plan	Project Company	Throughout operational phase
Socio-Economic									
Employment, Skills Enhancement and Local Business Opportunities	Optimise opportunities for employment of local people, wherever possible, or alternatively that employment of South Africans, is prioritised over foreigners	Establish and implement a recruitment policy which prioritises the employment of South African and local residents (originating from the Local Municipality) over foreigners. Criteria will be set for prioritising local residents and then other South Africans as part of the recruitment process.	X	X	X	X	Recruitment Policy	Project Company	Throughout all phases of the Project
		All contractors will be required to recruit in terms of the Project's recruitment policy, where practical.	X	X	X	X	Recruitment Policy	Contractors	Throughout all phases of the Project
		The Project will meet with the Local Municipality to access any available skills/employment-seekers database for the area. This database is to be	X	X	X	X		Project Company	Throughout all phases of the Project

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		updated and made available to the appointed contractors.							
		Advertise job opportunities and criteria for skills and experience as needed through local media. This information should also be provided to all relevant authorities, community representatives and organisations on the interested and affected party database.	X	X	X	X		Project Company	Advertise at least three months ahead of recruitment
		Monitor on-the-job performance and training through performance reviews. Training needs will be identified and provided by the Project.	X	X	X	X	Performance Reviews Training Records	Project company, Contractors	Throughout all phases of the Project
Impacts on affected and surrounding landowners and land uses	Ensure effective communication mechanisms	Compile and implement a grievance procedure that is easily accessible to the local community, through which complaints related to contractor or employee behaviour can be lodged and responded to.		X	X	X	Grievance mechanism procedure	Project Company, Contractors	To be implemented during construction, operational, and if applicable, decommissioning phases
Community Health and Safety: Impacts associated with: • presence of the Project workforce; • influx of jobseekers; • air emissions	To protect members of the public / landowners / residents.	Develop an induction programme, including a Code of Conduct, for all workers directly related to the project and address the following aspects: • respect for local residents and customs; • zero tolerance of bribery or corruption; • zero tolerance of illegal activities; • no alcohol and drugs policy during working time or at times that will affect ability to work; • description of disciplinary	X	X	X	X	Code of Conduct to be signed by each person.	Project Company	To be developed during planning and design phase and implemented during construction, operation, and if applicable, decommissioning phases

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		measures.							
		Develop and implement an HIV/AIDS policy and information document for all workers directly related to the Project.		X	X	X	HIV/AIDS policy and information document	Project Company	To be implemented during construction, operational, and if applicable, decommissioning phases
		Secure the site, working areas and excavations in an appropriate manner.		X	X	X	Visual Inspection	Project Company, Contractors	During site establishment and maintenance for duration of contract.
		Implement access control procedures which allows for the identification of all people on-site.		X	X	X	Visual Inspection	Project Company, Contractors	During site establishment and maintenance for duration of contract. Operational phase
Risk to Workers' Health and Safety due to Hazardous Construction and Operational Activities	To protect the construction workforce and operational personnel	The Project will comply with all applicable South African legislation in terms of health and safety, and worker rights, which will include access to workman's compensation for loss of income resulting from an onsite incident.		X	X	X	Workman's compensation policy as part of contract	Project Company, Contractors	Compliance throughout construction, operation, and if applicable, decommissioning phases
		As part of the contractor and supplier selection process the Project will take into consideration performance with regard to worker management, worker rights, health and safety as outlined in South African law, international standards and the Project's policies.		X	X	X		Project Company, Contractors	Throughout all phases of the Project
		The Project will provide support to		X	X	X	Training records	Project	Throughout all

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		contractors and subcontractors to ensure that labour and working conditions are in line with South African law through capacity building.						Company, Contractors	phases of the Project
		Workers will be provided with primary health care and basic first aid at construction camps /worksites.		X		X	Visual inspection	Contractors	Throughout construction and decommissioning phases
		In line with the worker code of conduct employees should not be under the influence of intoxicants which could adversely affect the ability of that employee to perform the work or adversely affect the health and safety of other employees, other persons or the environment.		X	X	X	Conduct breathalyser tests at random	Project Company, Contractors	Throughout all phases of the Project
		Provide Personal Protective Equipment (PPE), training and monitoring as well as ongoing safety checks and safety audits		X	X	X	Visual Inspection	Project Company, Contractors	Throughout all phases of the Project
		Ensure that all workers on site are aware of the proper procedure in case of a fire occurring on site.		X	X	X	Emergency Preparedness and Response Plan Training Records	Project Company, Contractors and ECO	Prior to construction and during duration of contract
		Establish the necessary ablution facilities with chemical toilets at appropriate locations on site (1 toilet per every 15 workers).		X		X	Visual Inspection	Contractors	During site establishment and maintenance for duration of contract
Visual									
Visual Impacts associated with the plant	To reduce the visual impact of the Project activities on the surrounding	Construction areas to be kept neat and tidy, with litter and dust management measures in place at all times.		X		X	Visual Inspection	Project Company, Contractors	Throughout construction phase
		If construction or operation is to occur		X	X		Visual Inspection	Project	During

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
	communities	during the night, all lights used for illumination will be designed and installed appropriately to avoid excessive light spill						Company, Contractors	construction and operation phases
		Signage related to the Site must avoid commercial messages, be discrete, and be confined to entrance gates unless they serve to inform the public about the facility.			X		Visual Inspection	Project Company	Throughout operation
		All equipment and infrastructure on site will be removed and the impacted areas rehabilitated unless an alternative use for the infrastructure is identified in the closure plan.				X	Visual Inspection	Project Company	Following the decommissioning phase
Cultural Heritage									
Impacts to Pre-colonial & Colonial Archaeology, Graves and Cairns		Should any human burials, archaeological or palaeontological materials (fossils, bones, artefacts etc.) be uncovered or exposed during earthworks or excavations, they must immediately be reported to the Heritage Western Cape must be notified (Telephone: 021 483 9685), as well as Environmental and Heritage Section of the Saldanha Bay Municipality		X			Report sent to the Heritage Western Cape	Project Company and Contractor with assistance from heritage specialist	During construction
		After assessment and if appropriate a permit must be obtained from the SAHRA or HWC to remove such remains.		X			Heritage permit	Project Company and Contractor with assistance from heritage specialist	During construction
Impacts to buried Palaeontology		Sub-surface excavations should be monitored by a palaeontologist or archaeologist with appropriate		X			Monitoring reports	Project Company and Contractor with assistance	During construction

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		palaeontological knowledge. The frequency of this to be worked out a priori with the contractor to minimise time spent on site.						from a palaeontologist	
		Any material recovered will be lodged in the Cenozoic collections of Iziko South African Museum.		X				Project Company and Contractor with assistance from a palaeontologist	During construction
		If any palaeontological material is uncovered, permit for the disturbance and removal of palaeontological material will be required from the Western Cape Provincial Heritage Agency.		X			Heritage permit	Project Company and Contractor with assistance from heritage specialist	During construction
		Training in the nature and value of palaeontological and archaeological remains should be provided to project staff and equipment operators.		X			Training materials and attendance registers	Project Company, ECO, Contractor and Palaeontologist	During construction
		Should anything of a palaeontological nature be encountered on site by the Contractor (or any other party), e.g. bones or wetland deposits, work is to be stopped in that area immediately, and the OM / Principal Agent notified. Failure to do so will result in a penalty and this must be carefully explained to workers during the Environmental Education Programme undertaken by the OM.		X				Project Company, ECO, Contractor	During construction
		In the event of palaeontological material being encountered, the OM will demarcate the area and notify the		X			Visual inspection	Project Company, ECO, Contractor and Palaeontologist	During construction

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		appointed specialist (palaeontologist/ archaeologist with appropriate experience) who will view the material and ascertain whether further study of the area is required.							
		Should the specialist confirm a genuine fossil or sub-fossil and recommend further study of the area, work in the applicable area is to cease until further notice while arrangements are put in place. Heritage Western Cape (HWC) is to be informed immediately by the OM (Telephone: 021 483 9685).		x				Project Company, ECO, Contractor and Palaeontologist	During construction
Waste Management									
Pollution of the environment caused by waste	Limit the potential for site pollution and the accumulation of waste materials on site.	A suitable area for the storage of waste must be selected and included in the site layout plan.	X					Project Company	Prior to construction
		An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling, re-use and disposal where appropriate.	X	X	X	X	Waste Management Plan	Project Company	Plan to be developed prior to construction and implemented throughout Project
		Where required, bunds will need to be constructed for fuel, oil, used oil and chemical storage areas. Bunds must be appropriately surfaced and have sufficient volume to accommodate any leaks as per the requirements of SABS 089:1999 Part 1.	X	X	X		Visual Inspection	Project Company, Contractors	Bund design to be confirmed prior to construction.
		All waste must be separated into clearly marked skips for recycling, reuse and disposal.		X	X	X	Visual Inspection	Project Company, Contractors	
		Vegetative material will be kept on site		X			Rehabilitation	Project	

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		and mulched after construction to be spread over the disturbed areas to enhance rehabilitation of the natural vegetation, provided that they are free of seed-bearing alien invasive plants.					Plan	Company, Contractors	
		Any hazardous waste must be removed by a licensed waste disposal operator.		X	X	X	Waste Disposal Certificates	Project Company, Contractors	
		Hazardous substances must not be stored where there could be accidental leakage into surface or groundwater.		X	X	X	Visual Inspection	Project Company, Contractors	
		Waste must not be disposed of by burning, dumping or burying.		X	X	X	Visual Inspection	Project Company, Contractors	
		Littering on-site is forbidden and clean-up operations will be undertaken to address litter.		X	X	X	Visual Inspection	Project Company, Contractors	Daily clean-up operations to be undertaken.
		Temporary ablutions will be located in convenient locations around the Site, and must be cleaned regularly by a licenced sanitary contractor. All temporary ablutions must be removed from the site when the construction phase is completed		X			Waste Management Policy Visual Inspection	Contractors	
		Effluent from the cement batching plant must be contained within a settling sump and not be allowed to drain into water courses. Effluent will be recycled or removed.		X			Waste Disposal Certificates Visual Inspection	Project Company, Contractors	
		Excess or spilled concrete should be confined to the batching plant and work locations, and be disposed of as waste at a licensed landfill site.		X			Method Statement Waste Disposal Certificate Visual Inspection	Project Company, Contractors	

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		The visible remains of the mixing of concrete, either solid or from washings, shall be physically removed and disposed of as waste at a licensed landfill site.		X			Waste Disposal Certificate Visual Inspection	Project Company, Contractors	
		All excess aggregate shall also be removed from site.		X			Visual Inspection	Project Company, Contractors	
		Spill containment and clean up kits will be available onsite and clean-up from any spill will be appropriately contained and disposed of to a licensed landfill by a licensed operator.		X	X	X	Visual Inspection	Project Company, Contractors	
		Used oil stored on site must be stored in an impervious container, within a bunded area.		X	X	X	Visual Inspection	Project Company, Contractors	
		All waste at the site must be handled appropriately and kept in closed bins not accessible to fauna.		X	X	X	Visual Inspection	Project Company, Contractors	
		General waste must be removed from site by a licensed contractor.		X	X	X	Waste manifest	Project Company, Contractors	
		Hazardous waste such as oils, oily rags, paint tins, bitumen etc. must be disposed of at a licenced hazardous waste facility.		X	X	X	Hazardous Waste Disposal Certificates	Project Company, Contractors	
		An effective monitoring system must be put in place to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage.			X		Monitoring system	Project Company	
		Ensure that precautionary measures are in place to limit the possibility of oil			X		Engineering Designs	Project Company	

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Construction	Operation	Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		and other toxic liquids from entering the soil or stormwater system.							
Unplanned Events									
Risk of an incident (i.e. fire or explosion) from a loss of containment of Natural Gas or Propane from pipelines, facilities or ancillary equipment at the proposed Natural Gas pipelines or Propane electricity generator	Ensure legal compliance of the facility.	Completing recognised processes of hazard analysis processes (HAZOP, FMEA, SIL, LOPA etc.) for the proposed CCGT power plant prior to construction	X				Completed processes of hazard analysis	Project Company	After Planning and Design Phase
		Ensuring a Major Hazard Installation (MHI) risk assessment is carried out for the facility in accordance with the Major Hazard Installation regulations	X				MHI Risk Assessment	Project Company	After detailed designs have been completed for the pipelines and CCGT power plant
Loss of containment of Natural Gas or Propane from pipelines	To avoid or minimise the risk of an incident (i.e. fire or explosion) through engineering design features	The pipelines to be designed to an international standard such as: • BS EN 14161: Petroleum and natural gas industries – Pipeline transportation systems; • ASME B31.8 Gas Transmission and Distribution Piping Systems; or • Other internationally recognised standards.	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		The pipelines' wall thickness to be designed to accommodate the maximum operating pressure of 90 barg with a suitable safety factor.	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Isolation valves to be located at least at either end of the pipelines but ideally at intervals such that in the event of a	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
		leak only small amounts of Natural Gas would be released.							
		Leak prevention systems such as cathodic protection and pipeline coatings suitable for the ground conditions to be implemented.	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		The pipelines are to include an emergency shutdown system that will shut emergency isolation valves and depressurise the pipelines safely.	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Areas of road crossing shall include specific protection measures to account for the weight from road traffic.	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		A leak detection system is to be considered for the pipelines.	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		The installation of non-return valves on the pipelines is to be considered.	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Depth of burial of the pipelines along their length should be equal to, or greater than the minimum depth of burial specified.	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Potential other risk reduction measures include concrete sheathing, tiles above pipelines, marker tape above pipelines, route marker posts etc.	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Emergency response plan for the pipeline must be compiled with the user of the pipelines and the Local Authority together.	X				Emergency Response Plan	Project Company	Planning and Design Phase
Loss of containment of Natural Gas or	To avoid or minimise the risk of an incident (i.e. fire or explosion)	The installation must comply with all the requirements of SANS 10087-3:2015	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase: Planning and Design	Applicable Phase: Construction	Applicable Phase: Operation	Applicable Phase: Decommissioning	Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
Propane from Propane generator installations on the CCGT power plant site	through engineering design features	The handling, storage, distribution and maintenance of liquefied petroleum gas in domestic, commercial, and industrial installations Part 3: Liquefied petroleum gas installations involving storage vessels of individual water capacity exceeding 500 L							
		Multiple (at least two) safety systems will be implemented for Propane offloading.	X	x	x		Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase. To be implemented in Construction and Operation.
		There will be effective inspection and pressure/leak tests to prevent transfer system leaks and bursts.		x	x		Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase. . To be implemented in Construction and Operation.
		The Propane storage vessel shall be fitted with pressure relief valves, which would only lift when the vessel has reached its maximum operating pressure or level	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		All piping shall be rated to accommodate the required operating pressure of the system and allow for pressure relief to a safe area	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		All pressure relief systems should vent away from the generator air intake system	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		The Propane vessel shall be filled with sparge pipes in the vapour space to limit reverse flow to the off-loading point as well as preventing vessel stresses due to uneven temperature	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		All instrumentation and electrical equipment shall be specified in accordance to the Hazardous Area classification as per SANS 10108	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Off-loading of Propane shall be done on a fully-automated system to prevent overfilling	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Pullaway prevention systems such as wheel chocks should be utilised during Propane offloading	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Off-loading safety systems such as earthing of the road tanker are required	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Off-loading of Propane shall be done using hoses with breakaway couplings	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Emergency shutdown (ESD) shall be provided that would automatically shut down systems such as feed or off-loading pumps and emergency shut off valves in the event of an emergency	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Emergency shutdown should be initiated by local operators, CCGT control room operators as well as by gas detectors where appropriate.	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Active or passive fire protection on the Propane storage bullet in line with SANS 10087-3:2015	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Propane road tanker offloading deluge system to cool equipment in the event of a fire if required by SANS 10087-3:2015	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Gas detectors with appropriate logic	X				Final Detailed	Project Company	Planning and

Aspect, Potential Impact / Issue	Objective	Mitigation and Enhancement Commitments	Applicable Phase				Monitoring and Indicators	Responsible Party	Implementation Time Frame and Frequency
			Planning and Design	Construction	Operation	Decommissioning			
		which can initiate emergency shutdown					Design	and appointed Engineers	Design Phase
		All of the automatic safety systems shall be designed so that they can also be manually activated	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase
		Procedures should ensure at least one person be present during Propane offloading	X				Final Detailed Design	Project Company and appointed Engineers	Planning and Design Phase

11.7.1 *Decommissioning Phase*

A detailed decommissioning and rehabilitation plan must be developed prior to decommissioning the CCGT gas fired power plant and associated infrastructure. This plan should include, but not be limited to, management of socio-economic aspects such as employment loss, removal, re-use and recycling of materials and vegetative rehabilitation to prevent erosion.

The decommissioning activities will be similar to construction activities and therefore recommendations outlined to manage construction phase impacts should be adhered to during decommissioning. Management actions should focus on the rehabilitation of disturbed areas and the removal of infrastructure.

11.8 *SPECIFIC MANAGEMENT PLANS*

In accordance with the DEA's acceptance of the Scoping Report, a variety of management plans have been developed as part of the EMPr. These are aimed at ensuring that construction and operation occur in a responsible manner and include:

- Alien Invasive Management Plan;
- Plant Rescue and Protection Plan;
- Revegetation and Rehabilitation Plan;
- Open Space Management Plan;
- Traffic Management Plan;
- Stormwater Management Plan;
- Erosion Management Plan; and
- Emergency Preparedness and Response Plan.

The purpose, objectives and underlying principles of these plans are detailed in the sections that follow. All management and mitigation measures of the plans have been included in *Table 11.3*.

11.9 *ALIEN INVASIVE MANAGEMENT PLAN*

11.9.1 *Objectives*

The purpose of the Alien Invasive Management Plan is to provide a framework for the management of alien and invasive plant species during the construction and operation of the Project. The broad objectives of the plan include the following:

- Ensure alien plants do not become dominant in parts or the whole site through the control and management of alien and invasive species presence, dispersal and encroachment.

- Initiate and implement a monitoring and eradication programme for alien and invasive species.

- Promote the natural re-establishment and planting of indigenous species in order to retard erosion and alien plant invasion.

11.9.2 Principles

General Clearing and Guiding Principles

- The lighter infested areas should be cleared first to prevent the build-up of seed banks.

- Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they are currently.

- Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses.

- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

- Different species require different clearing methods such as manual, chemical or biological methods or a combination of both. However care should be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum.

Construction Phase Alien Invasive Management Principles

- Clearing of vegetation should be undertaken as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.

- Where cleared areas will be exposed for some time, these areas should be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.

- Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.

- Clearing of vegetation is not allowed within 32m of any wetland, 80m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the ECO for specifically allowed construction activities in these areas.

- Alien invasive species (such as ryegrass or oats) or straw containing any such species will not be used for temporary soil stabilisation of the pipeline corridor, as these will then rapidly dominate these areas, to the exclusion of indigenous species.

- Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.

Operation Phase Alien Invasive Management Principles

- Ongoing alien invasive plant management will be undertaken on an annual or biannual basis within any undeveloped portions of the power plant site and within the full pipeline servitude.

- No spraying of herbicide will be undertaken in the rehabilitated areas as this kills numerous non-target species.

- Focus will be on removing (using CapeNature approved methodology) all alien invasive shrubs and large herbs, although in some cases it may be possible and necessary to also remove invasive alien grasses.

11.9.3 Monitoring

Document and record alien invasive plant management throughout the life cycle of the project on a biannual basis including:

- alien plant distribution maps;
- alien plant control measures implemented; and
- evaluation of control success rate

11.10 PLANT RESCUE AND PROTECTION PLAN

11.10.1 Purpose

The purpose of the plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development of the Project on listed and protected plant species and their habitats during construction and operation.

11.10.2 Rescue and Protection Plan Principles

A plant rescue and translocation operation for protected plants will need to be undertaken prior to site clearing or construction taking place, according to the following principles:

- A suitably qualified botanist must be appointed prior to any construction / land clearing activities taking place, to undertake plant search and rescue from the entire pipeline development corridor south of the Langebaan – Saldanha road. Search and Rescue will also be undertaken for selected species within the power plant footprint prior to development.

- All translocatable plant species will be bagged up and stored in a nursery for later use, once construction has been completed and rehabilitation is required.

- A Training and Awareness Programme will be developed for employees and contractors to allow for training with regard to the areas of High and Medium – High sensitivity. This will be undertaken in conjunction with an experienced botanist.

- Replanting of the rescued specimens will be undertaken in the first autumn – winter (May – June) after construction has been completed, giving the plants maximum time to establish before the next summer dry period.

- The approved development footprint in this area will be surveyed and clearly demarcated with wire or coloured rope, and strung with warning signs, prior to any construction.

- Immediately after being transplanted, species should be adequately watered.

11.10.3 Monitoring

Plant mortality can be high when plants are transplanted and it is therefore recommended that relocated plants be monitored for a period of at least a month post-translocation to identify any additional plant requirements.

11.11 REVEGETATION AND REHABILITATION PLAN

11.11.1 Purpose

Disturbance of terrestrial vegetation outside the actual development footprint is likely to be inevitable and will likely require rehabilitation post-construction where the vegetation and / or soil surface has been damaged or disturbed. The purpose of this plan is to ensure that areas cleared or impacted during construction activities of the proposed Facility are rehabilitated with a plant cover that reduces the risk of erosion from these areas as well as restores ecosystem function. The purpose of the rehabilitation at the site can be summarised as follows:

- Achieve long-term stabilisation of all disturbed areas to minimise erosion potential;

- Re-vegetate all disturbed areas with suitable local plant species;
- Minimise visual impact of disturbed areas;
- Ensure that disturbed areas are safe for future uses; and
- The movement of people and vehicles within rehabilitated areas must be restricted and controlled.

11.11.2 Principles

The following guidelines provide a clear and practical means of implementing such rehabilitation once construction activities have ceased.

General Recommendations

- Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible.
- Once revegetated, areas should be protected to prevent trampling and erosion.
- No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated.
- Fencing should be removed once a sound vegetative cover has been achieved.
- Any runnels, erosion channels or wash-aways developing after revegetation should be backfilled and consolidated and the areas restored to a proper stable condition.

Topsoil Management

Effective topsoil management is a critical element of rehabilitation, particularly in arid areas where soil properties are a fundamental determinant of vegetation composition and abundance. Where any excavation or topsoil clearing is required, the topsoil should be used immediately where possible or stockpiled and later used to cover cleared and disturbed areas once construction activity has ceased.

- Topsoil should be retained on site in order to be used for site rehabilitation. Topsoil must be excavated to the correct depth. It is recommended that no more than the top 10cm of topsoil are stored and used for rehabilitation.
- Wherever possible, stripped topsoil should be placed directly onto an area being rehabilitated. This avoids stockpiling and double handling of the soil.

- If direct transfer is not possible, the topsoil should be stored separately from other soil heaps until construction in an area is complete. The soil should not be stored for extended periods and should be used as soon as possible.

- Ideally stored topsoil should be used within one month and should not be stored for longer than three months. In addition, it is recommended that topsoil stores should be a maximum depth of 1m to avoid compaction and the development of anaerobic conditions within the soil.

- If topsoil is stored on a slope then sediment fencing should be used downslope of the stockpile in order to intercept any sediment and runoff should be directed away from the stockpiles upslope.

Seeding

In some areas the natural regeneration of the vegetation may be poor and the application of seed to enhance vegetation recovery may be required. Seed should be collected from plants present at the site and should be used immediately or stored appropriately and used at the start of the following wet season. Seed can be broadcast onto the soil, but should preferably be applied in conjunction with measures to improve seedling survival such as scarification of the soil surface or simultaneous application of mulch.

Transplants

Where succulent plants are available or other species which may survive translocation are present, individual plants can be dug out from areas about to be cleared and planted into areas which require revegetation. The primary purpose of using transplants is not to restore plant cover to its former levels, but rather to provide nodes of biological activity and a source of propagules that can spread and recover disturbed areas on their own. As such transplants should be planted in clumps rather than as isolated individuals.

- Plants for transplant should preferably be removed from areas that are going to be cleared.

- Transplants should be placed within a similar environment from where they came in terms of aspect, slope and soil depth.

- Transplants must remain within the site and may not be transported off the site.

As required, additional rehabilitation of the pipeline servitude south of MR559 will be undertaken using the relevant locally indigenous species that are additional to those used in the Search and Rescue process. This work will be undertaken by an contractor with relevant horticultural experience who has access to suitable locally grown species.

Use of Soil Savers

In areas where seed and organic matter retention is low, it is recommended that soil savers are used to stabilise the soil surface. The site is windy and wind erosion is likely to be a potentially significant issue at the site following construction and measures to protect the soil surface such as soil savers may to be necessary. Soil savers are man-made materials, usually constructed of organic material such as hemp or jute and are usually applied in areas where traditional rehabilitation techniques are not likely to succeed. In areas where a soil saver is used, it should be pegged down to ensure that it captures soil and organic matter flowing over the surface.

Soil saver may be seeded directly once applied as the holes in the material catch seeds and provide suitable microsites for germination. Alternatively, fresh mulch containing seed can be applied to the soil saver.

11.11.3 Monitoring Requirements

As rehabilitation success is unpredictable, monitoring and follow-up actions are important to achieve the desired cover and soil protection.

- Re-vegetated areas should be monitored every 6 months for the first 18 months following construction.
- Re-vegetated areas showing inadequate surface coverage (less than 10% within 12 months after re-vegetation) should be prepared and re-vegetated.
- Any areas showing erosion, should be re-contoured and seeded with indigenous grasses or other locally occurring species which grow quickly.

11.12 Open Space Management Plan

11.12.1 Purpose

The purpose of the Open Space Management Plan (OSMP) is to provide a framework for the integrated management of the natural spaces within the Project Area. The footprint of the facility will occupy a small proportion of the site, but impacts resulting from the construction and operational activities of the facility may spread well beyond the required footprint and impact biodiversity within the site more generally. The goal of the OSMP is to reduce the ecological footprint of the power plant through ensuring that the facility operates in a biodiversity-compatible manner and does not have a long-term negative impact on the local environment.

11.12.2 *Principles*

The following mitigation and management measures are considered part of the Open Space Management Plan:

Access Control

- Access to the facility should be strictly controlled.
- All visitors and contractors should be required to sign-in.
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly prohibited.
- The fencing around the facility should consist of a single fence with electrified strands only on the inside of the fence and not the outside.

Prohibited Activities

The following activities should not be permitted within the facility by anyone except as part of the other management programmes of EMPr for the development.

- No fires within the site.
- No hunting, collecting or disturbance of fauna and flora, except where required for the safe operation of the facility and only by the Environmental Officer on duty and with the appropriate permits and landowner permission.
- No dogs should be allowed on site.
- No driving off of demarcated roads.

Fire Risk Management

The National Veld and Forest Fires Act places responsibility on the landowner to ensure that the appropriate equipment as well as trained personnel are available to combat fires. Therefore, the management of the facility should ensure that they have suitable equipment as well as trained personnel available to assist in the event of fire. Fires must be managed in accordance with the plants Emergency Response Plan.

Alien Plant Control

Alien invasive plants should be controlled according to the Alien Invasive Management Plan.

Erosion Management

The facility should be inspected every 6 months for erosion problems or more frequently in the event of exceptional rainfall events. All erosion problems should be rectified according to the Erosion Management Plan.

11.13 *TRAFFIC MANAGEMENT PLAN*

11.13.1 *Purpose*

Implementation of the Traffic Management Plan (TMP) will ensure regulatory compliance and the reduction of the significance of impacts related to transport during the construction and operation of the Project. The objectives of this plan are therefore:

- Ensure compliance with all legislation regulating traffic and transportation within South Africa;
- Avoid incidents and accidents;
- Raise greater safety awareness in each drivers;
- Avoid the deterioration of roads; and
- Avoid pollution that can be created from noise and emissions related to transport.

11.13.2 *Traffic and Transport Management Principles*

The following principles (as included in *Table 11.3*) will be adhered to during the applicable phases of the Project:

- Conduct a road condition survey in order to gauge the damage to the road as a result of the intensive heavy traffic.

- The risk assessment of the proposed improvements to OP7644 should be the subject of a Road Safety Audit (RSA).

- All employees must attend an environmental training programme which will include details of approved access roads and speed limits.

- Adjacent landowners must be notified of the construction and operation schedule.

- Flagging must be provided at access points to the site and must be maintained until construction is completed.

- All vehicles must be maintained in good condition.

- Speed restrictions must be established prior to commencement of construction and enforced over all construction traffic.

- The movement of all vehicles within the site must be on designated roadways.

- All necessary transportation permits to be applied for and obtained from the relevant authorities prior to construction, including access to the site from OP7644 which will include the addition of proposed turning lanes.

- If abnormal loads are required, the appropriate arrangements will be made to obtain the necessary transportation permits and the route agreed with the relevant authorities to minimise the impact of other road users.

- A designated access point to the site must be created and clearly marked to ensure safe entry and exit.

- Signs must be placed along construction roads and at the entrance to the site to identify speed limits, travel restrictions and other standard traffic control information and road markings.

- Where possible, construction vehicles to avoid travelling on the public roadway during the morning and late afternoon commute time, to reduce the impact on other road users.

- Public transport embayments will be provided downstream of the entrance to the power plant and on both sides of the OP7644.

- All internal and access roads that will be used during the operational phase of the Project must be maintained.

11.13.3 Monitoring

Contractors and the Project Company must ensure that all vehicles adhere to the speed limits. A speeding register should be maintained which details the offending drivers and the offence.

11.14 STORMWATER MANAGEMENT PLAN

11.14.1 Purpose

The construction and operation of the Project can negatively impact drainage systems therefore stormwater management systems that take cognisance of natural hydrological patterns and processes will reduce the potentially negative impacts. The main risks associated with poor stormwater management practices are increased erosion risk and risks associated with flooding. Therefore the principles underlying the Erosion Management Plan should be read in conjunction with the Stormwater Management Plan (SWMP).

The objective of this SWMP is to provide measures to address runoff from disturbed portions of the site so that:

- Concentrated flows into natural watercourses are minimised;

- Concrete or other lining of watercourses to protect them from concentrated flows is not required; and

- Natural flow pathways are not diverted.

11.14.2 *Stormwater Management Principles*

The following sets out the general design principles that will enable effective stormwater management. It should be noted that a detailed SWMP with engineering specifications for proposed stormwater control measures will be prepared by the civil engineers during the detailed design phase. This will be based on the following underlying principles:

Sedimentation

Mitigation of possible sedimentation that may impact drainage systems can be achieved by implementing the following measures:

- Implement energy dissipation structures where concentrated flows occur.

- Implement appropriate measures to trap sediment at sources where areas are going to be disturbed (e.g. construction materials laydown area). Mitigation measures could include sediment fences and erosion control blankets.

- Design road networks to prevent the accumulation of high energy surface flows by specifying surface cross drains at regular intervals, by constructing roads to natural ground level or by including sufficient drainage in the form of culverts.

- Maintain, where possible, the natural vegetation cover and facilitate re-vegetation of disturbed areas to stabilise the soil.

- Stabilise all earthen berm structures by specifying adequate compaction and revegetating.

- Exercise good excavation practises during the construction phase. Backfill and compact all material to acceptable standards as soon as possible after construction and facilitate re-vegetation of all disturbed areas as soon as possible after backfilling.

- Workshop areas will be lined to prevent subsurface ingress of contaminants and drainage from these areas will not be allowed to drain into groundwater.

Flooding

Mitigation of the possible risk of flooding can be achieved by implementing the following measures:

- Only remove natural vegetation where necessary and maintain the natural flow resistance which will decrease flood peaks.

- Implement free draining platforms (if required) for the substations and transformers to prevent the risk of flooding of infrastructure.

- Establish earthen berms to protect infrastructure against flooding.

- Implement attenuation facilities of areas that are drained.

11.14.3 *Monitoring*

Although it is anticipated that the proposed Project (the pipeline development in particular) will have a limited impact on the drainage characteristics of the area, it is recommended that monitoring of the site be carried out both during and after construction to identify potential impacts on the natural systems as a result of potential altered flow patterns.

In addition, the discharge points from the laydown areas should be monitored for signs of concentrated flows and erosion.

The pipeline access road has the potential to impact negatively on the natural drainage pattern of the area if not designed and implemented correctly. The road network should be monitored regularly to determine areas where stormwater may be concentrated or diverted which may lead to erosion. In addition, the crossing points at the drainage features should be monitored for signs of erosion.

Should signs of erosion and alterations to the natural flow patterns be identified, appropriate interventions should be designed to address the issues as they arise.

11.15 *EROSION MANAGEMENT PLAN*

11.15.1 *Purpose*

The erosion management plan addresses the management and mitigation of potential impacts relating to soil erosion during the construction and operation of the Project. The objectives of the plan are there to:

- Provide a general framework for soil erosion and sediment control; and

- Outline general methods to monitor, manage and rehabilitate erosion prone areas.

11.15.2 *Erosion and Sediment Management Principles*

The following management principles will reduce the impact of erosion and enable progressive revegetation and stabilisation of disturbed areas:

- Restrict removal of vegetation and soil cover to the development footprint.
- Soil stockpiles must be protected from wind or water erosion through placement, vegetation or appropriate covering.
- Excavations/trenches should be backfilled slightly higher than the natural ground level to accommodate some degree of settlement of the backfill material.
- Exercise good excavation practises - backfill and compact all material to acceptable standards as soon as possible after construction and facilitate re-vegetation of all disturbed areas as soon as possible after backfilling.
- Construction vehicles will remain on designated and prepared roads.
- Maintain, where possible, the natural vegetation cover and facilitate re-vegetation of disturbed areas to stabilise the soil against erosion.
- Foundations and trenches must be backfilled with originally excavated materials as far as possible. Excess excavation materials must be disposed of only in approved areas or, if suitable, stockpiled for use in reclamation activities.
- Borrow materials must only be obtained from authorised and permitted sites.
- Although soil erosion is not considered significant, it might be necessary to implement control measures such as suitable location on flatter areas with low erosion potential and the rapid establishment of vegetation through seeding of the stockpiles, to promote and reserve indigenous seeds and (soil fertility) organic matter.
- Where space constraints are not limiting, topsoil stockpiles will be constructed as low and long facilities not higher than 2m, or where space constraints limit this, stockpiles will be constructed as terraced stockpiles.
- Compacted areas must have adequate drainage systems to avoid pooling and surface flow.
- Rehabilitation activities must commence at work faces as soon as construction activities have concluded. Phased construction and progressive rehabilitation should be implemented where practicably possible.

11.15.3 *Monitoring*

The site must be monitored continuously during construction and operation in order to determine any indications of erosion. If any erosion features are recorded as a result of the activities on site, the ECO must:

- Assess the significance of the situation and determine the cause of the impact including taking photographs as visual reference;
- Inform the Project Company / contractors that rehabilitation must take place and that a rehabilitation method statement is to be implemented;
- Monitor that the Project Company / contractors are taking action to stop the erosion;
- Report and monitor the progress of the rehabilitation on a weekly basis; and
- Report all actions in a monthly compliance audit report.

11.16 *EMERGENCY PREPAREDNESS AND RESPONSE PLAN*

ArcelorMittal Saldanha Steel's has a current 'Emergency Preparedness Procedure'. This plan will be updated to include specific measures related to gas-fired power plants and gas pipelines and utilised by the Project. All measures included in *Table 11.3* relevant to emergency procedures will be included in the plan.

11.17 *NOISE MANAGEMENT AND MONITORING*

Noise monitoring measures are presented in this monitoring programme, but will only be required if there is development within 2000 m of the plant and/or noise complaints are received.

Should a reasonable and valid complaint about noise be registered, it is the responsibility of the developer to investigate this complaint as per the following sections. It is recommended that the noise investigation be done by an independent acoustic consultant.

While this section recommends a noise monitoring programme, it should be used as a guideline as site specific conditions may require that the monitoring locations, frequency or procedure be adapted.

11.17.1 *Measurement Localities and Procedures*

Measurement Localities

No routine noise measurements or locations are recommended. Noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint. The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading. A second instrument should ideally be deployed at a control point close to the potential noise source during the measurement period.

11.17.2 *Measurement Frequencies*

Once-off measurements if and when a reasonable and valid noise complaint is registered. Results and feedback must be provided to the complainant. If required and recommended by an acoustic consultant, there may be follow-up measurements or a noise monitoring programme can be implemented.

11.17.3 *Measurement Procedures*

Ambient sound measurements should be collected as defined in SANS 10103:2008. Due to the variability that naturally occurs in sound levels at most locations, it is recommended that semi-continuous measurements are conducted over a period of at least 24 hours, covering at least a full day- (06:00 – 22:00) and night-time (22:00 – 06:00) period. Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{Aeq,I}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit). Spectral frequencies should also be measured to define the potential origin of noise. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

11.17.4 *Relevant Standard for Noise Measurements*

Noise measurements must be conducted as required by the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008. It should be noted that the SANS standard also refers to a number of other standards.

11.17.5 *Data Capture Protocols*

Measurement Technique

Noise measurements must be conducted as required by the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008.

Variables to be analysed

Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{Aeq,I}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit). Noise levels should be co-ordinated with the 10-m wind speed. Spectral frequencies should also be measured to define the potential origin of noise.

Database Entry and Backup

Data must be stored unmodified in the electronic file saved from the instrument. This file can be opened to extract the data to a spread sheet system to allow the processing of the data and to illustrate the data graphically. Data and information should be safeguarded from accidental deletion or corruption.

Feedback to Receptor

A measurement report must be compiled considering the requirements of the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008. The facility must provide feedback to the potential noise-sensitive receptors using the channels and forums established in the area to allow interaction with stakeholders, alternatively in a written report.

11.17.6 Standard Operating Procedures for Registering a Complaint

When a noise complaint is registered, the following information must be obtained:

- Full details (names, contact numbers, location) of the complainant;
- Date and approximate time when this non-compliance occurred;
- Description of the noise or event;
- Description of the conditions prevalent during the event (if possible).

12 SUMMARY AND CONCLUSION

12.1 INTRODUCTION

The aim of the Environmental Impact Assessment (EIA) for the proposed 1507 MW (net capacity) Combined Cycle Gas Turbine (CCGT) power plant and gas pipeline is to provide information to inform decision-making that will contribute to environmentally sound and sustainable development. This report is to be submitted to the Department of Environmental Affairs (DEA) to provide information and an independent assessment, thus enabling the DEA to make an accountable and properly informed decision regarding whether or not to grant an environmental authorisation for the proposed development in terms of NEMA.

This report will also assist the DEA to define under what conditions the development should go ahead if authorisation is granted. In considering the development of this type of facility, it is inevitable that there will be certain negative environmental impacts. However, these have largely been mitigated and should be viewed along with Saldanha Steel's urgent requirement for stable, economical electricity for the long term future and the requirement for new generation capacity in South Africa.

Through the EIA process, which included stakeholder and specialist input, ERM has identified and assessed a number of potential impacts relating to the development. A brief overview of the EIA findings and key mitigation measures are presented in this chapter.

The preferred layout of the power plant has been designed based on the sensitivity constraints of the site, as established during the EIA process, including ecological sensitivities, as identified during the initial screening process. The pipeline routing was selected to avoid, as far as possible, the high value conservation areas. The technology to be used was selected to minimise safety risks associated with the Project.

12.2 SUMMARY OF IMPACTS IDENTIFIED AND ASSESSED

12.2.1 Construction Phase Impacts

A summary of the bio-physical and socio-economic impacts, including their pre-mitigation and residual impacts post-mitigation, is given in *Table 12.1* below.

Table 12.1 ***Summary of the significance of identified impacts in the construction phase of the proposed Project*** *(+ve = positive; -ve = negative)*

Impact	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Decreased Ambient Air Quality	Negligible (-ve)	Negligible (-ve)
Increase in Ambient Noise Levels	Negligible (-ve)	Negligible (-ve)
Destruction/disturbance of Flora	Minor to Moderate (-ve)	Minor (-ve)
Loss of Faunal Habitat	Moderate (-ve)	Minor (-ve)
Direct Faunal Impacts	Minor (-ve)	Negligible (-ve)
Habitat Degradation for Fauna	Minor (-ve)	Negligible (-ve)
Avifaunal Habitat Loss during Construction	Moderate (-ve)	Minor (-ve)
Disturbance to Avifauna	Moderate (-ve)	Minor (-ve)
Impact on Traffic Levels	Negligible (-ve)	Negligible (-ve)
Land Use Planning Risk, Natural Gas Pipeline	Negligible (-ve)	Negligible (-ve)
Land Use Planning Risk , Propane Generator	Negligible (-ve)	Negligible (-ve)
Location Specific Individual Risk, Natural Gas Pipelines and Propane Generator	Moderate (-ve)	Moderate (-ve)
Employment Creation, Skills Enhancement and Local Business Opportunities	Moderate (+ve)	Moderate (+ve)
Impacts Associated with the Presence of a Workforce and Jobseekers	Moderate (-ve)	Minor - Moderate (-ve)
Impacts Associated with Pressure on Social Infrastructure and Services	Moderate (-ve)	Moderate (-ve)
Impact on Human Health due to Air Emissions and Dust Generation	Negligible (-ve)	Negligible (-ve)
Nuisance due to Noise, Dust and Vibration	Moderate (-ve)	Minor (-ve)
Risk to Workers' H&S due to Hazardous Activities	Minor to Moderate (-ve)	Minor (-ve)
Impacts to Pre-colonial & Colonial Archaeology	Minor (-ve)	Negligible (-ve)
Impacts to buried Palaeontology	Major (-ve)	Negligible (-ve)

As can be seen, the post-mitigation significance of the unplanned events (linked to location specific individual risk) considered by the quantitative risk assessment was determined to be moderate.

The location of the power plant and pipeline route were specifically selected to avoid ecologically sensitive areas. This resulted in minor and negligible post-mitigation significance.

The implementation of palaeontological chance find procedures and mitigation measures reduces the potential impact to negligible.

Negative impacts associated with the proposed development have been mitigated to a level which is deemed appropriate for the construction phase to proceed.

12.2.2 *Operational Phase Impacts*

A summary of the bio-physical and socio-economic impacts associated with the operational phase, including their pre-mitigation and residual impacts post-mitigation, is given in *Table 12.2* below.

Negative impacts associated with the proposed development have been mitigated to a level which is deemed acceptable. The post-mitigation significance of unplanned events considered by the quantitative risk assessment was determined to be moderate. However, these unplanned events are not considered a fatal flaw if the mitigation measures outlined in the Environmental Management Programme (EMPr) are incorporated during the detailed design phase. Similarly, post-mitigation significance of the increased nuisance caused by the Project and change in sense of place was determined to moderate, but is also not considered to be a fatal flaw.

Table 12.2 ***Summary of the significance of identified impacts in the operational phase of the proposed Project*** *(+ve = positive; -ve = negative)*

Impact	Significance (Pre-mitigation)	Residual Impact Significance (Post-mitigation)
Decreased Ambient Air Quality	Minor (-ve)	Minor (-ve)
Increase in Ambient Noise Levels	Minor (-ve)	Minor (-ve)
Disturbance of Flora	Negligible to Minor (-ve)	Negligible to Minor (-ve)
Habitat Degradation for Fauna	Minor (-ve)	Negligible (-ve)
Disturbance to Avifauna	Moderate (-ve)	Minor (-ve)
Impact on Traffic Levels	Minor (-ve)	Minor (-ve)
Land Use Planning Risk, Natural Gas Pipelines	Negligible (-ve)	Negligible (-ve)
Land Use Planning Risk, Propane Generator	Negligible (-ve)	Negligible (-ve)
Location Specific Individual Risk, Natural Gas Pipelines and Propane Generator	Moderate (-ve)	Moderate (-ve)
Employment Creation, Skills Enhancement and Local Business Opportunities	Minor (+ve)	Minor (+ve)
Impact on Human Health due to Air Emissions and Dust Generation	Minor (-ve)	Minor (-ve)
Increased nuisance factors and change in sense of place	Moderate (-ve)	Moderate (-ve)
Risk to Workers' H&S due to Hazardous Operation Activities	Minor (-ve)	Minor (-ve)
Impacts to Pre-colonial & Colonial Archaeology	Minor (-ve)	Negligible (-ve)

As far as greenhouse gasses are concerned, the Project is expected to emit >1 000 000 t CO_2e per annum, which according to the benchmarks applied by international lender standards, assigns this project a magnitude of 'Very Large'. This translates into an overall significance rating of High (Negative) using the impact significance scale being used for the Project. However, this finding should be considered in the context of the positive impacts associated with the Project in relation to efficiency and impact on the South African electricity supply grid and that the Project is being developed in line with South Africa's energy policy.

12.3 *RECOMMENDATIONS*

ERM is confident that suitable effort has been made by the Project to accommodate the mitigation measures recommended during the EIA process, to the extent that is practically possible, without compromising the economic viability of the proposed Project. The implementation of the mitigation measures detailed in *Chapter 10* and listed in the EMPr, including monitoring, will provide a basis for ensuring that the potential positive and negative impacts associated with the establishment of the Project are respectively enhanced and mitigated to a level which is deemed adequate for the Project to proceed.

In summary, based on the findings of this assessment, ERM is of the opinion that the CCGT power plant and associated pipeline should be authorised, contingent on the mitigations and monitoring for potential environmental and socio-economic impacts as outlined in the EIA Report and EMPr being implemented.

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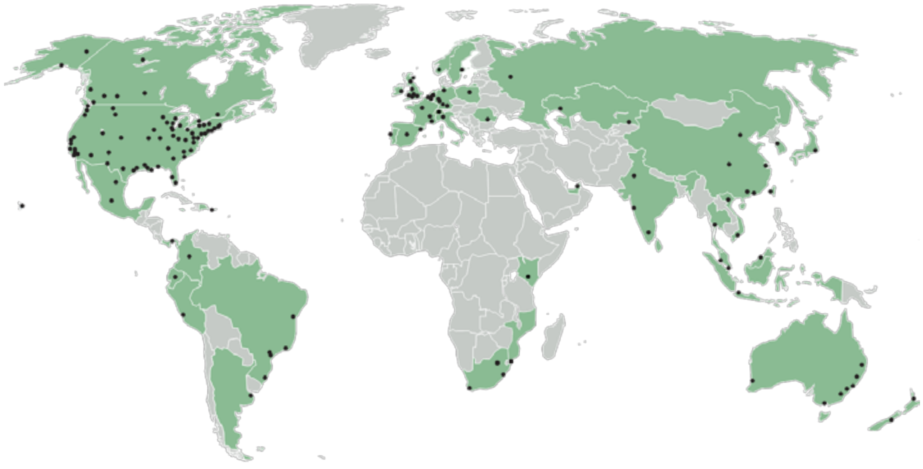

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