ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT ENVIRONMENTAL IMPACT REPORT

GAS TO POWER PLANT ON A SITE WITHIN THE RICHARDS BAY INDUSTRIAL DEVELOPMENT ZONE, KWAZULU-NATAL PROVINCE

DEA REF NO.: 14/12/16/3/3/2/867

DRAFT FOR PUBLIC REVIEW

10 May 2016 - 09 June 2016

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/867
Title	:	Environmental Impact Assessment Process Draft EIA Report for the Gas to Power Plant on a Site within the Richards Bay Industrial Development Zone, KwaZulu-Natal Province
Authors	:	Savannah Environmental (Pty) Ltd Dilona Somai Jo-Anne Thomas Gabriele Wood
Sub-consultants	:	Social: Candice Hunter of Savannah Environmental (with external review by Neville Bews) Air Quality: Mark Zunckel and Atham Raghunandan of uMoya-Nilu Ecology: Adam Teixeira-Leite of Eco-Pulse
Client	:	Richards Bay Gas Power 2 (Pty) Ltd
Report Status	:	Draft Environmental Impact Assessment Report for public review
Review Period	:	10 May 2016 – 9 June 2016

When used as a reference this report should be cited as: Savannah Environmental (2016) Draft Environmental Impact Assessment Report: Gas to Power Plant on a Site within the Richards Bay Industrial Development Zone, KwaZulu-Natal Province.

PURPOSE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Richards Bay Gas Power 2 (Pty) Ltd, an Independent Power Producer (IPP), is proposing the establishment of a gas to power plant and associated infrastructure on a site located within the Richards Bay Industrial Development Zone (IDZ) 1F, located within the uMthlathuze Local Municipality in Kwazulu-Natal, South Africa. The gas to power plant will have a capacity of up to 400MW. This project is to be developed in response to the Department of Energy's (DoE) request for projects to be developed by IPPs in order to provide alternative power generation technologies to meet the energy requirements of 10 000MW of additional electrical capacity by 2025, as identified in the National Development Plan (NDP).

As the project has the potential to impact on the environment, an Environmental Impact Assessment (EIA) process is required to be completed in support of an application for Environmental Authorisation (EA) prior to the commencement of construction of the project.

In terms of the EIA Regulations (2014) of GN R982, GN R983, GN R984 and GN R985, a Scoping and EIA study is required to be undertaken for the proposed project. The Scoping Phase of the EIA process identified potential issues associated with proposed Gas-to-Power Plant and was undertaken in accordance with the Section 24 (5) of the National Environmental Management Act (No 107 of 1998).

The EIA Phase addresses those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

This Environmental Impact Assessment Report consists of the following sections:

» **Chapter 1** provides background to the project and the environmental impact assessment, the recommendations and conclusions from the Scoping Report and the details and expertise of the Environmental Assessment Practitioner conducting the EIA.
» **Chapter 2** outlines the strategic legal context for energy planning within South Africa and for the proposed project.
» **Chapter 3** provides a description of the proposed project, including feasible alternatives considered, and the need and desirability of the proposed project.
» **Chapter 4** outlines the approach to undertaking the environmental impact assessment process.
» **Chapter 5** describes the existing biophysical and socio-economic environment within and surrounding the project development footprint.

- **Chapter 6** provides an assessment of the potential issues and impacts associated with the project and presents recommendations for mitigation of significant impacts.
- **Chapter 7** provides an assessment of cumulative impacts.
- **Chapter 8** presents the conclusions and recommendations based on the findings of the EIA.
- **Chapter 9** provides a list of reference material used to compile the EIA Report.

The release of a EIA Report provides stakeholders with an opportunity to verify that the issues they have raised to date have been captured and adequately considered within the study. The Final EIA Report will incorporate all issues and responses prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project.

DEA REQUIREMENTS FOR THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Savannah Environmental has compiled a table (refer to Table 1 below) which outlines the DEA requirements as outlined in the acceptance of the Scoping Report dated 29 February 2016, and where in the draft EIR the requirements have been addressed within this report for ease of reference.

Table 1.1: Information Requested by DEA

Items in terms of Scoping Acceptance Requirements	**Report Reference**
You may proceed with the EIA process in accordance with the tasks contemplated in the PoSEIA and the requirements of the EIA Regulations, 2014.	The EIA process was conducted in accordance with the 2014 EIA regulations, see Chapter 4 for details.
All comments and recommendations made by all stakeholders and Interested and Affected Parties (I&APs) in the draft SR and submitted as part of the final SR must be taken into consideration when preparing an Environmental Impact Assessment report (EIAr) in respect of the proposed development.	All comments and recommendations made by all stakeholders and Interested and Affected Parties (I&APs) in the draft SR and submitted as part of the final SR have been taken into consideration when preparing the Environmental Impact Assessment report (EIAr) in respect of the proposed development.
Please ensure that all mitigation measures and recommendations in the specialist studies are addressed and included in the final EIAr and Environmental Management Programme (EMPr).	All mitigation measures included in the specialist studies have been included in both the EMPr and the main EIAr.
Please ensure that comments from all relevant stakeholders are submitted to the Department with the final EIAr. This includes but is not limited to: » Provincial Department of Environmental Affairs » Department of Agriculture, Forestry and Fisheries (DAFF) » Provincial Department of Agriculture » South African Civil Aviation Authority (SACAA) » SENTECH » Department of Transport » Local Municipality » District Municipality » Department of Water and Sanitation (DWS) » South African Roads Agency Limited (SANRAL) » South African Heritage Resources Agency (SAHRA) » Endangered Wildlife Trust (EWT) » BirdLife SA » Department of Mineral Resources » Ezemvelo KZN Wildlife	Listed in Chapter 4; and Appendix C includes all comments received so far. The Comments & Responses Report will be updated upon closure of the public review period on 9 June 2016 and submitted together with the Final EIA Report
Please ensure that the EIAr and EMPr comply with Appendix 3 and Appendix 4 of Regulation 2014, before submission to the Department.	Both the EIAr and EMPr comply with all requirements in terms of the 2014 regulations

Items in terms of Scoping Acceptance Requirements	**Report Reference**
You are also required to address all issues raised by Organs of State and I&APs prior to the submission of the EIAr to the Department.	All issues raised by organs of state and I&APs have been addressed in the comments and responses and included in Appendix C. Some comments to be included with final EIR in cases where comment has not yet been received.
Proof of correspondence with the various stakeholders must be included in the EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	Proof the attempts were made to obtain comments is included in Appendix C in cases where no comment could be obtained
The EAP must, in order to give effect to Regulation 8, give registered I&APs access to, and an opportunity to comment on the report in writing within 30 days before submitting the final EIAr to the Department.	The comment period for the draft EIA Report is from 10 May – 9 June 2016.
The EAP must provide detailed motivation and reasons on the applicability of Activity 4 and 6 of GN R.984. In addition, the impacts, and any specialist study to assess the impacts for these activities must be provided in the draft EIAr.	Detailed motivation and reasons on the applicability of Activity 4 and 6 of GN R.984 is provided in Chapter 4. The impacts, and any specialist study to assess the impacts for these activities are provided in Chapter 6 and Appendices **F-H**.
The draft EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	All listed activities are linked to specific impacts and mitigation measures are provided for in Chapter 6.
The listed activities represented in the EIAr and application form must be the same and correct.	Noted. An amended environmental authorization application form is being submitted with the draft EIA Report.
The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under point 2 of the EIA information required for Gas facilities below.	The EIAr provides the technical details for the proposed facility in a table format as well as their description and/or dimensions - refer to Chapter 3, Section 3.2 and 3.3.
The EIAr must provide the four coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities.	Refer to Chapter 3, Section 3.2.
The EIAr must provide clear indications of the following: - The envisioned area for the proposed facility; i.e. placing of all associated infrastructure should be mapped at an appropriate scale. - Areas of the facilities to be utilised during the different phases of the operation. - Indicate the power output for all phases of the development. - The preferred layout and length of the 132kV power line.	Refer to Chapter 3, Section 3.2 and 3.3, as well as Appendix B.

Items in terms of Scoping Acceptance Requirements	Report Reference
- Description of all associated infrastructure. This description must include, but is not limited to the following: ➢ Power lines; ➢ Internal roads infrastructure; ➢ All supporting onsite infrastructure such as laydown area, guard house and control room, etc. ➢ All necessary details regarding all possible locations and sizes of the proposed satellite substation and the main station.	
The EIAr must assess the impacts on Air Quality in the area. The air quality assessment must also identify and predict the significance of direct, indirect and cumulative risks/impacts arising from the activity for the key stages of the project including preconstruction, construction, operation and post-closure and identify management and mitigation measures and actions that addresses the direct, indirect and cumulative risks and impacts. This assessment must make recommendation into the air quality management plan.	The impacts on Air Quality in the area have been assessed, please refer to Chapter 6 and 7, and Appendices G and I.
The EIAr must clearly indicate the sources of the preferred fuels for Phase 1 and volumes required.	The sources of fuel have been indicated - refer to Chapter 3, section 3.2.
The EIAr must assess the impacts of storing and handling of the preferred fuels for Phase 1 and 2 of the project and must include specialist assessments.	Refer to Chapter 6, and Appendices G, H and I.
The EIAr must assess all impacts associated with the burning of preferred fuels for Phase 1.	Refer to Chapter 6 and 7, as well as Appendices G and I.
The EIAr must assess the preferred layout of the 132kV power line.	Refer to Chapter 6. It must be noted that the powerline is to be located within the proposed development site and therefore has been assessed as such.
It is imperative that a reliable water source is secured for the success of this project. The Department requests proof of availability of water for the facility from the relevant authority.	Refer to Appendix C9.
The EIAr must adequately assess and provide a comparative analysis for alternative water sources for the proposed development. The preferred water source alternative must further motivate the preferred technology choice for the facility.	Refer to Chapter 3, section 3.2 and 3.3. It must be noted the volume of water required will be supplied via the Richards Bay IDZ water supply network that has an allotment from the local water authority. The Richards Bay IDZ has undertaken to provide the water to the site under its long-term lease agreement with Richards Bay Gas Power 2 (Pty) Ltd, and has provided Richards Bay Gas Power 2 (Pty) Ltd with a letter of confirmation that the volumes required would be supplied (refer to Appendix C9).

Items in terms of Scoping Acceptance Requirements	Report Reference
	In addition, every effort is being made to reduce the volumes further, including the potential for recycling condensation from air cooled condensers if such equipment will form part of the final plant design.
A cumulative assessment must be undertaken for the sourcing of water as the facility is located in a water stressed area.	It must be noted the volume of water required will be supplied via the Richards Bay IDZ water supply network that has an allotment from the local water authority. The Richards Bay IDZ has undertaken to provide the water to the site under its long-term lease agreement with Richards Bay Gas Power 2 (Pty) Ltd, and has provided Richards Bay Gas Power 2 (Pty) Ltd with a letter of confirmation that the volumes required would be supplied (refer to Appendix C9). In addition, every effort is being made to reduce the volumes further, including the potential for recycling condensation from air cooled condensers if such equipment will form part of the final plant design. Based on the above, a cumulative assessment was not deemed necessary for the EIA.
The EIAr must assess risks associated with storage of dangerous goods. The risk of the possibility of pollution to surface (hydrological) and groundwater (hydrogeological) systems and flows must also be assessed. The risk assessment must make recommendations into the emergency preparedness and spill response plans.	Refer to Chapter 6, Appendix I (as well as the Storm Water Management Plan and Emergency preparedness and Response Plan within Appendix I).
The EIAr must assess the impacts of use of water onsite (sourcing, treating, disposing, etc.).	It must be noted the volume of water required will be supplied via the Richards Bay IDZ water supply network that has an allotment from the local water authority. The Richards Bay IDZ has undertaken to provide the water to the site under its long-term lease agreement with Richards Bay Gas Power 2 (Pty) Ltd, and has provided Richards Bay Gas Power 2 (Pty) Ltd with a letter of confirmation that the volumes required would be supplied (refer to Appendix C9). In addition, every effort is being made to reduce the volumes further, including the potential for recycling condensation from air cooled condensers if such equipment will form part of the final plant design. Refer to Chapter 6, Appendix I (as well as the Storm Water Management Plan and Emergency

Items in terms of Scoping Acceptance Requirements	Report Reference
	preparedness and Response Plan within Appendix I).
The EIAr must assess all identified impacts including traffic and geotechnical impacts.	Refer to Chapter 3, Section 5.5.2 for geotechnical considerations and Chapter 6 and Appendix F for traffic impact considerations. Furthermore, in terms of geology, the proposed Project site falls within conditions classified as either "have no restrictions on development" or "are developable, but with minor geotechnical and/or development constraints". In this regard, a Geotechnical survey by geotechnical engineers will be undertaken during pre-construction surveys.
The socio-economic report must provide a comparative analysis of the competing land uses on the property.	Refer to Appendix F.
Should in-house specialists be used for any specialist study, then the specialist study must be peer reviewed by external specialists (ecological, socio-economic and agriculture, etc.)	The Social Impact Assessment was undertaken by an in-house specialist. The report has been externally peer reviewed and confirmation has been provided by the reviewer in the appendices section of the SIA (refer to Appendix F).
All comments raised by Interested and Affected Parties must be responded to.	Appendix C includes all comments received so far and responses to address the comments - some comments to be included with final EIR in cases where comment has not yet been received.
The EIAr must also include a comments and responses report in accordance with Appendix 2h (ii) of the EIA Regulations, 2014.	A Comments & Response Report is included in Appendix C and is in accordance with Appendix 2h (ii) of the EIA Regulations, 2014.
The EIAr must include the detail inclusive of the PPP in accordance with Regulation 41 of the EIA Regulations, 2014.	Refer to Chapter 4.
Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies.	Refer to Chapter 3, Section 3.2.
Information on services required onsite, e.g. sewage, refuse removal, water and electricity. Who will supply these services and has an agreement and confirmation of capacity been obtained? Proof of these agreements must be provided.	Refer to Chapter 3, Section 3.2. Services required will be provided by the Richards Bay IDZ under the terms and conditions of its lease agreement with Richards Bay Gas Power 2 (Pty) Ltd. Letters of confirmation are provided within Appendix C (i.e. C9 and C10).
The EIAr must provide a detailed description of the need and desirability, not only providing motivation on the need for cleaner energy in South Africa of the proposed activity. The need and desirability must also indicate if the proposed development is needed in the	Refer to Chapter 3, Section 3.1.

Items in terms of Scoping Acceptance Requirements	Report Reference
region and if the current proposed location is desirable for the proposed activity compared to other sites.	
A copy of the final site layout map and alternatives. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout must indicate the following: - Positions of the power island, steam turbine and generator, fuel storage tanks, water storage reservoir and tanks, water and gas supply pipelines; - Permanent laydown area footprint; - Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible); - Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used; - The location of sensitive environmental features on site e.g. CBAs, heritage sites, wetlands, drainage lines, etc. that will be affected by the facility and its associated infrastructure; - Substations(s) and/or transformer(s) sites including their entire footprint; - Connection routes (including pylon positions) to the distribution/ transmission network; - All existing infrastructure on the site, especially roads; - Buffer areas; - Buildings, including accommodation; and - All "no-go" areas.	Refer to Appendix B. It must be noted that the design (operational alternatives) of the power station has not yet been finalised, i.e. whether the plant will be designed to operation at baseload or mid-merit. This will be dependent on the DoE IPP Programme requirements, as well as those of Eskom. As such, the layouts for the two operational alternatives have been included in Appendix B.
An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	Refer to Appendix B.
A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	Refer to Appendix B.
A shapefile of the preferred development layout/footprint must be submitted to this Department. The shapefile must be created using the Hartebeeshoek 94 Datum and the data should be in Decimal Degree Format using the WGS 84 Spheroid. The shapefile must include at a minimum the following extensions i.e. .shp; .shx; .dbf; .prj; and .xml (metadata file). If specified symbology was assigned to the file, then the .avl and/or the .lyr file must also be included. Data must be mapped at a scale of 1:10 000 (please specify if an alternative scale was used). The metadata must include a description of the base data used for digitising. The shapefile must be	As noted above, it must be noted that the design (operational alternatives) of the power station has not yet been finalised, i.e. whether the plant will be designed to operation at baseload or mid-merit. This will be dependent on the DoE IPP Programme requirements, as well as those of Eskom. Shapefiles can only therefore be provided once the project has been authorised and the operational alternative has been selected.

Items in terms of Scoping Acceptance Requirements	Report Reference
submitted in a zip file using the EIA application reference number as the title. The shapefile must be submitted to: **Postal Address:** Department of Environmental Affairs Private Bag X447 Pretoria 0001 **Physical Address:** Environment House 473 Steve Biko Road Pretoria For Attention: Muhammad Essop Integrated Environmental Authorisations Strategic Infrastructure Developments Telephone Number: (012) 399 9406 Email Address: MEssop@environment.gov.za	
The EMPr to be submitted as part of the EIAr must include the following:	
All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted.	Refer to Appendix I.
The final layout map.	Refer to Appendix B within the EMPr.
Measures as dictated by the final site layout map and micro-siting.	Refer to Appendix I. As noted above, the design has not yet been finalised.
An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.	Refer to Appendix B within the EMPr.
A map combining the final layout layout superimposed (overlain) on the environmental sensitivity map.	Refer to Appendix B within the EMPr.
An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	Refer to Appendix B within the EMPr.
A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.	Refer to Appendix C within the EMPr.
A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	Refer to Appendix D within the EMPr.

Items in terms of Scoping Acceptance Requirements	Report Reference
An open space management plan to be implemented during the construction and operation of the facility.	Refer to Appendix J within the EMPr.
A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimise impacts on local communities e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	Refer to Appendix E within the EMPr.
A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.	Refer to Appendix F within the EMPr.
A fire management plan to be implemented during the construction and operation of the facility.	Refer to Appendix K within the EMPr.
An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	Refer to Appendix G within the EMPr.
An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.	Refer to Section 4 of the EMPr.
Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other relevant environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.	Refer to Appendix F of the EMPr as well as measures provided in the EMPr (sections 4-7).
An air quality management plan.	Refer to EMPr as well as Appendix G.
Emergency preparedness response plan.	Refer to Appendix K of the EMPr.
The EAP must provide detailed motivation if any of the above requirements is not required by the proposed development and not included in the EMPr.	Not applicable, all provided.
The EIAr must include a cumulative impact assessment of the facility since there are other similar facilities in and around the proposed site as well as in the region. The specialist studies as outlined in the	Refer to Chapter 7 of the EIA Report.

Items in terms of Scoping Acceptance Requirements	Report Reference
PoSEIA which is incorporated as part of the SR must also assess the facility in terms of potential cumulative impacts.	
Please ensure that all relevant Listing Notice activities are applied for, that the Listing Notice activities applied for are specific and that they can be linked to the development activity or infrastructure in the project description.	Refer to Chapter 4 and 6.
You are hereby reminded that should the EIAr fail to comply with the requirements of this acceptance letter, the project will be **refused** in accordance with Regulation 24(1)(b) of the EIA Regulations, 2014.	Noted.
The applicant is hereby reminded to comply with the requirements of Regulation 45 with regard to the time period allowed for complying with the requirements of the Regulations, and Regulations 43 and 44 with regard to the allowance of a comment period for interested and affected parties on all reports submitted to the competent authority for decision-making. The reports referred to are listed in Regulation 43(1).	The comment period for the draft EIA Report is from 10 May – 9 June 2016.
Furthermore, it must be reiterated that, should an application for Environmental Authorisation be subject to the provisions of Chapter II, Section 38 of the National Heritage Resources Act, Act 25 of 1999, then this Department will not be able to make nor issue a decision in terms of your application for Environmental Authorisation pending a letter from the pertinent heritage authority categorically stating that the application fulfils the requirements of the relevant heritage resources authority as described in Chapter II, Section 38(8) of the National Heritage Resources Act, Act 25 of 1999. Comments from SAHRA and/or the provincial department of heritage must be provided in the EIAr.	Refer to Appendix D. The EIA Report will be uploaded onto the relevant website (SAHRIS) for comments. Comments will be included in the Final EIA Report if received.
You are requested submit two (2) electronic (CD/DVD) and two (2) hard copies of the EIAr to the Department as per Regulation 23(1) of the EIA Regulations, 2014.	Noted.

INVITATION TO COMMENT ON THE DRAFT EIA REPORT

Members of the public, local communities and stakeholders are invited to comment on the draft EIA Report for the Gas to Power Plant Project which is available for 30-day public review and comment period at the following locations from **10 May 2016 – 9 June 2016**:

» Richards Bay Public Library (Richards Bay Civic Centre, 5 Mark Strasse, Richards Bay)
» www.savannahSA.com

Please submit your comments to
Gabriele Wood of Savannah Environmental (Pty) Ltd PO Box 148, Sunninghill,2157, Gauteng Tel: 011 656 3237 Fax: 086 684 0547 E-mail: gabriele@savannahsa.com
The due date for comments on the Draft EIA Report is **9 June 2016**.

Comments can be made as written submission via fax, post, or e-mail.

EXECUTIVE SUMMARY

Background and Project Overview

Richards Bay Gas Power 2 (Pty) Ltd, an Independent Power Producer (IPP), is proposing the establishment of a gas to power plant and associated infrastructure on a site located within the Richards Bay Industrial Development Zone (IDZ) 1F, located within the uMthlathuze Local Municipality in Kwazulu-Natal, South Africa. The gas to power plant will have a capacity of up to 400MW. This project is to be developed in response to the Department of Energy's (DoE) request for projects to be developed by IPPs in order to provide alternative power generation technologies to meet the energy requirements of 10 000MW of additional electrical capacity by 2025, as identified in the National Development Plan (NDP).

The gas to power plant and associated infrastructure is proposed to be located on erven 17455, 17443 and 17442 within the Richards Bay Industrial Development Zone (RBIDZ): Phase 1F (refer to **Figure 1**). The EIA undertaken by Nemai Consulting (2015) which considers the installation of infrastructural services (roads, sewer infrastructure, internal electrical infrastructure, water mains, storm water infrastructure and infill of wetlands), notes that under its application for environmental authorisation, the site will be cleared for the placement of infrastructure services and servitudes and each tenant will develop their respective stands for industrial purposes. This is aligned with the intentions of the RBIDZ to develop and establish a world-class built industrial park incorporating a delimited Customs Controlled Area and linked to the Richards Bay International Port, with the provision of quality infrastructure including ICT and transport infrastructure, business and utility services.

The proposed plant net output, at International Standards Organisation (ISO) Reference Conditions, is expected to be up to 400 MW, to be developed in two (2) phases to operate with liquid fuel such as diesel and/ or Liquefied Petroleum Gas (LPG) in Phase 1 and ultimately Liquid Natural Gas (LNG) or Natural Gas in Phase 2 of the development. It is anticipated that 300MW will be fuel/ gas generated energy and 100MW will be heat/ steam generated energy (i.e. a combine-cycle system).

The proposed plant net output, at International Standards Organisation (ISO) Reference Conditions, is expected to be up to 400 MW, to be developed in two (2) phases to operate with liquid fuel such as diesel and/ or Liquefied Petroleum Gas (LPG)[1] in Phase 1[2] and ultimately

[1] In response to comments received on the draft scoping report, Light Fuel Oil (LFO) and Heavy Fuel Oil (HFO) have been excluded as fuel sources due to their high emissions.

[2] Planned to be developed as an on-land early power project.

Liquid Natural Gas (LNG) or Natural Gas in Phase 2 of the development. It is anticipated that 300MW will be fuel/ gas generated energy and 100MW will be heat/ steam generated energy.

The main infrastructure associated with the facility includes the following:

» Up to six (6) Gas Turbines (this is dependent on the DoE's Gas IPP Programme and the requirements of gas power stations to run at either base-load or mid-merit)
» 1-2 steam turbines utilising the heat from all the engines for power production in a steam cycle.
» The power plant will comprise multiple engine halls, each of ~60MW. Each engine hall will typically comprise one engine. Stacks associated with engine halls will be up to 20m in height.
» Access roads within project locality boundaries.
» Three (3) fuel tanks with a capacity of 2000m^3 each which will be used as an interim fuel storage facility until the gas infrastructure is constructed by the DoE and Transnet. Two (2) fuel unloading stations will be associated with these tanks.
» Water storage facilities for process water and fire-fighting purposes.
» An HV-Yard and Substation, adjacent to the power plant.
» A new 132kV power line to connect into the Municipal grid, connecting directly to the Indus Substation bordering the site.
» Guard house, admin building, workshops and a warehouse.

Water volumes of between 50 000m^3 and 270 000m^3 ^{3}per annum are expected to be required for the project. The volume of water required will be supplied via the Richards Bay IDZ water supply network that has an allotment from the local water authority. Every effort is being made to reduce these volumes further, including the potential for recycling condensation from air cooled condensers if such equipment will form part of the final plant design. The Richards Bay IDZ has undertaken to provide the water to the site under its long-term lease agreement with Richards Bay Gas Power 2 (Pty) Ltd. The Richards Bay IDZ have provided Richards Bay Gas Power 2 (Pty) Ltd with a letter of confirmation that the volumes required would be supplied (refer to Appendix C9).

Evaluation of the Proposed Project

Alternatives Considered for the Gas to Power Plant

In accordance with the requirements outlined in Appendix 3 of the EIA Regulations 2014, the consideration of alternatives including site, activity, technology, as well as the "do-nothing" alternative should be undertaken. Thus, the identification of alternatives is a key aspect of the success of the EIA process. In

[3] Exact water requirements are unconfirmed at this stage and are therefore best estimates. Once the final technology has been selected, water volumes will be confirmed.

relation to a proposed activity "Alternatives" means different ways of meeting the general purposes and requirements of the proposed activity. The following sections address this requirement.

Site Alternatives

The proposed gas to power plant is to be located on a site within the Richards Bay IDZ Phase 1F within the uMhlathuze Local Municipality, which falls under the jurisdiction of the uThungulu District Municipality in Kwazulu-Natal. The site has been zoned for IDZ industrial development as part of the planning for this IDZ area.

The erven on which the proposed facility is planned have been allocated to the developer for this purpose. Therefore, the siting of the facility has been predetermined and no feasible siting alternatives within an appropriately zoned area exist. Richards Bay Gas Power 2 (Pty) Ltd considers this area, and specifically the demarcated site, to be highly preferred for the development of a gas to power project from a technical perspective as detailed in Section 3.1.4 of the EIA Report.

Cooling Technology Alternatives

Combined cycle gas to power plants require cooling at the back-end of the thermal cycle. The purpose of the cooling is to condense steam back to water at the end of the steam cycle. There are different types of cooling technologies available (discussed below for comparative purposes) but typically water is used for cooling in power plants.

Due to water availability considerations in the area, dry cooling technology will be used for the project. This is also consistent with the Department of Water and Sanitation requirements. Therefore no alternative technology is considered.

» Dry Cooling

Dry-cooling systems use air instead of water to cool the steam exiting a turbine. Dry-cooled systems use no water and can decrease total power plant water consumption by more than 90 percent[4]. The tradeoffs to these water savings are higher operating costs and lower plant efficiencies (Source: http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/water-energy-electricity-cooling-power-plant.html#sources).

» Wet cooling system

Wet-recirculating or closed-loop systems use cooling water in a second cycle to cool the steam. Most commonly, wet-recirculating systems use cooling towers to expose water to ambient air. Some of the water evaporates;

[4] Though no water is required for dry-cooling systems, power plants using dry-cooling systems also require water for system maintenance and cleaning

the rest is then sent back to the condenser in the power plant. Because wet-recirculating systems withdraw water to replace any water that is lost through evaporation in the cooling tower, these systems tend to have appreciably high water consumption (Source: http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/water-energy-electricity-cooling-power-plant.html#sources).

Fuel type Alternatives

The fuel types that were originally under consideration for Phase 1 of the proposed gas to power plant were diesel; Liquefied Petroleum Gas (LPG), Heavy Fuel Oil (HFO) and Light Fuel Oil (LFO). HFO and LFO were subsequently excluded, in response to comments received on the draft scoping report, due to their high emissions.

It is important to note that the impacts identified and assessed in this EIA Report have considered diesel and LPG as the only fuel sources for Phase 1. Should sustainable supplies of cleaner fuel (e.g. biofuel) become commercially viable in the future then Richards Bay Gas Power 2 (Pty) Ltd should investigate the conversion of the plant to be able to utilise such fuels if technically and financially feasible.

Operational Alternatives

As previously indicated in the EIA Report, the power plant could operate at base load or mid-merit energy. This will be dependent on the DoE IPP Programme requirements, as well as those of Eskom.

Base load is defined as the minimum level of demand on an electrical supply system over 24 hours. Base load power sources are those plants which can generate dependable power to consistently meet demand.

Mid-merit is defined as the power supply that fills the gap between peak load and base load where peak load is the maximum level of power demand. This generally translates to an operational period of 8 hours per day.

Table 1 below shows the main differences associated with operating the power plant at base load versus mid-merit as proposed by Richards Bay Gas Power 2 (Pty) Ltd.

Table 1: Base load versus Mid-merit

	Base load	**Mid-merit**
Number of gas turbines	2	6
Number of steam turbines	1-2	1-2
Number of engines	2	6
Number of operational hours per year	8 000	3 000
Volume of diesel /LPG required	1 000 000 m^3	410 000m^3
Number of trucks delivering fuel daily	52	18
Volume of LNG/ NG required	800 000 000m^3	326 000 000m^3

	Base load	Mid-merit
Volume of water required	270 000m^3	50 000m^3

This impact assessment has considered the operation of the facility at base load as a worst-case scenario.

Results of the Ecological Study

The development of the project will require the clearance of the entire development footprint (i.e. an area of 7.3ha). The significance of potential pre-construction and construction related ecological impacts are estimated to range from **Low to Medium** ecological significance with mitigation; with the direct disturbance/degradation and loss of vegetation/habitat as a result of stripping and clearing of vegetation being the most significant. The spread of Invasive Alien Plants (IAPs), weeds and other undesirable plants post-construction (due to disturbance created) is likely to be of a **Medium** ecological significance and will affect areas adjacent to the facility over the operational life-span of the project. During the decommissioning phase of the project, impacts are unlikely to be of much significance, with the potential of the project to have a net positive ecological impact on the habitat and biodiversity when the artificial infrastructure is removed and the grassland vegetation/habitat is properly reinstated at the site.

Cumulative impacts associated with the development were identified and assessed, in the context of past historic disturbance at the site and future industrial expansion within the broader Phase 1F site. Cumulative impacts on ecosystem conservation targets, loss of ecological functioning and ecosystem services supply, and impacts to species of conservation concern are expected to range from **Medium to High** significance in light of the threat status and irreplaceability value of the Maputaland Wooded Grassland vegetation type and the presence of protected/threatened plant species at the site. Cumulative impacts are likely to remain Moderately-High to High even when considering these impacts without the planned gas to power plant development (due to the extensive industrial development planned for the Phase 1 F area).

With adequate mitigation and impact management, most direct and indirect impacts can be effectively managed and reduced to estimated low significance levels. The cumulative loss of threatened/protected plant species can be effectively managed by rescuing and translocating species to suitable conservation sites outside of the developable area, reducing the impact on the local population of these species to a low significance level. Other on-site impacts can be relatively easily mitigated through appropriate practical on-site impact mitigation and best practice management measures which have been outlined in this report. These include the implementation of an alien plant management programme and revegetation/rehabilitation plan for areas disturbed during construction.

The cumulative, permanent and irreversible loss of vegetation and habitat will be difficult to mitigate, and the consequences in terms of meeting targets set for Maputaland Wooded Grassland (Endangered vegetation type) as well as the resultant loss of ecosystem functioning, goods and services will be unavoidable. The contribution of the project itself to this impact is expected to be limited as a result of the limited footprint (i.e. 7.3ha).

Wetlands

As discussed in Chapter 5 (Section 5.1) wetland systems were identified on the north-western and eastern portions of the site. The wetland assessment carried out for the Nemai Consulting EIA Report, 2015 identified wetland units that should be retained due to their respective relatively natural and moderately modified condition and the services they render, and the wetland unit that could be developed as it was largely modified and the services it offers have largely been impacted on by a drain that had been cut into it. As part of the Wetland Offset Plan, the conservation and rehabilitation of the wetlands (that should be retained) as assessed in light of the proposed loss of the wetlands (that can be developed), and it was found that wetlands that should be retained provides the following contributions:

» To wetland functionality = 0.23 ha; and
» To ecosystem conservation = 10.4 ha.

These results indicate that, due to its existing healthy state, rehabilitation and protection of the wetland, including its 30m buffer zone, will contribute little wetland gain in terms of functionality, particularly when compared with the 14.82 ha required to offset the losses incurred by allowing development. Thus, additional offset area will be required to meet this target. Preservation of the identified wetland will meet the estimated Ecosystem Conservation Target, and should certainly be zoned as conservation amenity within the Phase 1F development. A Wetland Management Plan has been compiled as part of the Integrated Water Use License (IWULA) submitted together with the Nemai Consulting EIA Report (2015), and the main activities for wetland rehabilitation include:

» Appropriate securing (fencing) of designated wetland areas and erection of informative and educational signage;
» Eradication of invasive alien plant species in all wetland areas through removal and sustained treatment (on-going maintenance programme);
» The clearing and safe disposal of any waste found in all wetland areas with specific attention to wetlands in red, including the drainage canal;
» The planting of appropriate indigenous plant species, as per sustainable urban drainage

system (SUDS) requirements; and

» The replacement of the northern portion of the drainage canal with a pipeline system (and suitable erosion prevention methods) allowing for platforming of this section for possible development.

Approval has been obtained by the RBIDZ to commence with construction activities related to the upgrade of the railway line to the RBIDZ, upgrade of Medway Road at 1A and development within the RBIDZ 1F in terms of the National Water Act (Act No. 36 of 1998) in March 2016 (refer to Appendix J). In this regard, whilst wetlands in close proximity to the site has been adequately assessed, the proponent must take cognisance of the Wetlands Offset Plan and the rehabilitation measures as proposed in the Nemai Consulting EIA Report, 2015 ensuring that there are no further impacts, as it is a key aspect for achieving the estimated Ecosystem Conservation Target.

Results of the Air Quality Study

Negative air quality impacts associated with the generation of dust and emissions have been identified. However, the assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws and which are of such significance that they cannot be successfully mitigated.

In this study, direct impacts will result from exposure to dust generated from the construction and decommissioning phases of the proposed gas to power plant. Direct impacts will also result from the inhalation of SO_2, NO_2, PM_{10}, CO and benzene emitted during the operational phase of the proposed gas to power plant.

Indirect impacts resulting from emissions of SO_2 and NO_2 from power plants include their contribution to acidification in both dry and wet (acid rain) deposition, during the operational phase. Further indirect effects during the operational phase are associated emissions of CO and CO_2. CO_2 is a GHG, adding to the global concentrations. CO is not considered a GHG, but is a strong precursor in the formation of ozone in the troposphere.

Ambient air quality in Richards Bay is influenced by a number of sources of air pollution, including large and smaller industry, transportation, agricultural burning, mining and the long range transport of pollutants from the interior. The proposed gas to power plant is located in an area where there are many notable sources of SO_2, NO_2, PM_{10}, CO and benzene (to a lesser extent) in the immediate vicinity of the site.

According to the model results, the 99^{th} percentile of the predicted 1-hour and 24-hour and annual average SO_2, NO_2, PM_{10}, CO and benzene concentrations from the proposed gas to power plant are well below the respective National Ambient Air

Quality Standards (NAAQS) and World Health Organisation (WHO) guidelines for Scenario 1 and Scenario 2. Predicted ambient concentrations are localised and very low for the modelled scenarios. The contribution to ambient concentrations beyond the immediate vicinity of the proposed gas to power plant is therefore small. The additive effect of these concentrations to the ambient environment is therefore highly unlikely to make a significant contribution to the cumulative impacts of SO_2, NO_2, PM_{10}, CO and benzene in the ambient environment. Impacts in terms of predicted concentrations of SO_2, NO_2, PM_{10}, CO and benzene from the operational scenarios will however last for the full period of the proposed gas to power plant. The duration of direct, indirect and cumulative impacts from the operational scenarios are therefore expected to be long-term. The significance of all impacts for the two operational scenarios is **low**.

Construction and decommissioning activities will result in the emission of low quantities of terrestrial and construction dust, not expected to pose a health risk. Furthermore, dust emissions will not travel over vast distances, but will most likely settle within 100m to 1km of the proposed development site. A temporary nuisance impact may be experienced in parts of the RBIDZ Zone 1F, the property on which the site is to be constructed. Construction and decommissioning impacts will last for a relatively short period as these activities occur for the duration of these activities only. It is predicted that the significance of all impacts during the construction and decommissioning phase is **low**. No mitigation is necessary, however, measures are suggested to minimise the nuisance impacts arising from these activities.

In this assessment, two NO_X emission mitigation strategies have been tested for the proposed gas to power plant. These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed gas to power plant, this will result in significantly lower NO_2 concentrations during the operational phase for all scenarios. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the diesel and LNG. However, it has been concluded that this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 content levels are already low. Due to the low predicted impacts, no mitigation measures are suggested for operational activities, in other words, mitigation measures to control SO_2 and NO_X, or even PM_{10}, CO and benzene are not necessary for the normal operations of the proposed gas to power plant. The significance rating will remain **low** during the operational phase for all scenarios, with or without mitigation.

The operation of the proposed gas to power plant is a Listed Activity in

terms of the NEM: AQA. Requirements for environmental management will be dictated by the conditions in the Atmospheric Emission License (AEL). These are likely to include:

i. Annual emission measurements to assess compliance with the Minimum Emission Standards for Listed Activities (Government Gazette 37054, Notice No. 893 of 22 November 2013);
ii. The maintenance of an emission inventory with registration on the National Atmospheric Emission Inventory System (NAEIS) and annual reporting of emissions to the NAEIS (Government Gazette 38633, Notice No. R 283 of 2 April 2015).

Further environmental management requirements should address the control of emissions during operations through routine maintenance and operation according to specification.

According to the dispersion modelling results and air quality impact assessment, the site operations is expected to generate low emissions, low ambient concentrations, and low environmental impacts for both Scenario 1 and Scenario 2. It is therefore recommended that the proposed mitigation measures for the construction, operation and decommissioning phases are implemented to limit the negative impacts.

From an air quality perspective it is concluded that the project is supported, provided that mitigation measures are implemented and adhered to.

Results of the Social Study

Positive and negative social impacts have been identified to be associated with the construction and operation of the project. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings have been made:

» The potential negative social impacts are primarily associated with the traffic impacts on daily living and movement patterns during the construction phase and operation phase. These impacts can be reduced to acceptable levels with the implementation of the mitigation measures proposed.
» Employment opportunities will be created in the construction and operation phases. The impact is rated as positive even if only a small number of individuals benefit in this regard as a result of high levels of unemployment in the region.

- The proposed project could assist the local economy in creating entrepreneurial development, especially if local business could be involved in the provision of general material and services during the construction and operational phases.
- Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.
- The proposed development also represents an investment in infrastructure for the generation energy, which represents a positive social benefit for society as a whole.

From a social perspective it is concluded that the project is supported, but that mitigation measures should be implemented and adhered to.

Environmental Costs

The implementation of the project is expected to result in a number of environmental costs, as detailed within this report. This could include:

- Direct loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the gas to power plant (which is limited to the development footprint of 7.3ha). The cost of loss of biodiversity is expected to be limited as a result of the extent of the area and the limited presence of species of conservation concern within the development area.
- Visual impacts associated with the gas to power plant. The cost of loss of visual quality to the area is expected to be very low as a result of the location of the facility within the RBIDZ.
- Change in land-use and loss of land available for agriculture on the development footprint. The cost in this regard is expected to be insignificant due to the fact that the proposed development is located within the RBDIZ, zoned as IDZ Industry.
- Impacts to ambient air quality. The cost in this regard is expected to be low as the modelling results reveal that the predicted emissions from both, diesel fuel (Scenario 1) and LNG fuel (Scenario 2) is below WHO guidelines.

These costs are expected to occur at a local and site level and are considered acceptable provided the mitigation measures as outlined in this EIA and the EMPr are implemented. **No fatal flaws** associated with the proposed project have been identified.

Environmental Benefits

The positive implications of establishing the gas to power plant on the demarcated site include:

» The project will result in important socio-economic benefits at the local and regional scale through job creation, procurement of materials and provision of services and other associated downstream economic development. These will persist during the preconstruction, construction and operational phases of the project.
» The project contributes towards the Provincial and Local goals to accelerate economic growth, create jobs, uplift communities and alleviate poverty. The proposed development is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.
» The proposed development is to be located within the identified RBIDZ area most suitable for the rollout of the development of industrial activities within the KZN Province. This implies that projects of the same nature will be consolidated in one area creating a node, and ultimately aiming to reduce the potential for cumulative impacts associated with such developments when spatially fragmented. The location is therefore considered desirable
» The project serves to diversify the economy and electricity generation mix of South Africa by addition of gas-generated energy to the mix. Depending on the final design (baseload or mid-merit), the gas power plant has the ability to run 24 hours a day or during peak times. This will assist in stabilising the power supply during the periods of the day when this is required most.

The benefits of the project are expected to occur at a national, regional and local level. As the costs to the environment at a site specific level have been largely limited through the implementation of mitigation measures, the expected benefits of the project are expected to partially offset the localised environmental costs of the project.

OVERALL RECOMMENDATION

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the impacts associated with the development of the Ilanga CSP 5 facility can be managed and mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

The following mitigation measures provided in the EIA Report and associated specialist reports are recommended:

» Following the final design of the facility, a revised layout must be submitted to DEA for review and

approval prior to commencing with construction.

» An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMPr for the duration of the construction period.

» All mitigation measures detailed within this report and the specialist reports contained within Appendices **F - I** to be implemented.

» The draft Environmental Management Programme (EMPr) as contained within **Appendix I** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed solar energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project.

» Undertake plant rescue and translocation prior to any clearing/ disturbance of the site occurring, in line with the requirements and recommendations of the Plant Rescue Translocation and Protection Plan.

» Where access is required to areas surrounding the development site, a 2m buffer may be used for access. Where possible, cut vegetation to ground-level rather than removing it completely, leaving root systems intact to ensure rapid re-colonization in areas that are not to be permanently hardened.

» Vegetation clearing should ideally proceed mainly during the dry, winter months where possible in order to minimise the risk of soil erosion linked to high stormwater runoff rates.

» Vegetation/soil clearing activities must only be undertaken during agreed working (negotiated between the contractor and landowner) times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.

» Schedule vegetation clearing such that this is completed immediately before construction in an area to avoid prolonged exposure of the soil to weather elements.

» All vehicles accessing the site should adhere to a low speed limit (30km/h is recommended) to avoid collisions with susceptible species such as reptiles (snakes and lizards).

» Limit construction activities, site camps and equipment lay-down areas to disturbed areas within the development footprint and alongside the existing Tata steel north perimeter fence firebreak to the south of the site. No construction camps, etc. to be located within natural grassland areas in areas adjacent to the development site.

- An appropriate SUDS (Sustainable Urban Drainage System) should be implemented, characterized by a combination of open, grass-lined channels/swales and stone-filled infiltration ditches that will encourage infiltration across the site, provide for the filtration and removal of pollutants and provide for some degree of flow attenuation by reducing the energy and velocity of storm water flows.
- Semi-pervious materials must be used for roads that allow for some infiltration rather than using totally impermeable tarred road surfaces, as this will assist with reducing storm water runoff.
- Implement traffic control measures to limit vehicle-entrained dust from unpaved roads by limiting vehicle speeds (i.e. 30km/h) and by restricting traffic volumes.
- Limit access to construction site to construction vehicles only.
- Loading and unloading bulk construction material should be in areas protected from the wind or carried out in calm conditions.
- Loads on vehicles carrying dusty construction materials should be covered.
- Vehicles carrying dusty materials should be cleaned before leaving the site.
- Unpaved road surfaces should be sprayed with a surfactant to ensure high moisture content which will bind the silt or maintain high moisture content on exposed surfaces and roads by spraying with water.
- Stabilise open areas with dust palliative, gravel or similar.
- If NO_X mitigation strategies are implemented at the proposed gas to power plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS.
- Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the diesel fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.
- The EPC contractor should appoint a designated staff member to assist with the management of social impacts and to deal with any community issues.
- In terms of employment related impacts, it is important to consider that job opportunities for the unskilled and semi-skilled in the study area could create competition among the local unemployed. Introducing an outside workforce will therefore most likely worsen local endeavours to obtain jobs and provoke discontent as well as put pressure on the local services

available. It is imperative that local labour be sourced, wherever possible, to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the construction activities where possible. Local procurement of labour and services/products would greatly benefit the community during the construction and operational phases of the project.

» Local procurement of services and equipment where possible in order to enhance the multiplier effect. This would serve to mitigate other subsequent negative impacts such as those associated with the inflow of outsiders to the area, the increased pressure on the infrastructure and services in the area, as well as the safety and security concerns.

» Involve the community in the process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).

» Implement mitigation measures to reduce and avoid negative impacts.

» It is important that the mitigation measures relating to traffic impacts (daily living and movement patterns) as detailed within the SIA (**Appendix F**) are implemented to reduce the negative impacts.

» Obtain all other required environmental permits for the project.

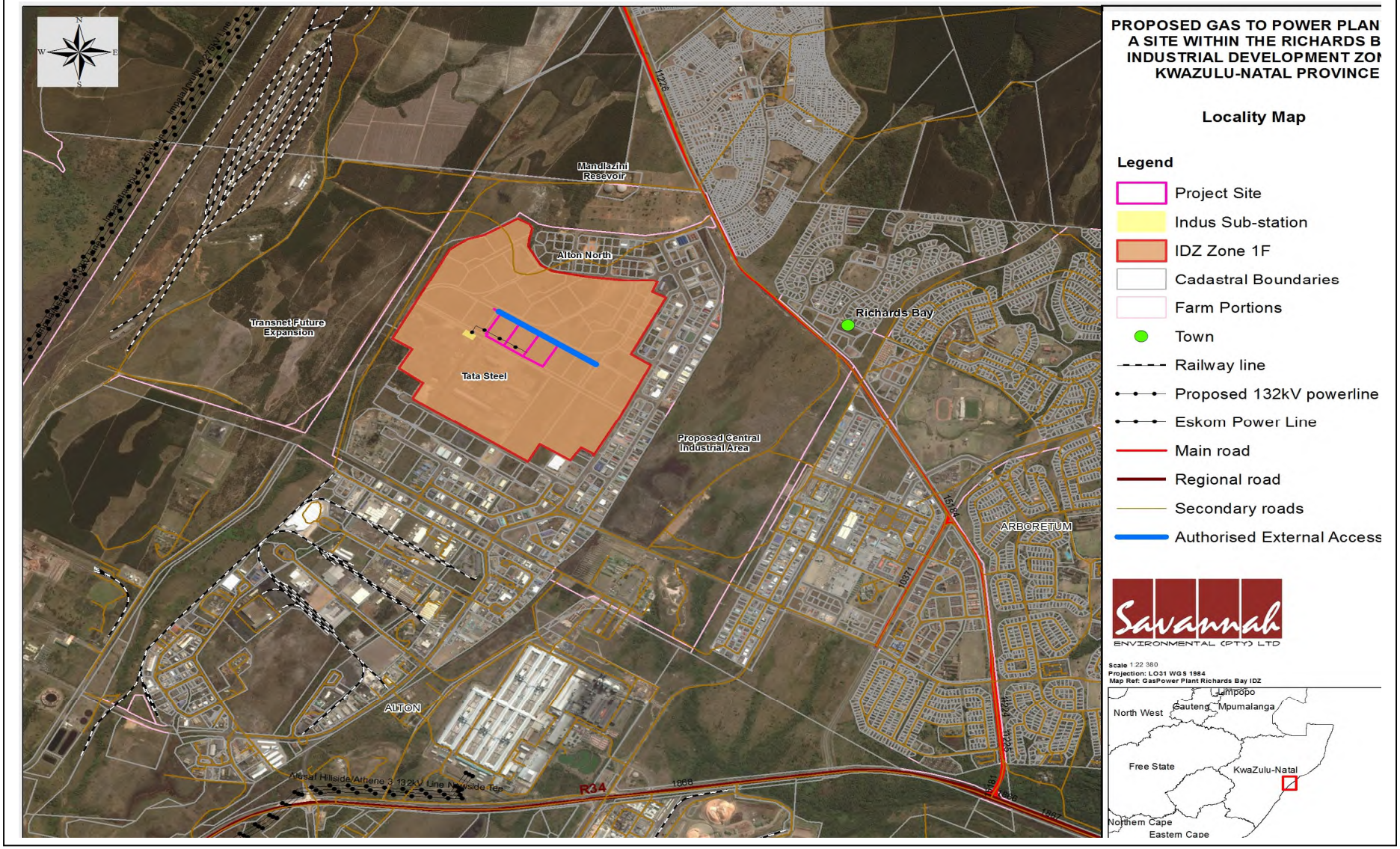

Figure 1: Locality map showing the proposed area for the establishment of the gas-fired power station (Refer to **Appendix B** for A3 Maps)

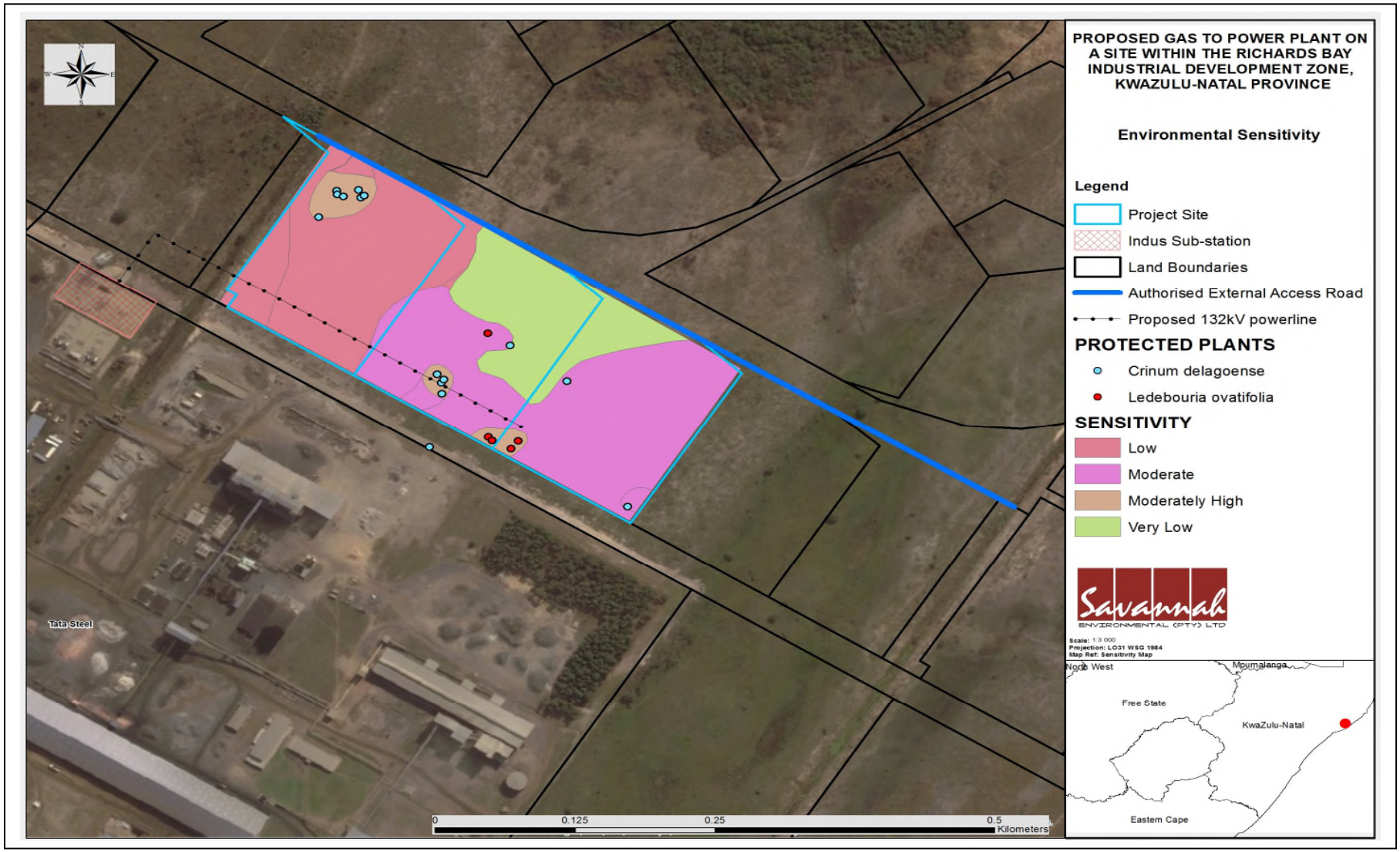

Figure 2: Environmental sensitivity map for the project study area illustrating ecologically sensitive areas in relation to the gas to power plant as well as the location of protected plant species (Refer to **Appendix B** for A3 maps)

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DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Ambient sound level: The reading on an integrating impulse sound level meter taken at a measuring point in the absence of any alleged disturbing noise at the end of a total period of at least 10 minutes after such meter was put into operation.

Baseload Electricity: Energy output produced or capable of being produced at a constant or near constant rate by power stations that have high load factors.

Capacity factor: refers to the expected output of the plant over a specific time period as a ratio of the output if the plant operated at full rated capacity for the same time period.

Cumulative impacts: In relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities. The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section should address whether the construction of the proposed development will result in: (i) Unacceptable risk, (ii) Unacceptable loss, (iii) Complete or whole-scale changes to the environment or sense of place, and (iv) Unacceptable increase in impact.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Emergency plan: An emergency plan is a plan in writing that, on the basis of identified potential incidents at the installation together with their consequences, describes how such incidents and their consequences should be dealt with, both on site and off site.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. the land, water and atmosphere of the earth;
ii. micro-organisms, plant and animal life;
iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the planning and implementation of a proposal and its ongoing maintenance and operation after implementation.

Flammable limits: Flammable limits are a range of gas or vapour amounts in the air that will burn or explode if a flame or other ignition source is present. The lower point of the range is called the Lower Flammable Limit. Likewise, the upper point of the range is called the Upper Flammable Limit.

General Waste: as defined in the NEM: Waste Amendment Act, 2014 (Act No. 26 of 2014) Waste that does not pose an immediate hazard or threat to health or to the environment, and includes:

(a) domestic waste;
(b) building and demolition waste;
(c) business waste;
(d) inert waste; or
(e) any waste classified as non-hazardous waste in terms of the regulations made under section 69, and includes non-hazardous substances, materials or objects within the business, domestic, inert or building and demolition wastes

Greenhouse gases: These are gases which are emitted that trap energy radiated from the sun in Earth's atmosphere in turn producing the greenhouse (or warming) effect. Greenhouse gases include water vapour, carbon dioxide and methane.

Hazardous waste: as defined in the NEM: Waste Amendment Act, 2014 (Act No. 26 of 2014)
Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within the business waste, residue deposits and residue stockpiles.

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Interested and Affected Party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

Integrated Resource Plan: Refers to the co-ordinated schedule for generation expansion and demand-side intervention programmes, taking into consideration multiple criteria to meet electricity demand.

Integrated Energy Plan: Refers to the over-arching co-ordinated energy plan combining the constraints and capabilities of alternative energy carriers to meet the country's energy needs.

Liquefied Natural Gas: Liquefied Natural Gas (LNG) is a super-cooled (cryogenic) liquid cooled between -120 and -170°C (usually around -162°C). The volume is 1/610th of natural gas

Mid-Merit Electricity: The energy output produced by generating units that load follow and provide most or all of their energy output at times when energy demand increases and which either turn off or cycle to a low minimum run level at other times so they can match the diurnal demand patterns.

Natural Gas Liquid: A group of hydrocarbons including ethane, propane, normal butane, iso-butane, and pentanes plus. It generally includes natural gas plant liquids, and all liquefied refinery gases, except olefins.

Perennial and non-perennial: Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contains flows for short periods, such as a few hours or days in the case of drainage lines.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Significant impact: An impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

Wetland: Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (National Water Act, Act No. 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

Water course: as per the National Water Act (Act No. 36 of 1998) means -
(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and

(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Waste: as per the NEM: Waste Amendment Act, 2014 (Act No. 26 of 2014)

(a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, by the holder of the substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 of the Act; or

(b) any substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, but any waste or portion of waste, referred to in paragraph (a) and (b) ceases to be a waste -

(i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;

(ii) where approval is not required, once a waste is or has been re-used, recycled or recovered;

(iii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or

(iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.

ABBREVIATIONS AND ACRONYMS

CCGT	Combined Cycle Gas Turbines
CO_2	Carbon dioxide
COGTA	Cooperative Governance and Traditional Affairs
DAFF	Department of Forestry and Fishery
DEA	National Department of Environmental Affairs
DEDT	Kwazulu-Natal Department of Economic Development and Tourism
DMR	Department of Minerals Resources
DoE	Department of Energy
DoT	Department of Transport
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
FPPs	Floating Power Plants
GHG	Greenhouse Gas
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GUMP	Gas Utilisation Master Plan
GW	Giga Watt
Ha	Hectare
HFO	Heavy Fuel Oil
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IDZ	Industrial Development Zone
IEP	Integrated Energy Planning
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
km	Kilometre
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
KZN	KwaZulu-Natal
KWh	Kilowatt hours

LFO	Light Fuel Oil
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
m^2	Square meters
m^3	Cubic metres
m^3/h	Cubic metres per hour
m/s	Meters per second
MW	Mega Watt
NDP	National Development Plan
NEMA	National Environmental Management Act (Act No 107 of 1998)
NEM: AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEM: BA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEM: WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (Act No 25 of 1999)
NG	Natural Gas
NGOs	Non-Governmental Organisations
NIRP	National Integrated Resource Planning
NOx	Nitrogen Oxides
NWA	National Water Act (Act No 36 of 1998)
OCGT	Open Cycle Gas Turbine
OECD	Organization for Economic Cooperation and Development
OHSA	Occupational Health and Safety Act (Act No. 85 of 1993)
PGDS	Provincial Growth and Development Strategy
RBIDZ	Richards Bay Industrial Development Zone
RSA	Republic of South Africa
SACNASP	South African Council of Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SANAS	South African National Accreditation System
SANS	South African National Standard
SDF	Spatial Development Framework
SHE	Safety, Health and Environmental
SHEQ	Safety, Health, Environment and Quality
SOx	Sulphur Oxides
ULM	uMhlathuze Local Municipality
UDM	uThungulu District Municipality

INTRODUCTION *CHAPTER 1*

Richards Bay Gas Power 2 (Pty) Ltd, an Independent Power Producer (IPP), is proposing the establishment of a gas to power plant and associated infrastructure on a site located within the Richards Bay Industrial Development Zone (IDZ) 1F, located within the uMthlathuze Local Municipality in Kwazulu-Natal, South Africa. The gas to power plant will have a capacity of up to 400MW. This project is to be developed in response to the Department of Energy's (DoE) request for projects to be developed by IPPs in order to provide alternative power generation technologies to meet the energy requirements of 10 000MW of additional electrical capacity by 2025, as identified in the National Development Plan (NDP).

As the project has the potential to impact on the environment, an Environmental Impact Assessment (EIA) process is required to be completed in support of an application for Environmental Authorisation (EA) prior to the commencement of construction of the project.

In terms of the EIA Regulations (2014) of GN R982, GN R983, GN R984 and GN R985, a Scoping and EIA study is required to be undertaken for the proposed project. The Scoping Phase of the EIA process identified potential issues associated with proposed Gas-to-Power Plant and was undertaken in accordance with the Section 24 (5) of the National Environmental Management Act (No 107 of 1998).

The EIA Phase addresses those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

This Environmental Impact Assessment Report consists of the following sections:

» **Chapter 1** provides background to the project and the environmental impact assessment, the recommendations and conclusions from the Scoping Report and the details and expertise of the Environmental Assessment Practitioner conducting the EIA.
» **Chapter 2** outlines the strategic legal context for energy planning within South Africa and for the proposed project.
» **Chapter 3** provides a description of the proposed project, including feasible alternatives considered, and the need and desirability of the proposed project.
» **Chapter 4** outlines the approach to undertaking the environmental impact assessment process.

» **Chapter 5** describes the existing biophysical and socio-economic environment within and surrounding the project development footprint.
» **Chapter 6** provides an assessment of the potential issues and impacts associated with the project and presents recommendations for mitigation of significant impacts.
» **Chapter 7** provides an assessment of cumulative impacts.
» **Chapter 8** presents the conclusions and recommendations based on the findings of the EIA.
» **Chapter 9** provides a list of reference material used to compile the EIA Report.

1.1. Need for the Project

Approximately 90% of South African electricity comes from coal-fired power stations, with Eskom being the dominant electricity producing company generating 95% of all electricity in South Africa (as detailed in the SA Yearbook 2009/2010). The demand for electricity in South Africa has grown, on average, at more than 4% over the past few years, with a simultaneous reduction in the surplus generating capacity due to limited commissioning of new generation facilities to meet the growing demand as well as replacing the aging fleet of generation capacity, which has an average age of 34 years (with a life expectancy of 50 years). Although the electricity demand shows a slight negative trend over the recent past, the maximum demand, together with the greater need for maintenance of existing power plants, has put the available power supply under pressure. In spite of capacity coming on line in the near future (as a result of the commissioning of Medupi Power Station near Lephalale, and a number of renewable energy projects across the country), the electricity demand within the country is still higher than the available capacity.

The Integrated Resource Plan (IRP) 2010-2030 developed by the Department of Energy (DoE) projected that an additional capacity of up to 56 539MW of generation capacity will be required to support the country's economic development and ensure adequate reserves over the next twenty years. The required expansion is more than two times the size of the existing capacity of the system. In order to meet this required generation capacity, the IRP includes a mix of generation technologies, including a nuclear fleet of 9.6 GW; 6.3 GW of coal; 17.8 GW of renewables; and 8.9 GW of other generation sources, including gas. Although liquefied natural gas (LNG)-fuelled combined cycle gas turbines is considered to be one of the alternative baseload power generation options in the least-cost Base Case presented in the IRP, the potential to develop these plants has been constrained by the availability of fuel and the capacity to build. The Department of Energy's Independent Power Producer (IPP) office, together with Transnet, is working together to help expedite the 3126 MW Ministerial determination for Gas IPPs[5]. It is in response to this initiative that this project is being proposed.

[5] This is being developed a two-phased approach. The first phase is to introduce Floating Power Plants (FPPs) in three of South Africa's commercial ports – Saldanha, Ngqura and Richards Bay, and/or, an on-land early power project in Richards Bay IDZ, Saldanha Bay and Coega IDZ. The second phase is to facilitate the import of

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. The IPP Office has to date successfully procured 6327MW independently produced renewable energy under the Renewable Energy IPP Procurement Programme (REIPPP). It is currently intended that a further 3126MW of new generation capacity, from gas[6], is needed to contribute towards future energy security.

For the Gas IPP Procurement Programme, the DoE through the IPP Office has, in collaboration with Transnet, developed a two-phased approach. The first phase is to introduce Floating Power Plants in three of South Africa's commercial ports – Saldanha Bay, Ngqura and Richards Bay. The second phase is to facilitate the import of Liquefied Natural Gas (LNG) in the same three ports, to allow for the development of medium- to long-term gas power plants outside of the port boundaries. It is in response to this initiative that this project is being proposed.

In response to the need for additional electricity supply to the national grid, and the goal of Government to procure electricity from IPPs, as detailed in the IRP 2010, Richards Bay Gas to Power 2 (Pty) Ltd is proposing the construction of a gas to power plant. The aim of this project is to increase the use of gas in South Africa's energy supply mix for generating electricity and the establishment of the greater gas economy as a whole.

1.2. Project Overview

The gas to power plant and associated infrastructure is proposed to be located on erven 17455, 17443 and 17442 within the Richards Bay Industrial Development Zone (RBIDZ): Phase 1F (refer to Figure 1.1). The RBIDZ has developed an all-inclusive 50-Year Integrated Master Plan to guide the further development of Phases 1A, 1F, and 2A of the zone so that the total developable land available for lease to businesses locating in the zone increases from the current level of 345 ha to just over 1 500 ha once the expansion and development has been completed (Nemai Consulting, 2014). The EIA undertaken by Nemai Consulting (2015) which involves the installation of infrastructural services (roads, sewer infrastructure, internal electrical infrastructure, water mains, storm water infrastructure and infill of wetlands), notes that under its application for environmental

Liquefied Natural Gas (LNG) in the same three ports, to allow for the development of medium- to long-term gas power plants outside of the port boundaries (ERM, 2015).

[6] Notwithstanding that the IRP 2010-2030 appears to primarily contemplate LNG as the potential source of natural gas for power generation and indicated (amongst other things) that other sources still require further research, the new generation capacity determined as necessary, may be generated from any gas type or source (including natural gas delivered to the power generation facility by any method including by pipeline from a natural gas field or elsewhere or an LNG based method; coal bed methane; synthesis gas or syngas; above or underground coal gasification; shale gas and any other gas type or source as may be considered appropriate by the procurer).

authorisation, the site will be cleared for the placement of infrastructure services and servitudes and each tenant will develop their respective stands for industrial purposes. This is aligned with the intentions of the RBIDZ to develop and establish built world-class industrial park incorporating a delimited Customs Controlled Area and linked to the Richards Bay International Port, with the provision of quality infrastructure including ICT and transport infrastructure, business and utility services.

The proposed plant net output, at International Standards Organisation (ISO) Reference Conditions, is expected to be up to 400 MW, to be developed in two (2) phases to operate with liquid fuel such as diesel and/ or Liquefied Petroleum Gas (LPG)[7] in Phase 1[8] and ultimately Liquid Natural Gas (LNG) or Natural Gas in Phase 2 of the development. It is anticipated that 300MW will be fuel/ gas generated energy and 100MW will be heat/ steam generated energy.

The main infrastructure associated with the facility includes the following:

» Up to six (6) Gas Turbines (this is dependent on the DoE's Gas IPP Programme and the requirements of gas power stations to run at either base-load or mid-merit)
» 1-2 steam turbines utilising the heat from all the engines for power production in a steam cycle.
» The power plant will comprise multiple engine halls, each of ~60MW. Each engine hall will typically comprise one engine. Stacks associated with engine halls will be up to 20m in height.
» Access roads within project locality boundaries.
» Three (3) fuel tanks with a capacity of 2000m^3 each which will be used as an interim fuel storage facility until the gas infrastructure is constructed by the DoE and Transnet. Two (2) fuel unloading stations will be associated with these tanks.
» Water storage facilities for process water and fire-fighting purposes.
» An HV-Yard and Substation, adjacent to the power plant.
» A new 132kV power line to connect into the Municipal grid, connecting directly to the Indus Substation bordering the site.
» Guard house, admin building, workshops and a warehouse.

Water volumes of between 50 000m^3 and 270 000m^3 [9]per annum are expected to be required for the project. The volume of water required will be supplied via the Richards Bay IDZ water supply network that has an allotment from the local water authority. Every effort is being made to reduce these volumes further, including the potential for recycling condensation from air cooled condensers if such equipment will form part of the final plant

[7] In response to comments received on the draft scoping report, Light Fuel Oil (LFO) and Heavy Fuel Oil (HFO) have been excluded as fuel sources due to their high emissions.

[8] Planned to be developed as an on-land early power project.

[9] Exact water requirements are unconfirmed at this stage and are therefore best estimates. Once the final technology has been selected, water volumes will be confirmed.

design. The Richards Bay IDZ has undertaken to provide the water to the site under its long-term lease agreement with Richards Bay Gas Power 2 (Pty) Ltd. The Richards Bay IDZ have provided Richards Bay Gas Power 2 (Pty) Ltd with a letter of confirmation that the volumes required would be supplied (refer to Appendix C9).

More details regarding the proposed project are included within Chapter 3 of this Report.

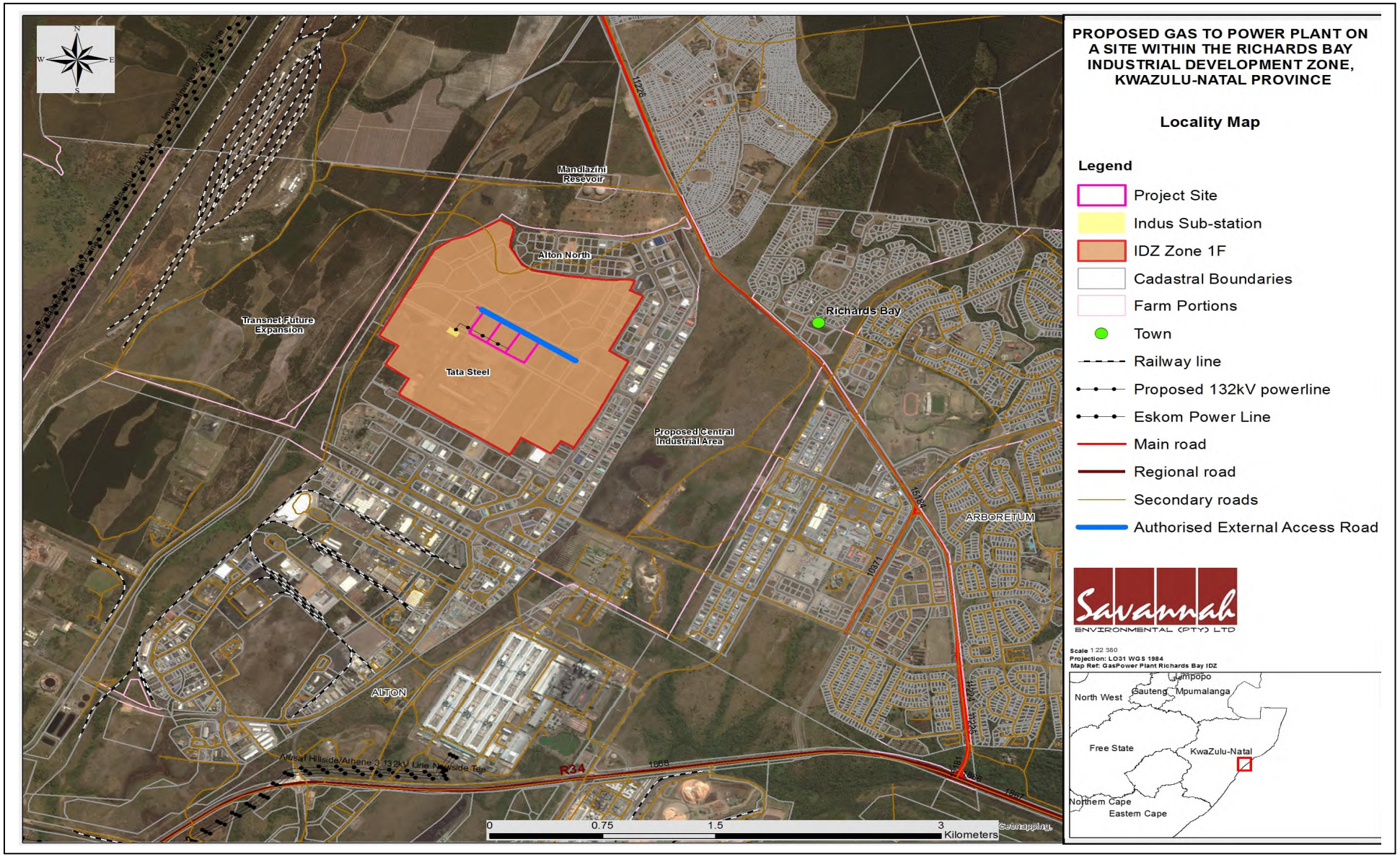

Figure 1.1: Locality map showing the proposed area for the establishment of the gas-fired power station

1.3. Conclusions from the Scoping Phase

1.3.1. Evaluation of the Proposed Project

The Scoping Study (dated January 2016) had been undertaken in accordance with the EIA Regulations published in Government Notice 38282 of 4 December 2014, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). The Scoping Report was aimed at detailing the nature and extent of the facility, identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project through consideration of existing information and previous studies undertaken for the IDZ and specifically for Phase 1F.

Potential impacts associated with the proposed gas to power project are expected to occur during both the construction and operational phases. The majority of potential impacts identified to be associated with the construction of the project are anticipated to be localised. Impacts associated with air quality during the operational phase are expected to occur at a local, regional and potentially transboundary level.

From the scoping study undertaken, the following conclusions were made regarding potential impacts associated with the proposed project:

» Impacts on ecological resources, including loss of remaining patches of natural vegetation and loss of species of conservation concern, are likely to occur at the extent of the site. As a result of the largely disturbed nature of the site, it is expected that the development would not result in any irreplaceable loss of resources and the consequences of the impacts are expected to be limited. Impacts can be minimised through the implementation of appropriate mitigation measures. Overall impacts are expected to be low in significance. Due to the limited footprint of the proposed development, cumulative impacts are expected to be limited.
» As a result of the limited agricultural potential of the site due largely to local climatic factors, impacts as a result of the construction of the proposed project is expected to be very unlikely to occur and will not result in the irreplaceable loss of resources. Impacts of the proposed projects on agricultural potential are expected to be of very low significance. No mitigation is required in this regard. No further studies in this regard are required.
» There is the potential for the loss of soil resources through erosion, particularly during the construction phase. This impact can be effectively minimised through the implementation of appropriate mitigation measures including implementation of an appropriate stormwater management plan and regular monitoring of the occurrence, spread and potential cumulative effects of erosion. Impacts post-mitigation are expected to be of low significance.

» The heritage resources in the area proposed for development are sufficiently recorded. The previous surveys undertaken in the area adequately captured the heritage resources. There are no known sites which require mitigation or management plans. It is therefore unlikely that impacts in this regard will occur. Should impacts occur, these would be local in extent and may result in irreplaceable loss of resources but the consequences are expected to be low. Impacts of the proposed project on heritage resources are expected to be of very low significance. No further studies in this regard are therefore required.
» The facility is located more than 1000m from the closest potential noise-sensitive receptors and therefore the potential of a noise impact would be low. This is in line with point 5.4 (h) of SANS 10328:2003, that states that if industry is to be situated further than 1 000m from noise-sensitive developments the activity is unlikely to have any acoustical implications. No further studies in this regard are therefore required.
» There is the potential for impacts on ambient air quality to occur as a result of the proposed development, specifically during the operational phase. Impacts during construction are largely expected to be associated with dust emissions. This impact is likely to occur and is typically limited to the immediate vicinity of the proposed site, the consequences of which are expected to be limited. With appropriate mitigation such as dust suppression, this impact can be marginal or of low significance. Operation of the gas to power plant is expected to result in relatively low emissions to the atmosphere as a result of the fuels to be used (ultimately natural gas). Despite the benefit of relatively low emissions per unit, the combined emissions of the all combustion turbines are expected to be potentially significant. Unless adequately mitigated, these emissions have the potential to negatively impact ambient air quality. The primary concerns are potential health impacts and associated ecological impacts. Pollutant concentrations are expected to be highest in the immediate vicinity of the plant, dispersing rapidly with increasing distance from the proposed site. The nearest residential area is located more the 1.5km to the north-west of the site. There is the potential for impacts on human health to occur. This should be confirmed through a detailed study within the EIA phase of the process. This study must also consider the cumulative impacts of other industrial developments within the Richards Bay area.
» Impacts on the social environment are expected during both the construction and operational phases. Both positive and negative impacts are anticipated to occur. The most important potential social benefits associated with the construction and operation of the project refer to the job opportunities and possible socio-economic spin-offs created. New economic activities such as this project having the potential to assist with the developmental challenges that much of province is faced with, providing employment and skills development to local community and contributing to the social, economic and institutional development of the local area. Additional employment and associated indirect economic benefits could improve the quality of life of the local community. The main negative impacts are associated with the influx of in-migrants and intrusion impacts associated with the construction phase from the gas to power

plant. The extent of the negative impacts and possible benefits would be further assessed during the EIA phase when these would be investigated in more detail.

1.3.2. Risks Associated with the Proposed Project

A potential risk associated with the development of the gas to power plant will be potential conflict with the land-use of the area. However, as the land is located within the identified Industrial Development Zone, and has been allocated for the purposes of the project, this conflict is considered to be negligible for this project.

The most significant risk associated with the project is the potential for increase in air quality impacts associated with the operational phase of the project. Burning natural gas produces nitrogen oxides and carbon dioxide (CO_2). Natural gas contains very little sulphur and no particulates, therefore the emissions of these pollutants are negligible. Methane (CH_4) is a primary component of natural gas and may also be emitted when natural gas is not combusted completely in the power generation process. Methane can also be emitted from leaks and losses during storage and transportation. NO_2 is a criteria air pollutant with known risks to human health. Detailed investigation of impacts of the gas to power station on air quality will be required to be undertaken in order to confirm the significance of potential impacts and risks in terms of human health.

1.3.3. Recommendations

No environmental fatal flaws or impacts of very high significance were identified to be associated with the proposed project on the identified site during the Scoping stage of the EIA process and the Final Scoping Report was accepted by the DEA on 29 February 2016 (Reference number: 14/12/16/3/3/2/867). In terms of this acceptance, more detailed environmental studies are required to be conducted in line with the Plan of Study contained in the Scoping report during the EIA Phase of the process. These studies must consider the detailed layouts produced by the developer and make recommendations for the implementation of avoidance strategies (if required), mitigation and management measures to ensure that the final assessed layout retains an acceptable environmental impact.

1.4. Details of Environmental Assessment Practitioner and Expertise to conduct the Scoping and EIA

Savannah Environmental was contracted by Richards Bay Gas to Power 2 (Pty) Ltd as an independent consultant to undertake the required Environmental Impact Assessment (EIA) for the proposed project, as required by the NEMA EIA Regulations of December 2014. Neither Savannah Environmental, nor any of its specialist sub-consultants on this project are subsidiaries of / or affiliated to Richards Bay Gas to Power 2 (Pty) Ltd. Furthermore,

Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

The Savannah Environmental staff and sub-consultants have acquired considerable experience in environmental assessment and environmental management over the last 10 years, and have been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa. Strong competencies have been developed in project management of environmental EIA processes, as well as strategic environmental assessment and compliance advice, and the identification of environmental management solutions and mitigation/risk minimising measures. Savannah Environmental has successfully completed various EIAs for transmission power lines, as well as EIAs for several substations, distribution power lines and power generation projects for Eskom Holdings Limited and Independent Power Producers.

Dilona Somai, the principal author of this report, is an Environmental Consultant with approximately five (5) years' experience. She holds an Honours BSc degree in Environmental Management and is a registered Candidate Natural Scientist (in the practice of Environmental Science) with the South African Council for Natural Scientific Professions. She has undertaken environmental compliance/ permitting (including basic assessments, water use license applications, social and environmental due diligence, social and environmental management systems and mining and prospecting right applications) and public participation /stakeholder engagement.

Jo-Anne Thomas, is a registered Professional Natural Scientist (in the practice of environmental science) with the South African Council for Natural Scientific Professions. She has gained extensive knowledge and experience on potential environmental impacts associated with electricity generation and transmission projects through her involvement in related EIA processes over the past eighteen (18) years. She has successfully managed and undertaken EIA processes for electricity generation projects throughout South Africa.

Curricula vitae for the Savannah Environmental project team consultants are included in Appendix A.

In order to adequately identify and assess potential environmental impacts as well as evaluate alternatives, Savannah Environmental has appointed specialist consultants to conduct specialist studies, which include a Social Impact Assessment, Air Quality Impact Assessment and Ecological Impact Assessment. Details of these specialist studies are included in Chapter 6.

STRATEGIC CONTEXT FOR ENERGY PLANNING CHAPTER 2

South Africa's Constitution, which was adopted in 1996, is unambiguous in its mandate for a sustainable energy future. The successful introduction of renewable energy into the country's electricity generation mix is founded in the Constitution. The Constitution and Bill of Rights provides that:

Everyone has the right:

- *To an environment that is not harmful to their health or well-being; and*
- *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures:*
  - *prevent pollution and ecological degradation*
  - *promote conservation; and*
  - *secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development*

Since the adoption of the Constitution, international and government policy papers (discussed below) have created the foundation for South Africa's energy programme.

2.1 National Policy and Planning Context

The need to expand and increase electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the Department of Energy (DoE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as the gas to power plant project is illustrated in Figure 2.1.

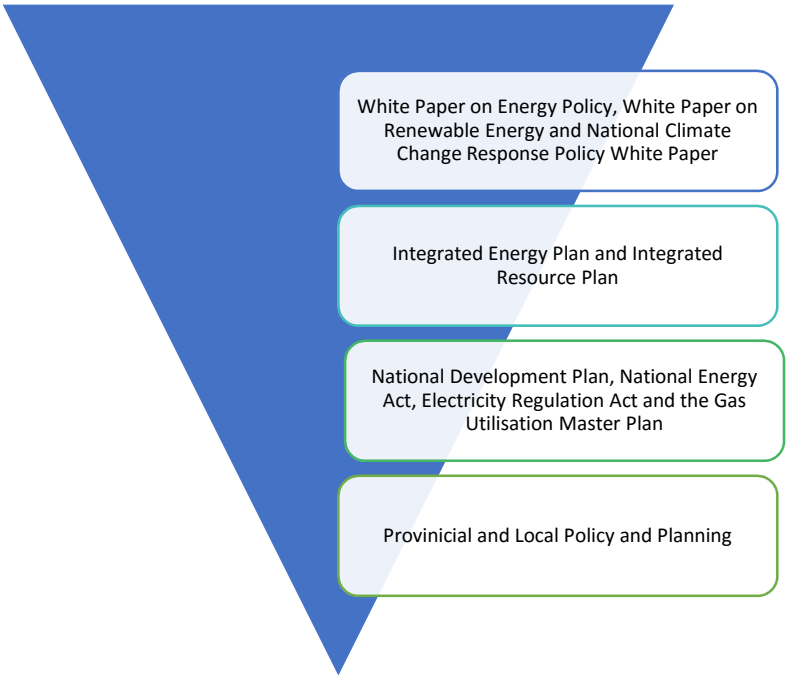

Figure 2.1: Hierarchy of electricity policy and planning documents

These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the proposed development.

2.1.1 White Paper on Energy Policy of South Africa (1998)

The White Paper on Energy Policy (1998) was published in December 1998 by the Department of Minerals and Energy (DME). The Paper considered all South Africans, recognising inequalities in the energy sector, both in energy usage and access, and escalated the need for increased access to affordable energy services for all the country's citizens. In addition, it gave a Government commitment to support and promote the development of renewable energy resources in the country. The White Paper on Energy Policy's position with respect to renewable energy is based on the integrated resource planning criterion of "ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options". The White Paper on Energy Policy (1998) identifies key objectives for energy supply, such as:

» Increasing access to affordable energy services;
» Improving energy sector governance;
» Stimulating economic development;
» Managing energy-related environmental impacts; and
» Securing supply through diversity.

In order to meet these objectives and the developmental and socio-economic objectives in South Africa, the country needs to optimally use the available energy resources. The South African Government is required to address what can be done to meet these electricity needs both in the short- and long-term.

From an energy policy point of view, the White Paper on Energy Policy (1998) promotes fuel diversification in the South Africa energy mix, and recognises natural gas as an attractive option for South Africa.

It notes that the development of the gas industry will stimulate inter-fuel competition, provide environmental benefits through lower emissions in contrast to oil and coal, provide greater options for industrial thermal applications, and increase the diversity of fuel supplies and hence improve South Africa's energy security. Government is therefore committed to the establishment of an appropriate climate to facilitate the development of the gas industry.

The proposed development of the gas to power plant by Richard's Bay Gas to Power 2 (Pty) Ltd therefore assists in meeting the objectives of the White Paper on Energy Policy (1998).

2.1.2 The Kyoto Protocol, 1997

South Africa's electricity is mainly generated from coal-based technologies. South Africa accounts for ~38 % of Africa's CO_2 (a greenhouse gas contributing to climate change) from burning of fossil fuels and industrial processes. The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change. South Africa ratified the Kyoto Protocol in 2002. The Kyoto Protocol requires developing countries to reduce its greenhouse gas emissions through actively cutting down on using fossil fuels, or by utilising more renewable resources. Therefore certain guidelines and policies (discussed further in the sections below) were put in place for the Government's plans to reduce greenhouse gas emissions. The development of renewable energy projects (such as the proposed CSP energy facility) is therefore in line with South Africa's international obligations in terms of the Kyoto Protocol. A second commitment period commenced from 1 January 2013, and extends to 31 December 2020.

2.1.3. United Nations Framework Convention on Climate Change and COP21 – Paris Agreement

Climate change is one of the major global challenges of the 21st century that require global response. The adverse impacts of climate change include persistent drought and extreme weather events, rising sea levels, coastal erosion and ocean acidification, further threatening food security, water, energy and health, and more broadly efforts to eradicate poverty and achieving sustainable development. Combating climate change would require

substantial and sustained reductions in greenhouse gas emissions (GHGs), which, together with adaptation, can limit climate change risks. The convention responsible for dealing with climate change is called United Nations Framework Convention on Climate Change (UNFCCC).

The UNFCCC was adopted in 1992 and entered into force in 1994. It provides the overall global policy framework for addressing the climate change issue and marks the first international political response to climate change. The UNFCCC sets out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases to avoid dangerous anthropogenic interference with the climate system.

The Convention has established a variety of arrangements to govern, coordinate and provide for oversight of the arrangements described in this document. The oversight bodies take decisions, provide regular guidance, and keep the arrangements under regular review in order to enhance and ensure their effectiveness and efficiency. The Conference of Parties (COP), established by Article 7 of the Convention, is the supreme body and highest decision-making organ of the Convention. It reviews the implementation of the Convention and any related legal instruments, and takes decisions to promote the effective implementation of the Convention.

COP 21 was held in Paris from 30 November to 12 December 2015. From this conference, an agreement to tackle global warming was reached between 195 countries. This Agreement shall be open for signature and subject to ratification, acceptance or approval by States and regional economic integration organizations that are Parties to the Convention from 22 April 2016 to 21 April 2017. Thereafter, this Agreement shall be open for accession from the day following the date on which it is closed for signature. The agreement can only enter into force once it has been ratified by 55 countries, representing at least 55% of emissions.

This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;
(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;
(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

In order to achieve the long-term temperature goal set out in Article 2 of the Agreement, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

In working towards this goal, advanced economies have already included renewables in their energy mix and have planned to increase their use in order to meet their mitigation goals: Japan aims to derive 22-24% of its electricity production from renewable sources by 2030 and the European Union plans for them to reach 27% of its final energy consumption. Developing countries are also playing their part, including South Africa which has included a goal of 17,8GW of renewables by 2030 as well as the use of cleaner fuel sources such as natural gas within the IRP (refer to Section 2.1.6).

South Africa supports the adoption of the Paris Agreement and will be required to communicate a nationally determined contribution to the global response to climate change every five years from 2020.

2.1.4. National Climate Change Response Policy White Paper (2011)

The Department of Environmental Affairs (DEA) National Climate Change Response Policy White Paper (2011) is the third influential policy paper that supported the country's aspirations for cleaner energy. The National Climate Change Response White Paper (2011) was largely informed by a process known as the Long-Term Mitigation Scenario (LTMS) formulation. The LTMS, led by the DEA, was a Cabinet-mandated process that took place in South Africa between 2005 and 2008. The LTMS arose out of the realisation that South Africa would need to contribute its share to mitigation, but recognising that the economy had been built around energy intensive industry, which is heavily reliant on coal. The country also needed to address poverty and inequality, so any move to a low carbon development path would require a major shift in thinking and action. However, a potential 'advantage' was that such Third World issues could be strategically addressed in the process of creating cleaner energy, as the provision thereof is manufactured from scratch, using the most appropriate and affordable technologies.

South Africa's response to climate change has two objectives: 1) to effectively manage the inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity; and 2) to make fair contribution to the global efforts to stabilise greenhouse gas (GHG) concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe that enabled economic, social and environmental development to proceed in a sustainable manner. The paper proposes a number of approaches dealing with climate change impacts with respect to selected

sectors. Energy, in this context, is considered to be one of the key sectors that provides for possible mitigations to address climate changes. In this regard the air pollution impacts that may arise from the proposed development would need to be taken into consideration, although it will result in lower carbon dioxide emissions relative to other energy fossil fuels (e.g. coal).

2.1.5 Integrated Energy Plan (2012)

The Integrated Energy Plan (IEP) (2012) and Integrated Resource Plan (IRP) are the most important documents shaping the country's energy sector, and can be regarded as the second level of implementation, with the policy papers being the first. Often confused with each other, the IEP is Government's strategic, coordinated master plan for the entire energy system that enables alignment and optimisation across the respective energy carriers and provides a coherent and holistic energy plan for the country. The IEP takes into consideration the crucial role that energy plays in the entire economy of the country and reflects the three developmental elements of the energy triangle (refer to Figure 2.2) with the imperative of a sustainable energy system apparent in its objectives, some of which include:

» To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector.
» To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels).
» To guide investment in and the development of energy infrastructure in South Africa.
» To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

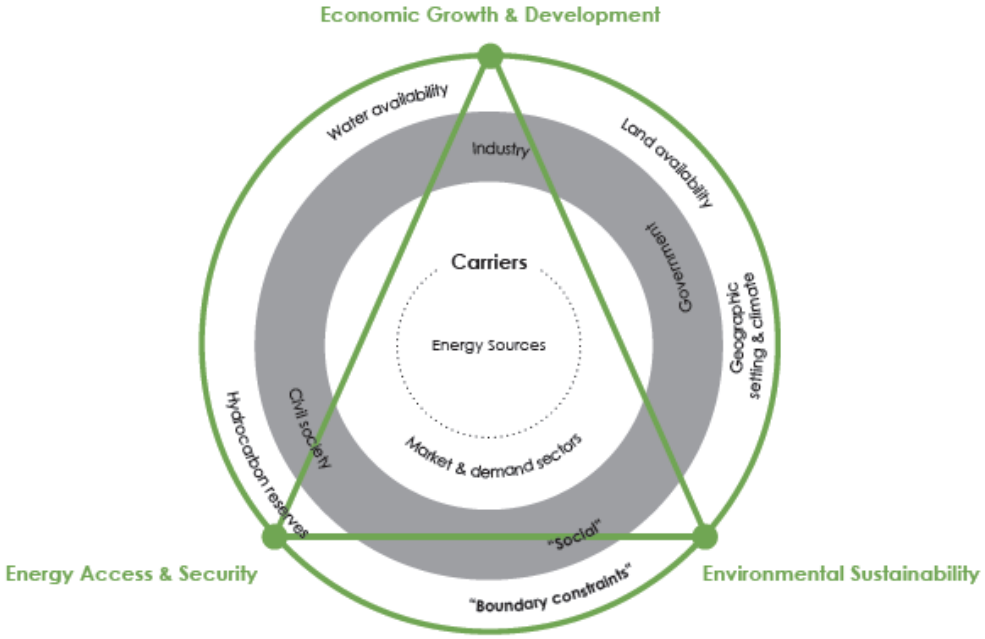

Figure 2.2: Energy Triangle (Source: State of Renewable Energy in South Africa Report, 2015)

Eight key objectives for energy planning were identified:

» Objective 1: Ensure the security of supply
» Objective 2: Minimise the cost of energy
» Objective 3: Increase access to energy
» Objective 4: Diversify supply sources and primary sources of energy
» Objective 5: Minimise emissions from the energy sector
» Objective 6: Promote energy efficiency in the economy
» Objective 7: Promote localisation and technology transfer and the creation of jobs
» Objective 8: Promote the conservation of water

The IEP recognises the potential of natural gas both for power generation and direct thermal uses. It is noted that power generation remains the main driver behind natural gas demand growth globally and remains a key potential for South Africa. It is highlighted that South Africa has a limited gas network and that one of the challenges of introducing natural gas into new markets is that large, capital-intensive investment in infrastructure along the supply chain is required. Transporting gas by pipeline is relatively expensive, more so than oil, because of the additional capital-intensive equipment needed to overcome the lower energy density of gas. The construction of an LNG facility would need to be underpinned by a gas-fired power plant as a key off-taker as the most feasible solution in the short- to medium-term. This option could enable South Africa to move towards a low carbon future as natural gas has lower carbon content than coal.

The proposed project aligns with all 8 objectives of the IEP and can also be seen as the "key off-taker" for gas within the Richards Bay area, thus supporting the shift towards a low carbon future for South Africa.

2.1.6 Integrated Resource Plan (2010 – 2030)

Secondary to the IEP is the Integrated Resource Plan (IRP) 2010-2030 which was promulgated by the Department of Energy (DoE) in May 2011. It is a key document that provides a long-term plan for electricity generation. It calls for doubling of electricity capacity using a diverse mixture of energy sources, mainly Coal, Gas, Nuclear and Renewables, as well as large-scale Hydro, which is to be imported from the southern African region.

The primary objective of the IRP 2010-2030 is to determine the long term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. However, the IRP 2010-2030 also serves as input to other planning functions, *inter alia* economic development, and funding, environmental and social policy formulation.

Implementation of the IRP 2010-2030 is carried out through Ministerial Determinations, which are regulated by Electricity Regulations on New Generation Capacity.

The accuracy of the IRP 2010-2030 is to be improved by regular reviews and updates, and a draft revised Plan had been available for public comment (until 7 February 2014) with the final Plan submitted to Cabinet in March 2014 for approval[10]. The IRP 2010 projected that an additional capacity of up to 56 539MW of generation capacity will be required to support the country's economic development and ensure adequate reserves over the next twenty years. The required expansion is more than two times the size of the existing capacity of the system.

The current iteration of the IRP for South Africa, initiated by the DoE after a first round of public participation in June 2010, led to the Revised Balanced Scenario (RBS) that was published in October 2010. The document outlines the proposed generation new build fleet for South Africa for the period 2010 to 2030. This scenario was derived based on the cost-optimal solution for new build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation. In addition to all existing and committed power plants, the RBS included a nuclear fleet of 9.6 GW; 6.3 GW of coal; 17.8 GW of renewables; and **8.9 GW of other generation sources (including gas)**. This means that 75% of new generation capacity by 2030 will be derived from energy sources other than coal.

[10] The updated IRP 2010-2030 has not yet been adopted by Parliament.

2.1.7. National Development Plan (2012)

The National Development Plan (NDP) (2012) is a long-term development plan aimed which aims to eliminate poverty and reduce inequality by 2030. A key focus of the NDP is the country's ability to return to a state of continued and uninterrupted electricity supply. This is to be achieved by increasing the electricity generation reserve margin from 1% (2014) to 19% in 2019, which will require the development of 10GW of additional electricity capacity by 2019 against the 2010 baseline of 44GW. Five of the 10GW are to be sourced from RE, with an additional 2GW to be operational by 2020.

The plan sets out steps that aim to ensure that, in 20 years, South Africa's energy system looks very different to the current situation: coal will contribute proportionately less to primary-energy needs, while gas and renewable energy resources – especially wind, solar and imported hydroelectricity – will play a much larger role. The development of gas is identified in a number of areas of the NDP as a priority, including:

» The development of policies and plans for the exploration of gas as an alternative to coal.
» The investigation and development of various gas supply options as an alternative to coal for power generation in order to help reduce South Africa's greenhouse gas emissions.
» The consideration of the use of gas as an alternative to nuclear power. Gas could provide a reliable base-load and mid-merit power generation through combined-cycle gas turbines.
» The construction of infrastructure to import liquefied natural gas and increasing exploration to find domestic gas feedstock (including investigating shale and coal bed methane reserves) to diversify the energy mix and reduce carbon emissions.

In this regard, the proposed gas to power plant aligns with the NDP as it is an alternative, "cleaner" energy source compared to coal thereby reducing the country's reliance on coal for energy. This project can assist to alleviate the immediate need for electricity while the necessary LNG infrastructure is secured to ensure alleviation of the long term energy crisis that the country faces.

2.1.8. National Energy Act (Act No. 34 of 2008)

The National Energy Act (Act No 34 of 2008) was promulgated in 2008. The Act aims to strengthen energy planning in order to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices to the South African economy and more specifically to "provide for energy planning, increased generation and consumption of renewable energies". This is to be undertaken in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors. The Act provides the legal framework which supports the

development of power generation facilities. The proposed gas to power plant would therefore be supported by the Act.

2.1.9. Electricity Regulation Act (Act No. 4 of 2006)

Under the National Energy Regulator Act, 2004 (Act No. 40 of 2004), the Electricity Regulation Act, 2006 (Act No. 4 of 2006) and all subsequent relevant Acts of Amendment, the National Energy Regulator of South Africa (NERSA) has the mandate to determine the prices at and conditions under which electricity may be supplied by licence to Independent Power Producers (IPPs). NERSA has recently awarded electricity generation licences for new generation capacity projects to renewable projects under the Renewable Energy IPP procurement (REIPPP) programme. This establishes an enabling environment for IPPs to enter the market, the bid programme rules and guidelines as well as procurement of new generation capacity.

The proposed gas to power plant is expected to generate up to 400MW. The intention is to transmit the energy generated into the national grid by means of connecting directly to the Indus Substation bordering the site.

2.1.10. Gas Utilisation Master Plan

In 2012, the Minister of Energy 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 3 126MW 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[11]

During the Gas Conference III held in May 2014[12] it was noted that LNG can provide a solution to mitigate the power shortage in a competitive manner and at the same time can complement South Africa's efforts to improve its balance of payments and meet its CO_2 emissions targets.

Power generation utilising natural gas currently comprises only 3% of the total energy mix (Michael-Fichardt, Department of Energy, 2014). South Africa has three options for increasing its natural gas share in its primary energy mix:

1. Increase imports through pipelines from neighbouring countries;
2. Import Liquefied Natural Gas (LNG) via tankers and yet-to-be-built LNG landing terminals; and

[11] https://www.ipp-gas.co.za/Home/About

[12] http://www.fossilfuel.co.za/gas-conference-iii-21-may-2014/

3. Own domestic gas, either conventional or unconventional

The DoE is currently finalising a Gas Utilisation Master Plan (GUMP) for South Africa in order to give guidance on how these different options could be developed in the next decades. The GUMP is a 30-year plan for the development of the South African gas industry and has been developed in parallel to the Gas-to-Power Procurement Programme. The GUMP includes an analysis of demand; supply; current infrastructure; market structure and organisation; and social, economic and environmental risks and considerations. One of the key objectives of the GUMP is to enable the development of indigenous gas resources and to create the opportunity to stimulate the introduction of a portfolio of gas supply options.

Michael-Fichardt from the DoE, in his presentation at the Gas Conference III, noted that there is a demand for gas in the Industrial Development Zones in South Africa, namely: Saldanha, Coega and **Richards Bay** and that these IDZs are potential locations for LNG import terminals. The benefits of gas utilisation in the energy mix include decreasing South Africa's CO_2 emissions and that it could provide South Africa with cheaper energy, and therefore a competitive economic advantage.

2.1.11. Gas-to- Power programme

The DoE, in May 2015, issued a Request for Information (RFI) regarding possible developments in a proposed Gas-to- Power programme. This RFI has its genesis in the Integrated Resources Plan 2010-2030. No such gas based economy presently exists in South Africa, and the country is caught in an impasse between developing domestic demand for gas (which depends on gas being readily available) and developing gas distribution infrastructure (which depends on the existence of local demand). The Gas-to-Power programme is seen as a way to break this impasse. The demand from the Gas to Power Programme will provide a market for a potential supply of gas. It will also provide long term gas demand sinks for future indigenous gas supplies.

The RFI speaks boldly to respondents providing information on possible Gas-to-Power solutions. These solutions could take two forms. First, there could be a 'cradle-to-grave' sourcing of gas, comprising development of the gas import infrastructure and delivery of the gas to, and processing of the gas in, that infrastructure, then utilisation of that gas for power generation and sale of power to Eskom under a long term power purchase agreement (PPA). Alternatively, there could be solutions that speak to discrete elements of this value chain.

The DoE recognises that, in the absence of available natural gas within South Africa and to ensure new capacity is delivered in timescales commensurate with the objectives of the medium-term risk mitigation project, it will be necessary to import Gas, *inter alia*, in the form of Liquefied Natural Gas (LNG) or Compressed Natural Gas (CNG). As a consequence,

the Gas to Power Programme could be designed as a potential means to catalyse the importation of such Gas.

The proposed gas to power plant is aligned with the Gas to Power Programme and the development of the gas sector in South Africa. It is expected to generate up to 400MW and will thus make a contribution to the 8.9GW of other generation sources required by 2030 as defined in the IRP.

2.2 Provincial Policy and Planning Context

2.2.1. KZN Provincial Growth and Development Strategy (PGDS) 2011-2030 (Version 29.2- September 2013)

The Provincial Growth and Development Plan (PGDP) for KZN addresses the triple challenge of poverty, inequality and unemployment. The KZN provincial government's vision is for the province to maximize its position as a gateway to South and Southern Africa, as well as its human and natural resources to create a safe, healthy and sustainable environment by 2030; eliminating poverty, inequality, unemployment and the current disease burden in the province. Through the seven strategic goals the KZN PGDS aims to achieve its vision by 2030, including:

» Job creation (expanded and sustained economic output is the fundamental driver for job creation)
» Human resource development (he human resource capacity of KZN is relevant and responsive to the growth and development needs of the province)
» Human and community development (reduce poverty and inequality in KZN)
» Strategic infrastructure (strategic infrastructure provides for social and economic growth and development needs of KZN)
» Environmental sustainability (reduce global greenhouse gas emissions and create social-ecological capacity to adapt to climate change)
» Governance and policy (effective and efficient government systems)
» Spatial equity (increased spatial access to goods and services)

The proposed development will result in the creation of job opportunities, human resource development, and strategic infrastructure for social and economic growth which will contribute towards reducing poverty and inequality in KZN. This development will therefore assist the province in achieving the aims of the PGDS to some extent.

2.2.2. KZN Department of Economic Development and Tourism Strategic Plan 2013/14- 2017/18

The strategic focus for the KZN DEDT during the 2013/14 – 2017/18 planning period will be building a resilient KZN provincial economy that can respond to global factors,

stimulating provincial economic development, alignment of functions and purpose of all economic development entities as well as building a vibrant organisation. The vision of the strategic plan is 'leading the attainment of inclusive growth for job creation and economic sustenance.' The mission of the strategic plan is to 1) develop and implement strategies that drive economic growth; 2) be a catalyst for economic transformation and development; 3) provide leadership and facilitate integrated economic planning and development; and 4) create a favourable environment for investment. The main objectives of the strategy that relate to the proposed project are as follows:

» To facilitate creation of new markets;
» To drive growth of the KZN provincial economy;
» To enhance sector and industrial development through Trade, Investment and Exports Logistics, ICT, Manufacturing, Green economy, agri-business, Tourism, Creative Industries, Maritime, Aerotropolis, Aviation;
» To investigate and develop viable alternative energy generation options.

The proposed development will drive economic growth, infrastructural transformation and development and the area is seen as a favourable area for investment and development.

2.2.3. KwaZulu Natal Provincial Spatial Development Framework (PSDF)

The KZN Provincial Spatial Development Strategy has been developed in order to achieve the goals and objectives of the PGDS in a targeted and spatial co-ordinated manner. Spatially, it is vital to consider general accessibility as a cross-cutting variable which impacts all three pillars of sustainable development and as a result the four main spatial variables informing the provincial spatial development framework include:

» *Environmental Sensitivity:* According to the environmental constraints map, the study area is located in an area that's been transformed and is not located in any Biodiversity Priority areas
» *Economic Potential:* Key economic sectors include Agriculture, Industry, Tourism and Service Sector. The current general distribution of high potential agricultural land has the potential to increase its contribution to the provincial economy. The potential for industrial development in the province is anchored by the nodes of eThekwini and uMhlathuze. The primary tourism potential within the province is in the beach tourism cultural tourism and eco-tourism markets. The areas of national tourism importance within the province are the Southern Zululand and Dolphin Coast, the Elephant Coast and surrounds, the greater Pietermaritzburg and Durban region, and the Drakensberg region. The service sector is the largest sector in the provincial economy, contributing 52.8% to GGP. Based on all the key economic sectors, the economic potential in the study area is medium-high.
» *Social Need:* uMhlathuze was identified as one of the core areas where concentrated high densities of more than 451 persons per square kilometre were recorded. The ULM was not indicated as one of the Local Municipalities with notable concentrations of

significantly high dependency ratios. The Social Needs composite map demonstrates that the study area where the proposed site is located has low social needs.

» *Urban Accessibility:* The areas where limited urban accessibility occurred were classified as areas with a high need for intervention as regional accessibility is viewed as the first step towards spatial integration of these marginalised areas into the provincial economy. The study area has significant urban accessibility.

The PSDF spatial variables were considered collectively and a ranking order to key elements used to formulate a composite Provincial Spatial Development Framework which identifies Broad Provincial Spatial Planning Categories such as:

» Conservation Corridors
» Biodiversity Priority Areas
» Areas of Economic Value adding
» Areas of Economic support
» Areas of Agricultural Development
» Areas of High Social Need
» Mandated Service Delivery Areas

The study area is located within the Areas of Economic Value Adding and Areas of Economic Support. Areas of Economic Value Adding is the key economic centres and areas where all of the variety of economic sectors (Agriculture, Tourism, Manufacturing, Services) are prevalent and perceived to have good potential to be further expanded on. These areas are visibly linked to high accessibility areas with existing bulk infrastructure and relatively high population densities which would both contribute to the economic expansion and benefit from interventions in these areas. Due to these factors, further economic processing and value adding at a provincial level, are mainly proposed within these identified areas. Areas of Economic Support resemble a region of good economic potential in more than just one of the key provincial economic sectors. Typical interventions in these areas would include economic prioritisation of development, labour force interventions (e.g. skills development), key economic infrastructure investment and area promotion. The proposed development will contribute towards economic value, economic support and economic growth in the area.

2.2.4. KwaZulu Natal Climate Change Response and Sustainable Development Plan

In September 2012, the KwaZulu-Natal Provincial Government became the first provincial government to establish a Climate Change and Sustainable Development Council, which boosts multi-stakeholder membership (http://www.theclimategroup.org/who-we-are/our-members/the-province-of-kwazulu-natal). The Council has set up three Working Groups, namely Policy and Regulatory Alignment Working Group; Adaptation and Mitigation Working Group and Renewable Energy Working Group.

The province is in the early stages of developing the Climate Change Response and Sustainable Development Plan which is guided by, among others, the national strategy and the KwaZulu-Natal Growth and Development Strategy which has among its goals environmental sustainability as well as:

» Provision of 100% energy access in KZN Province by 2030, i.e., an additional 600,000 households or some 3 million people.
» Implementation of a number of significant renewable energy and energy efficiency projects.
» Establishment of renewable energy manufacturing hubs, a localisation initiative.

2.3 Local Policy and Planning Context

The strategic policies at the district and local level have similar objectives for the respective areas, namely to accelerate economic growth, create jobs, uplift communities and alleviate poverty. The proposed development is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

2.3.1. uThungulu District Municipality (UDM) Integrated Development Plan (IDP) (2012/2013-2014/2015)

The vision for uThungulu was developed within the context of the international, national and provincial environment. The vision of the UDM is as follows: "An economically viable district with effective infrastructure that supports job creation through economic growth, rural development and promoting of our heritage." The mission of UDM is to create a prosperous district through:

» Rural development, agrarian reform and food security,
» Creating economic growth and decent job opportunities,
» Fighting crime and corruption,
» Promoting quality education for all,
» Improving the quality of health,
» Community participation, nation building and good governance

The UDM core values include integrity, transparency, commitment, co-operation, innovation and accountability. The UDM goals include:

» Municipal Transformation and Institutional Development
» Basic Service Delivery and Infrastructure Development (one of the objectives is to facilitate renewable energy programmes)
» Local Economic Development (Objectives: promote job creation, capacitate SMMEs and local entrepreneurs)
» Municipal Financial Viability and Management
» Cross cutting

The district with the support of its social partners like COGTA is currently implementing innovative renewable and clean energy projects. The most notable projects in UDM are the Biogas and Wonderpot projects. Funding for these projects has been secured from the Cooperative Governance and Traditional Affairs (COGTA) and efforts to secure more funding will be intensified due to the success of the pilot projects.

Local Economic Development opportunities that will promote job creation are one of the key strategic objectives of the district municipality. In terms of infrastructure development one of the objectives is to facilitate renewable energy programmes. The proposed development will provide green energy opportunities for the area as well stimulate local economic growth through job creations, diversifying the local industry and skills development which is in line with the IDP.

2.3.2. uThungulu District Municipality (UDM) Spatial Development Framework (SDF) (2012)

According to the 2010 Global Insight Statistics, it is noted that the vast majority of economic performance (41.8%) in the district is vested in uMhlathuze Local Municipality with its primary urban centres being Richards Bay and Empangeni. This area is the third most important in the province of KZN in terms of economic production and contributes 9.1% of the total GGP1 and 8.5% of the total employment (formal and informal) in 2010. The uMhlathuze Municipality, although it has the smallest comparative size, accounts for nearly half of the population of the uThungulu District. The most significant population growth is noted in the uMhlathuze and Mthonjaneni Local Municipalities. A large and growing population will necessarily place increased pressure on the provision of infrastructure, i.e. water, sanitation, electricity and housing. Apart from engineering infrastructure, pressures will also increase for the provision of social infrastructure and economic development will have to be fostered to ensure households and individuals become and remain self-sufficient. Such a large population does also present an opportunity of development in the form of a large potential work force that has the ability to create and support economic opportunities.

Richards Bay, Msunduzi, Newcastle and Port Shepstone has been identified as provincial Secondary Nodes and thus urban centres with good existing economic development and the potential for growth and services to the regional economy. Key strategic interventions specifically targeted at these nodes include:

» Primary Economic Growth Area
» Priority Socio-Economic Development Spending
» Promote as Primary Node in support of Corridor Development
» Promote Compact Urban Development & Combat Urban Sprawl
» Promote Focused Investment & Managed Growth
» Promote Densification (Brown Agenda) and Infill Development

» Provide Economies of Scale for Effective & Affordable Service Delivery
» Infill where High Levels of Services are Available (Restructuring Nodes)
» Increased Residential Density (number of dwellings)
» Promote provision of sufficient Bulk Infrastructure Services (Demand & Supply)
» Priority spending on Infrastructural Upgrading Needs (New & Maintain)
» Promote Effective & Efficient Public Transportation Systems linked to Multi Modal Facilities
» Single Land Use Management System (Township Formalization)

The SDF states that a major economic sector is manufacturing which is located in Richards Bay. It is important to continue enforcing investor confidence through the provision of infrastructure. Also states the need to encourage alternative energy use in future developments given constraints in the electrification industry is critical. The uThungulu Environmental Concerns include, air pollution, loss of valuable agricultural land for food production and loss of biodiversity.

The SDF states the need to encourage alternative energy use in future developments given constraints in the electrification industry is critical; the proposed development will provide an alternative energy source for the national grid and contribute towards diversifying the local industry. Currently the district has a large and growing population that places increased pressure on the provision of infrastructure and services. It is therefore important that the majority of the labour for the project be sourced from within the local area as bringing in a non-local work force could further strain the existing infrastructure and services. Richards Bay has been identified as provincial Secondary Nodes and thus urban centres with good existing economic development and the potential for growth and services to the regional economy. The proposed development is located within the secondary node in Richards Bay and would contribute towards economic growth and alternative energy supply.

2.3.3. uMhlathuze Local Municipality (ULM) Integrated Development Plan (IDP) (2012-2017)

The ULM provides a reference point and essential socio- economic amenities and facilities to most of the towns in the northern region. Challenges facing the municipality include economic recovery placing huge strain on the municipality financial sustainability and the attraction of economic investment in the town, as well as rural development, employment, affordable housing, and maintenance of infrastructure and health issues. The Local government has the following objectives:

» Provide democratic and accountable government;
» Provision of Services to the community in a sustainable manner;
» Promote Social and Economic Development;
» Promote safe and healthy environment; and
» Encourage the involvement

Priority needs for budget purposes in the local municipality include the upgrade of rural roads, poverty/ job creation, housing, crime, provision of electricity, sanitation and water. The following key issues were identified within the situational analysis:

- Sustainable financial management: new approaches to risk and growth need to be created to sustain financial stability.
- Cash Flow Management
- Low levels of skills development and literacy
- Limited access to basic household and community services
- High rates if unemployment and low economic growth
- High levels of poverty
- Limited access to basic household and community services
- Unsustainable development practices: The Municipality faces a challenge of reacting to urban sprawl, which, in turn, results in increased informal settlement, overcrowded schools, ill health, marked spatial disparities, higher cost of providing infrastructure and services, disturbed ecosystems and environmental resources, changes in air quality, change in aesthetics and urban form, as well as loss of land for economic and agricultural services (ULM IDP, 2012-2017).
- Ensuring adequate energy and water supply: The unsustainable use of resources such as energy and water has major impacts on the environment, and will ultimately compromise the Municipality's energy security, as well as its ability to deliver water of adequate quality and quantity to its citizens. In the case of water, whole catchment management (including areas that fall outside of the municipal area) as well as efficient nature conservation programmes will help to ensure that there is an adequate supply of clean water. The most sustainable solution to the energy crisis is to reduce the demand for energy and at the same time investigate alternative renewable energy sources.
- High levels of crime and risk
- Increased incidents of HIV/AIDS and communicable diseases
- Infrastructure degradation: Degradation has become a critical social problem. It is therefore critical that the Municipality works towards managing its assets, work towards mitigating climate change, ensure life cycle management of infrastructure, thus ensuring value for money.
- Climate Change: Escalating greenhouse gas emissions contribute towards climate change and will ultimately impact on human health, food security, natural resources, sea level rise, land loss and coastal infrastructure. As such climate change runs the risk of undoing all of the development gains of the last one and a half decades, and for a city such as Durban climate change adaptation in all sectors will have to become one of the Municipality's top development priorities.

The vision of the ULM is 'offering improved quality of life for all its citizens through sustainable development.' The uMhlathuze's development strategies include the following:

» Development strategy 1: Good governance
» Development strategy 2: Infrastructure and services provision
» Development Strategy 3: Social and economic development (Objectives: to create opportunities through economic growth and development to increase economic stability by creating new functional linkages with other economic activities through enhancing a prudent and efficient use of social and economic infrastructure to meet future demands. To promote social cohesion and the creation of a safe and healthy living environment)
» Development Strategy 4: Institutional Development
» Development Strategy 5: Sound Financial Management

Key issues of the ULM include climate change, low levels of skills development and literacy, high rates if unemployment, low economic growth and high levels of poverty. The proposed development will contribute towards local economic development and job creation, therefore marginally reducing the unemployment rate/ poverty level during the temporary construction phase as well as during the operation phase of the proposed project. It will contribute towards economic development in the local municipality which will in turn support economic growth and provide employment opportunities which is in line with strategy 3 of the IDP.

2.3.4. uMhlathuze Spatial Development Framework (2007)

As part of the SDF, four (4) spatial development goals were identified. These include:

» Promote Sustainable urban Development
» Environmental management and Conservation
» Promote Economic Development (Permitting and encouraging diverse land uses at appropriate locations to develop the economy. Boosting those economic sectors/activities that have the potential to grow and create employment and income.)
» Provision of a minimum Level of Service (LOS) to all (New developments should, as far as possible, be serviced by existing infrastructure networks. Indicate where infrastructure investment is needed to provide minimum levels of services.)

The following elements that have a significant impact on the spatial development include:

» Proposed expansion of the Richards Bay Port - the proposed expansion of the Richards Bay Port is driven by external forces. The implementation of the Port Expansion proposals has a significant implication on the spatial form and structuring of the municipal area.
» Air Quality - dangerous emissions in the Richards Bay area (taking into account anticipated emissions from TATA Steel and Pulp Unite) cannot continue to increase. Based on current emissions, the air has virtually reached its limit. Significant portions of Richards Bay fall within a health risk area.
» Environmental conservation and linkage zones.

» Geotechnical stability.
» Availability of Bulk Infrastructure.
» Access to land.

One of the main outcomes of the uMhlathuze SDF is the identification of potential expansion areas. Also, the SDF considers a number of growth scenarios for the municipal area based on recorded growth over the last few years. The proposed development falls in line with the spatial development goals as the development will contribute towards sustainable urban development as well as it will promote economic development.

2.3.5. Environmental Management Framework (EMF) for Richards Bay Port Expansion Area and Industrial Development Zone (IDZ) (2011)

The Environmental Management Framework (EMF) was prepared for an area of about 25 000 hectares within the City of uMhlathuze informed mainly by the Port of Richards Bay (and its proposed expansion) as well as the then IDZ area to guide decision making in the area. The EMF essentially identified a number of Environmental Management Zones. Eight such zones were identified and a ninth zone was created as an overlay to address issues of conflicting and long-term land use proposals. The following environmental management zones were identified during the process:

» Zone 1: Lakes and Corridors
» Zone 2: Floodplain
» Zone 3: Port, Estuary, Marine and Seashore Area
» Zone 4: Dune Cordon
» Zone 5: Coastal Plain Residential Area
» Zone 6: Coastal Plan Subsistence Farming Area
» Zone 7: Coastal Plain Commercial-Industrial Area
» Zone 8: External Linkages
» Zone 9: Strategic Development Management Overlay Zone

The proposed development is located within the RBIDZ Zone 1F. Phase 1F of the IDZ falls within the Coastal Plain Commercial-Industrial Area Zone (Zone 7 of the EMF). Zone 7 represents fairly flat land on the sandy coastal plain. It is used primarily for light and heavy industrial purposes, business and commerce, and forms the economic hub of the municipality. The EMF Zone 7 objective is 'To promote sustainable commercial and industrial development that is able to secure ecosystem productivity over the long-term.'

» Environmental management priorities in Zone 7:
    1. Use of space
    2. Critical ecological assets and linkages (grasslands and wetlands)
    3. Integrated water resources management (alternative supply options, demand side measures, water quality, storm water management)

4. Sustainable consumption and production patterns (energy, air quality, waste management)
5. Industrial and commercial development
6. Port expansion potential
7. Integrated industrial development planning
8. Institutional arrangements for achieving conservation priorities
9. Landscape risks
10. Climate change

» Activities encouraged in Zone 7:
  * Industrial development that is directly related to and/or dependent on the port.
  * Activities such as techno-park industries (e.g. electronic components and assembly plants).
  * Energy-saving industries, such as solar water heater manufacturing.
  * Labour-intensive activities.
  * Development that promotes local entrepreneurship.
» Activities discouraged in Zone 7:
  - Large manufacturing facilities which may aggravate the air quality situation.
  - Resource intensive primary industries such as refineries and smelters.
  - Encroachment into open spaces.
  - Groundwater abstraction.

The land in Phase 1F is largely transformed. Tata Steel is located in this zone. High levels of degradation are prevalent of all the vegetation types that occur in this phase. Constraints for development include wetland and ecological linkages, water and air quality, and uncertainty about long-term energy and water supply. Opportunities exist to develop the area as long as the EMF guidelines are followed. The EMF must be therefore consulted when decisions are made.

» Activities encouraged in phase 1F:
  * Manufacturing activities that create backward linkages, such as assembling for electronic components and automotive parts.
  * Activities like chemical storage and blending.
  * IDZ enterprises that will advance the objectives of the EMF.
» Activities discouraged in phase 1F:
  * Encroachment of development into conservation amenity areas.
  * Large industrial activities such as refineries, smelters, pulp and paper mills.
  * Industries that demand large quantities of water.
  * Activities with high energy demand.

Conservation priorities of wetlands and ecological linkages in Phase 1F must be protected, maintained and managed as a contribution to the management of water quality by:

» Discouraging encroachment of development into and/or near wetlands.

» Delineating appropriate ecological buffers in accordance with the land development types.
» Discouraging reclamation or infilling of wetlands except if a no net loss policy is followed, if suitable offset receiving sites can be identified and if appropriate arrangement could be made to manage and monitor such arrangements.
» Preventing the illegal dumping of waste into water features and storm water gutters.
» Ensuring that activities which pose a risk of water contamination employ appropriate design measures to avoid and minimise this risk.

In terms of consumption and production there is severe air quality constraints associated with phase 1F. There are also uncertainties in respect of sustainable supply of water and energy, and the area's waste infrastructure in general is unable to accommodate potential future waste streams. Any development in Phase 1F must take cognisance of the air quality constraints and the potential impact and consequences development may have on the health of adjacent communities. Development in this zone must also take cognisance of the prevailing water demand and the integrated water resources management approach of the study area, and ensure that appropriate demand side management measures is implemented. The same applies to the energy constraints that currently prevail in the area. To ensure that land use in this area does not result in erosion and pollution appropriate storm water management is critical. Appropriate development must be promoted in this Phase to protect atmospheric integrity and air quality and to ensure sustainable consumption and production patterns.

Development priorities: The land in Phase 1F is zoned as general industrial. The 2005 IDZ Designation Notice promoted the area for "a Ferro-Metals Cluster as well as RHI Refractories". The Tata Steel Ferrochrome Smelter was subsequently established in this phase. There is still space to advance industrial development but the prevailing environmental constraints on these sites may limit the extent to which this potential could be realised. The IDZ objectives must be promoted in this phase but this must take cognisance of the environmental constraints outlined above.

2.4 Conclusion

The findings of the review of the relevant policies and documents pertaining to the energy sector indicate that the gas to power plant is supported at a national, provincial, and local level as it illustrates demonstrable alignment with the policies, plans, acts, and frameworks, and that the proposed gas to power plant will contribute towards the various targets, aims and objectives.

OVERVIEW OF THE PROPOSED PROJECT CHAPTER 3

In terms of the EIA Regulations (2014), when considering an application, the relevant competent authority must take a number of factors into consideration, including the need for, and desirability of the activity in context of the preferred location. The need and desirability of this project is discussed below including strategic plans, frameworks and policies applicable to the area and project. Chapter 2 provided, in detail, the strategic context for energy planning in South Africa, and therefore the reader is referred to Chapter 2 for this detail.

This chapter also provides an overview of the proposed gas to power plant and details the project scope which includes the planning/design, construction, operation and decommissioning activities. It looks at alternatives including site and technology alternatives as well as the 'do nothing' option.

3.1. Need and Desirability for the Proposed Gas to Power Plant

3.1.1. Need for the proposed activity from a Strategic Energy Planning Perspective

The Integrated Resource Plan (IRP) 2010-2030 developed by the Department of Energy (DoE) projected that an additional capacity of up to 56 539MW of generation capacity will be required to support the country's economic development and ensure adequate reserves over the next twenty years. The required expansion serves as both replacement for existing generation capacity due to reach "End of Life" during the period to 2030 (at present, the average baseload generation fleet age is 34 Years, with a life expectancy of 50 years), as well as add additional generation capacity for future economic growth. The findings of the review of the relevant policies and documents pertaining to the energy sector detailed in Chapter 2 of this report indicate that the gas to power plant is supported at a national, provincial, and local level as it illustrates demonstrable alignment with the current policies, plans, Acts, and frameworks in place, and that the proposed gas to power plant will contribute towards the various targets, aims and objectives (long, medium and short-term) in an environmental, social and economic context.

3.1.2 Need for the proposed activity from an Energy Supply Perspective

i) National Energy Needs

South Africa is a country with an economy dependent on coal for approximately 90% of its electricity. The demand for electricity in South Africa has grown, on average, at more than 4% over the past few years, with a simultaneous reduction in the surplus generating

capacity due to limited commissioning of new generation facilities and the increased maintenance required for the aging baseload generators, whom have an average age of 34 years (Eskom Investor Presentation, 2015), with a life expectancy of 50 years. Although the electricity demand shows a slight negative trend over the recent past, the maximum demand, together with the greater need for maintenance of existing power plants, has put the available power supply under pressure. In spite of capacity coming on line in the near future (as a result of the commissioning of Medupi Power Station near Lephalale, and a number of renewable energy projects across the country), the margin between electricity demand and available capacity remains undesirable from a reliability perspective.

In response to the need for additional electricity supply to the national grid, and the goal of Government to procure electricity from different sources supplied by IPPs, as detailed in the IRP 2010, Richards Bay Gas Power 2 (Pty) Ltd is proposing the construction of a gas to power plant

ii) Local Energy Needs

The Richards Bay IDZ Zone 1F was established to attract manufacturing and beneficiation industries. These include Titanium and Chemical manufacturing, for example, each of which would benefit from the availability of natural gas to augment the use of electricity as part of their manufacturing processes. Also incorporated within the RBIDZ 1F is an existing chrome smelter. In addition, these industries are energy intensive, and having reliable local power available would reduce the losses associated with electricity transmission from inland coal-fired power stations, which in turn, will reduce emissions for South Africa as the country aims to transition to a cleaner economy (discussed further in section 3.1.3 below).

3.1.3 Need for the proposed activity from a Climate Change Perspective

South Africa is a country with an economy dependent on coal for the majority of its electricity, an energy-intensive industrial sector and an energy sector responsible for 82% of total GHG emissions, making it the 12th highest world emitter of GHG[13]. Adding to the challenge is the need to address energy poverty, which manifests in the lack of access to affordable, adequate, reliable, safe and environmentally benign energy services. At the same time, economic growth is needed for development, in order to create employment. Traditionally economic growth has implied the increased use of finite resources and increased energy use. However, energy also has the potential to act as an engine of inclusive and sustainable growth. This is why moving towards a sustainable and low-carbon approach[14] is a priority, and tracking energy consumption is essential to

[13] Greenhouse Gas Inventory for South Africa: 2000-2010

[14] Sustainable energy is defined as the production and consumption of energy in ways that support social and economic development in an environmentally benign manner (UNDP, 2000).

map the transition to a lower carbon future. In this regard, the Intergovernmental Panel on Climate Change (IPCC) fifth assessment report identified cities as being major players in reducing global emissions.

The South African Government recognises the need to diversify the mix of energy generation technologies within the country and to reduce the country's reliance on fossil fuels which contribute towards climate change and are therefore not environmentally friendly. This is in accordance with the prescriptions of the United Nations Convention on Climate Change 1994 (UNFCCC) and its associated Kyoto protocol of 1997. South Africa has put in place a long term mitigation scenario (LTMS) by which the country aims to develop a plan of action which is economically viable and internationally aligned to the world effort on climate change. During this period (2003-2050) South Africa will aim to take action to mitigate greenhouse gas emissions by 30% - 40% by the year 2050. This is a reduction of between 9 000 and 17 500 tons of CO_2 by 2050. Consequently, the South African Government has recognised the need to move towards cleaner energy and has therefore set targets for cleaner energy technologies (including renewable energy and gas) by 2030 (IRP, 2011).

In December 2015, the Paris Agreement was launched, with a long-term objective of the agreement to make sure global warming stays "well below" 2 degrees Celsius (3.6 degrees Fahrenheit) and to "pursue efforts" to limit the temperature rise to 1.5 degrees Celsius (2.7 degrees Fahrenheit). To achieve that goal, governments pledged to stop the rise in heat-trapping greenhouse gas emissions "as soon as possible". By some point after 2050, the agreement says, man-made emissions should be reduced to a level that forests and oceans can absorb. In order to reach the long-term goal, countries, including South Africa, agreed to set national targets for reducing greenhouse gas emissions every five (5) years. More than 180 countries have already submitted targets for the first cycle beginning in 2020. Only developed countries are expected to slash their emissions in absolute terms; developing nations (such as South Africa) are encouraged to do so as their capabilities evolve over time. Until then, they are expected only to rein in the growth of emissions as their economies develop.

The proposed gas to power plant will assist in reducing the country's CO_2 emissions associated with energy supply relative to other fossil fuels (e.g. coal). From a climate change perspective, the benefits arising from the use of natural gas as a source of energy instead of coal include:

- Reduced carbon dioxide emissions relative to equivalent energy from other fossil fuels;
- Lower particulate emissions relative to coal;
- High energy efficiency in combined-cycle applications;
- Negligible sulphur content in regional deposits; and

» Gas-fired generation plants require less space than conventional coal-fired plants of the same capacity[15].

3.1.4 Desirability for the proposed activity at the current proposed location

The gas to power plant and associated infrastructure is proposed to be located on erven 17455, 17443 and 17442 within the Richards Bay Industrial Development Zone (IDZ), Phase 1F. Phase 1F of the IDZ falls within the Coastal Plain Commercial-Industrial Area Zone (Zone 7 of the EMF). Zone 7 represents fairly flat land on the sandy coastal plain. The land in Phase 1F is zoned as IDZ Industrial. Therefore it is used primarily for light and heavy industrial purposes, business and commerce, and forms the economic hub of the municipality. The 2005 IDZ Designation Notice promoted the area for "a Ferro-Metals Cluster as well as RHI Refractories". The Tata Steel Ferrochrome Smelter was subsequently incorporated within in this phase. There is still space to advance industrial development but the prevailing environmental constraints (such as groundwater considerations) on these sites may limit the extent to which this potential could be realised.

According to the Nemai Consulting EIA Report (2015), the RBIDZ is intended to promote the competitiveness of the manufacturing sector and to encourage beneficiation of locally available resources. Its objectives include the following:

» Develop and establish a purpose built world-class industrial park incorporating a delimited Customs Controlled Area and linked to the Richards Bay International Port;
» Provide quality infrastructure including ICT and transport infrastructure, business and utility services;
» Attract foreign and local investment projects which:-
  * create jobs
  * export led
  * sustainable
» Make arrangements for and mobilise financial, human and other resources for the development of the RBIDZ; and
» Promote, foster and mentor BEE and SMME business opportunities in and around the zone.

According to Nemai Consulting, 2015, protected vegetation within the RBIDZ will be identified at the pegging out phase, and removed under applicable governmental licences, in close liaison with Contractor and Employer environmental teams. The site will be cleared and each tenant will develop their respective stands for industrial purposes.

[15] White Paper on Energy Policy, 1998

Due to the nature of the development (i.e. a gas to power station), the location of the project is largely dependent on technical factors such as the extent and access of the site, available grid connection and available fuel supply. The proposed site was identified by the project developer as being technically feasible and, given its attributes, is also thought to be commercially feasible i.e. able to offer electricity within the Gas IPP procurement programme at a highly competitive tariff, with industries located within the RBIDZ as the main target market. One other important factor that supports the desirability of the proposed project is the need for cleaner energy sources in a city that is one of the major contributors to the country's emissions.

Site extent and access: The erven on which the proposed facility is planned have been allocated to the developer by the RBIDZ for this purpose. Therefore, the siting of the facility has been predetermined through the IDZ planning process, and no feasible siting alternatives within the RBIDZ exist. The extent of the allocated site is adequate for the development of the gas to power plant, which requires 7.3ha of the 7.45ha available. The study site is accessible via already authorised and established access roads within the RBIDZ Phase 1F.

Grid connection: The existing Indus Substation is located on the boundary of the site and has capacity to accommodate the 400MW (i.e. 300MW fuel/ gas generated and 100MW heat/ steam) to be generated from the power plant.

Gas Supply: The Richards Bay Port has been identified by the DoE for Gas and Gas-to-Power enablement. Environmental studies are currently underway to facilitate the import of Liquefied Natural Gas (LNG) to allow for the development of medium- to long-term gas power plants at the Port of Richards Bay. Richards Bay Gas Power 2 (Pty) Ltd will purchase LNG from various international and local LNG suppliers once that project is completed[16].

In addition, Richards Bay has direct access to the only existing gas transmission infrastructure, the Transnet Lilly[17] gas pipeline, in South Africa. This pipeline is currently fed by Syn-Gas produced by SASOL as a by-product of their Coal to Liquid process. There is however limited quantities of gas available, limiting the wider use of gas as a substitute for coal generated electricity. With a gas to power plant as an anchor off-taker for natural gas (imported, as there is currently no domestic natural gas available), many other industries and domestic users can benefit from the economies of scale.

[16] It is the intention of Richards Bay Gas Power 2 (Pty) Ltd to purchase diesel and LPG for Phase 1, in the interim, whilst the LNG import project is being established.

[17] This pipeline will be used as the secondary option should, for any unforeseen reason, the LNG import project not proceed. In this regard, Richards Bay Gas Power 2 (Pty) Ltd will undertake all the required studies to construct a pipeline from its site to connect to the Transnet Lily gas pipeline.

Agricultural considerations: The land comprising the site is zoned as IDZ Industrial and therefore has no agricultural merit. The development of the gas to power plant will have no impact on the agricultural potential.

Richards Bay electricity consumption: Richards Bay consumes nearly 8% of all power generated in South Africa, yet the nearest coal-fired power station is more than 500km away. Richards Bay, therefore, is a major contributor to national emissions, ranking number two in South Africa (refer to Figure 3.1). By transitioning to locally-produced cleaner energy, such as natural gas, Richards Bay would significantly reduce its emissions impact.

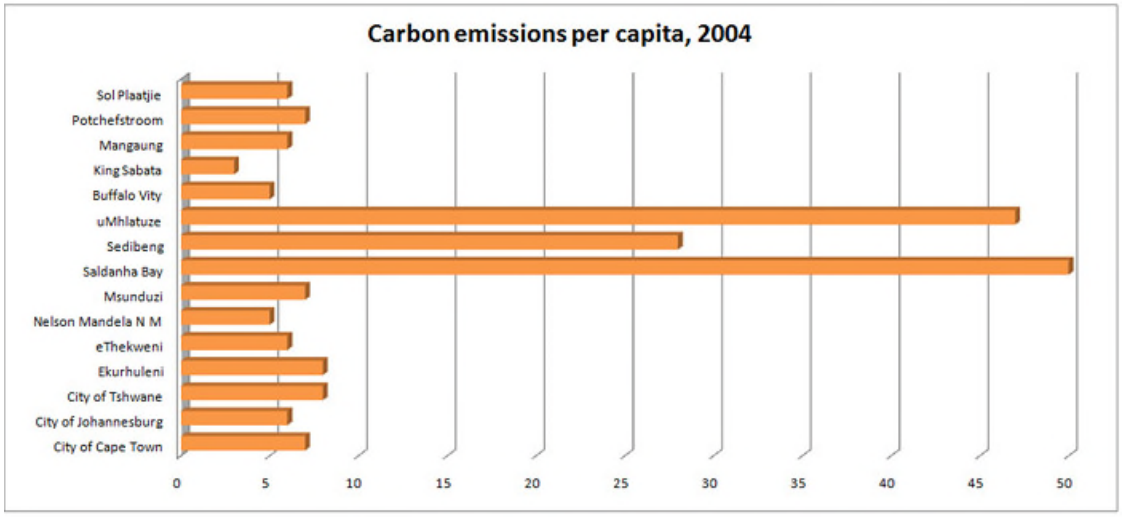

Figure 3.1: Carbon Emissions per capita, 2004 (Source: http://www.genesis-eco.co.za/sustainable-energy-system.php)

3.1.5 Benefits of Gas to Power Plants as an energy source

The generation of electricity from LNG and NG offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

Increased energy security: The electricity crisis experienced in South Africa in 2015 highlights the significant role that fuel diversification in the South African energy mix can play in terms of power supplementation. In addition, given that the proposed gas to power plant can be constructed in a short timeframe and connect directly to the national grid, it offers the opportunity for improving grid strength and supply quality in the short-term, while reducing expensive distribution losses.

Pollution reduction: The proposed gas to power plant will result in a decreased dependency on coal as the main energy source. As an economy that is dependent on coal for ~90% of its electricity and is the 12th highest world emitter of GHG, it is critical that South Africa moves towards a sustainable and low-carbon approach. The use of LNG/ NG for energy production results in reduced carbon dioxide emissions relative to

equivalent energy from other fossil fuels and lower particulate emissions relative to coal during its operation.

Support for international agreements: The effective deployment of cleaner alternative energy sources such as LNG and NG provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol and the COP21 agreement in terms of reduction of CO_2 emissions, and for cementing its status as a leading player within the international community.

Employment creation: The development, procurement, installation, maintenance and management of the proposed gas to power plant will have potential for job creation and skills development in the Richards Bay area.

Acceptability to society: The use of LNG and NG for the production of energy offers a number of tangible benefits to society including reduced pollution concerns and improved human and ecosystem health when compared to coal-based energy production. In addition, gas to power plants require less space than conventional coal-fired plants of the same capacity.

Support to a new industry sector: The development of gas to power plants offers the opportunity to establish and grow a new industry within the South African economy, which will create jobs and skill local communities which have potential for further gas to power projects. In addition, this industry will further grow the downstream gas economy where industry can transition from coal-generated power to gas for thermal industrial processes.

Protecting the natural foundations of life for future generations: Actions to reduce a disproportionate carbon footprint can play an important part in preventing dangerous anthropogenic impacts which have been linked to climate change, thereby securing the natural foundations of life for generations to come. This is the basis of sustainable development.

3.2. Project and Site Description

The proposed project entails the development of a gas to power plant on a site located in the Richards Bay IDZ: Phase 1F within the uMhlathuze Local Municipality, which falls under the jurisdiction of the uThungulu District Municipality in Kwazulu-Natal. The site has been zoned for IDZ Industrial development as part of the planning for this IDZ area. The project aims to provide electricity from an alternative energy source for input to the national grid.

The proposed plant net output, at International Standards Organisation (ISO) Reference Conditions, is expected to be up to 400 MW, to be developed in two (2) phases to operate with liquid fuel such as diesel and/ or Liquefied Petroleum Gas (LPG) in Phase 1 and

ultimately Liquid Natural Gas (LNG) or Natural Gas in Phase 2 of the development. It is anticipated that 300MW will be fuel/ gas generated energy and 100MW will be heat/ steam generated energy. The power plant could operate at base load or mid-merit, depending on the requirements of the DoE and Eskom. Within the 400MW limit, the proposed plant will comprise up to six (6) gas turbine units, each capable of producing in the range of up to 60 MW of electrical power (ISO rating), depending on the manufacturer selected.

While various generation technologies are being considered, it is most likely that combined cycle gas turbines (CCGTs) will be used to generate electricity. A CCGT power plant combines the procedures of both a gas turbine and a steam power plant. In the first stage the turbine compresses air and mixes it with fuel that is heated to a very high temperature. The hot air-fuel mixture moves through the gas turbine blades, making them spin. The fast-spinning turbine drives a generator that converts a portion of the spinning energy into electricity. In the second stage, a Heat Recovery Steam Generator (HRSG) captures exhaust heat from the gas turbine that would otherwise escape through the exhaust stack. The HRSG creates steam from this heat and delivers it to the steam turbine. The steam turbine sends its energy to the generator drive shaft, where it is converted into additional electricity. The process is shown schematically in Figure 3.2. The gas turbine is one of the most efficient technologies available, for converting gas fuels to mechanical power or electricity.

The electricity generated by means of gas and steam will be injected into the Eskom 132kV distribution system, through a connection to the Eskom Indus substation bordering the site. The power plant substation to be constructed will be a 132kV substation, and will be connected to the Indus Substation via an overhead power line of approximately 300m in length. The power line will be constructed according to Eskom's design and specifications (refer to Figure 3.3 and Figure 3.4). The substation will not be staffed, although technical staff will naturally monitor, inspect and maintain it from time to time.

Two layouts /designs of the power plant could be adopted. These include a design proposed for base-load (refer to Figure 3.9 in Section 3.3.4) and Mid-merit (refer to Figure 3.10 in Section 3.3.4). The designs proposed are conceptual at this stage and the final design and layout will be the responsibility of the developer. The power plant will comprise multiple engine halls with each engine hall will typically comprise up to one engine. Stacks associated with engine halls will be up to 20m in height, similar in appearance to the one shown in Figure 3.5. The entire site boundary is approximately 7.46 ha in extent with the extent for the proposed development, including associated infrastructure, being 7.3 ha. Table 3.2 below provides details of the proposed project, including the main infrastructure and services.

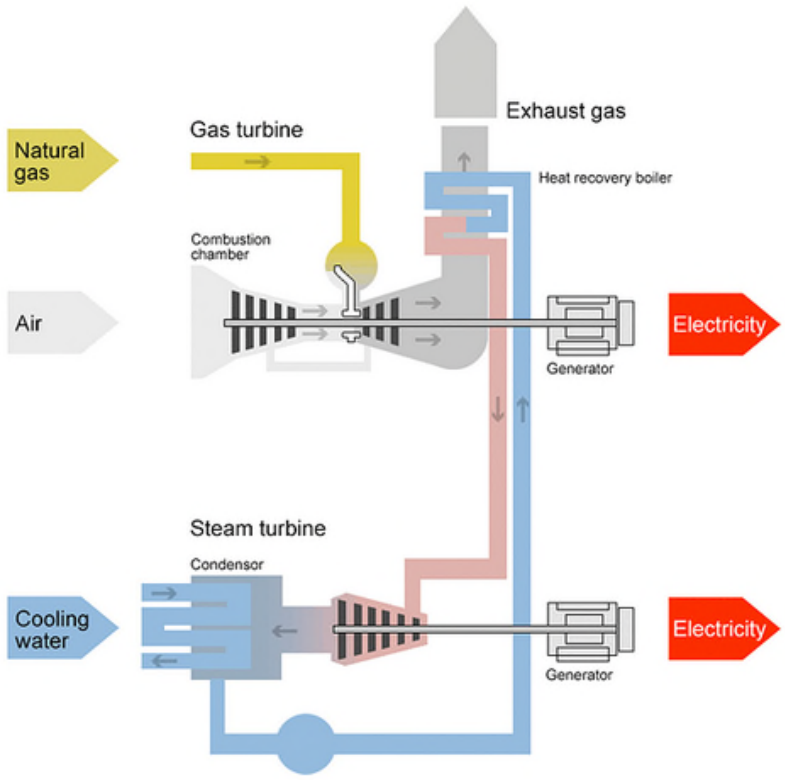

Figure 3.2: Mode of operation of CCGT power plants (Source: www.eon.com/en/business-areas/power-generation)

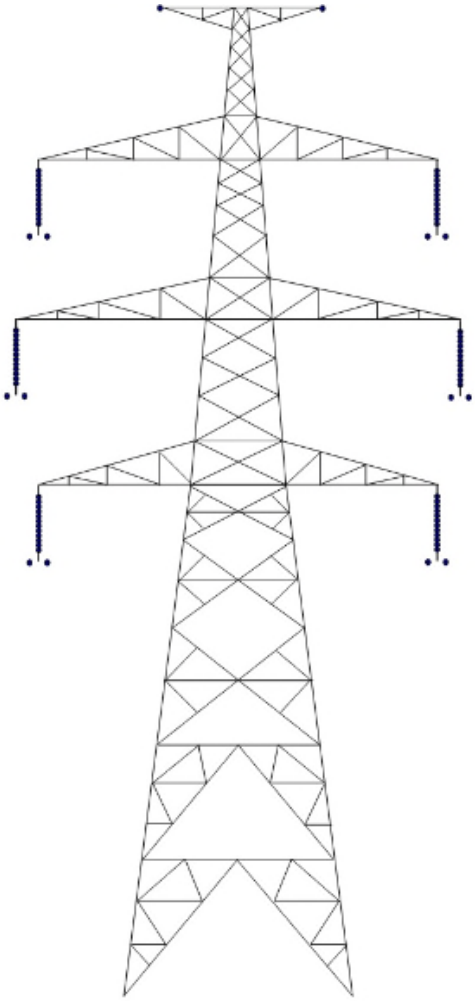

Figure 3.4: Example of an Eskom designed Lattice Tower with Double Circuits

Figure 3.5: Examples of Monopole versus Lattice Tower designs

Figure 3.6: Dedisa Peaking Power Plant in the Coega IDZ in Port Elizabeth[18] (Source: https://www.linkedin.com/company/avon-&-dedisa-peaking-power)

Table 3.2: Technical Details of the proposed project

Component	Description/ Dimensions
Location of the site	Erven 17455, 17443 and 17442 within the Richards Bay IDZ Phase 1F, KwaZulu-Natal
SG Codes	NOGVO4210000881800000 NOGVO4210000881900000 NOGVO4210000882000000
Four coordinate points for the proposed development site	32°1'31.137''E; 28°44'19.238''S 32°1'27.87''E; 28°44'24.814''S 32°1'41.779''E; 28°44'31.585''S 32°1'45.057'E; 28°44'26.176''S
Extent of the proposed development footprint (including all associated infrastructure)	7.3 ha (Refer to Appendix B for site maps).
Extent of broader site	7.46 ha
Municipal Jurisdiction	uMhlathuze Local Municipality which falls under the jurisdiction of the uThungulu District Municipality.
Proposed technology	» Up to six (6) Gas Turbines (GT) » Engines fuelled by diesel and LPG (Phase 1) and ultimately by LNG (Phase 2) » 1-2 steam turbines utilising the heat from all the engines for power production in a steam cycle. » Air cooler condensers » Dry cooling » Dry low emissions (DLE)

[18] NB: This shows a two unit installation, compared with the up to six (6) units to be installed in the Richards Bay IDZ.

Component	Description/ Dimensions
Power output capacity	300MW generated through the use of diesel /LPG (phase 1) and LNG / NG (phase 2). This is dependent on the final equipment and configuration choices. An additional 100MW[19] can be generated through combined cycle waste heat and steam turbines should the developer consider the CCGTs. The combined maximum power output is up to 400MW (this is dependent on the final equipment and configuration choices). There is no difference in the power output levels between phases 1 and 2.
Sources of the preferred fuels for Phase 1 and volumes required	» Liquid fuel (Diesel /LPG)[20] can be purchased from Durban Refinery and/ or imported internationally. The volumes required are: * 1 000 000m^3 per annum at base load * 410 000m^3 per annum at mid-merit » Gas (LNG /NG) can be purchased from international and/ or local LNG suppliers. The volumes required are: * 30 million GJ (800 000 000m^3) at base load per annum * 12.3 million GJ (326 000 000 m^3) at mid-merit per annum
Stack height	» Stacks associated with engine halls will be up to 15m in height.
Fuel storage	» Three (3) fuel tanks with a capacity of 2000m^3 each will be used as an interim fuel storage facility until the gas infrastructure is constructed by the DoE. These fuel tanks will be located within an appropriately bunded area on the site, » Two (2) fuel unloading stations will be associated with these tanks.
Site access	» The site will be accessed via existing roads within the IDZ Phase 1F (already approved through an EIA undertaken for the Phase 1F infrastructure) and internal access roads (width of up to 6m) which will be constructed.
Grid connection	» On-site substation (HV Yard) associated with the power station. » A new 132kV power line to connect to the Indus Substation bordering the site. Refer to Appendix B for site maps and coordinate points for power line and on-site substation.
Associated buildings	» Guard house, admin building, workshops and a warehouse

[19] The generation of additional power via the recovery of heat from the engines and power production thereof via steam turbines will not require additional water or fuel.

[20] In response to comments received on the draft scoping report, Light Fuel Oil (LFO) and Heavy Fuel Oil (HFO) have been excluded as fuel sources due to their high emissions.

Component	Description/ Dimensions
Services required	The proposed project will be located within the Richards Bay IDZ 1F under a long-term lease. The Zone Operator / Landlord (RBIDZ) is responsible for all services required by Richards Bay Gas Power 2 (Pty) Ltd (the tenant) under the long-term lease agreement. The RBIDZ lease agreement states: *"Undeveloped land which is to be serviced by the Landlord to include bulk water, sewer, and electrical connections and a road external to the leased premises but within the RBIDZ. The Landlord will be responsible for the development of the Property as vacant developed land with services in place to the supply points installed by the Landlord near the boundary of the Property."* In this regard, the following engineering services will be provided by the Landlord: » Water; » Sewage; » Roads; » Storm water; » Electricity; and » Refuse removal on a weekly basis by the uMhlathuze Municipality. Refer to Appendix C for a letter of confirmation for services from the Landlord.
Water Storage	» Water storage facilities will be located on site. This will include a raw water and fire water tank, demineralisation water tank and a tank for partially treated water.

It is estimated that during the construction period the construction staff complement will between ~300-400 people, with employment opportunities being provided for the local community as far as possible. The labour required includes 25% low skilled; 35% semi-skilled and a 40% skilled workforce. At the completion of the construction period all construction staff will leave the site and will be replaced by the operating staff. Up to 100 people are required for the operation phase, with up to 50% of labour to be sourced from the local community. The degree to which local labour can be used for this purpose will, however, be dependent on the skills available locally, as well as the requirement for specialist resources used by contractors.

3.2.1. Plant Consumables

The fuel types that were originally under consideration for Phase 1 of the proposed gas to power plant were diesel; Liquefied Petroleum Gas (LPG), Heavy Fuel Oil (HFO) and Light Fuel Oil (LFO). HFO and LFO were subsequently excluded, in

response to comments received on the draft scoping report, due to their high emissions. Therefore, only diesel and LPG are to be considered further.

The amount of fuel to be consumed will depend on the degree to which the plant is used (i.e. base load or mid-merit – comparison provided in Table 3.3). The maximum fuel consumption of the power plant will be approximately 1 000 000m^3 per annum at base load and 410 000m^3 per annum at mid-merit. The source of fuel is expected to be the fuel depot(s) located at Durban Refinery. Alternatively, fuel can be purchased from international suppliers. Fuel purchased locally will be supplied to the power plant by fuel tankers, by road. At this stage it is anticipated that 52 fuel trucks will deliver fuel on a daily basis if the power plant is to run at base load and 18 fuel trucks daily if the power plant is to run at mid-merit. Two (2) fuel unloading stations will be associated with these tanks.

The Richards Bay Port has been identified by the DoE for Gas and Gas-to-Power enablement. Environmental studies are currently underway to facilitate the import of LNG /NG to allow for the development of medium- to long-term gas power plants at the Port of Richards Bay. Once the DoE has been issued with its Environmental Authorisation, the Floating Power Plants can be constructed in less than 12 months. Richards Bay Gas Power 2 (Pty) Ltd can purchase LNG/ NG from international and local suppliers once this project is completed, replacing diesel /LPG. The estimated volumes required are: 30 million GJ per annum (800 000 000m^3) at base load and 12.3 million GJ per annum (326 000 000 m^3) at mid-merit. The gas will be supplied to the gas to power plant by pipeline, which will be subject to a separate EIA by a separate applicant / developer prior to commencement.

The gas to power plant may consume water at volumes up to 270 000m^3 per annum at base load and 50 000m^3 per annum at mid-merit[21]. . Every effort is being made to reduce these volumes further, including the potential for recycling condensation from air cooled condensers if such equipment will form part of the final plant design. The volume of water required will be supplied via the Richards Bay IDZ water supply network that has an allotment from the local water authority. The Richards Bay IDZ has undertaken to provide the water to the site under its long-term lease agreement with Richards Bay Gas Power 2 (Pty) Ltd. The Richards Bay IDZ has provided Richards Bay Gas Power 2 (Pty) Ltd with a letter of confirmation that the volumes required would be supplied (refer to Appendix C).

Other small consumables include oils for plant lubrication and electrical insulation, and selected other chemicals that are typically associated with such plants.

[21] Note that the volume of water required will be dependent on the final design of the facility as well as on the technology supplier.

The plant will produce waste water as an output of the demineralisation plant on site and the washing of turbines, as well as oily water. The waste water will be contaminated with heavy metals and must be disposed of by a specialist contractor. The waste water will be stored in a sump at each unit. At this stage, it is anticipated that each turbine will produce b0.5-1m^3 of waste water per kilowatt hour. Oily water will be collected from drains and processes at the gas turbines. The oily water will be sent to an oily water separator (one at each unit). Oil that is separated from the water will be removed from the sump periodically by a specialist contractor. The grey water from the separator will be discharged into the municipal's wastewater system which is a dedicated effluent discharge pipeline used by existing industrial users. It must however be noted that prior to any discharge of grey water, the developer must obtain an oil contamination requirement from the municipality to ensure that the oily water separator filter purchased is of the correct specifications. This will ensure that grey water discharged into the municipal system will not further contaminate the municipal wastewater system. .

At the end of its technical lifetime, the power plant will be decommissioned and the site rehabilitated.

3.2.2. Site Access

Access to the site will be via a 40m wide road (included in the Nemai Consulting, 2015 EIA). Internal roads will be constructed within the project site to access different areas of the site. These roads will have a width of up to 6m.

3.2.3. Proposed Project Lifetime

The starting date of the proposed project, in terms of construction, is dependent upon receiving Environmental Authorisation from the Department of Environmental Affairs as well as the developer being a preferred bidder and receiving a license from NERSA. The duration of the construction period is anticipated to be approximately 14-16 months. The expected operational lifetime of the proposed gas to power plant will be 25-40 years. Under the DoE's IPP Programme, projects are provided with a 20-25 year Power Purchase Agreement. There are currently no guidelines provided by the DoE as to whether these contracts will be renewed after this term in the future.

Technology continually advances in both efficiency and reduction in emissions. During the initial term of the Power Purchase Agreement with the DoE, the technology selected will remain in place for the duration of the initial contract period. If an extension to the initial contract is provided by the DoE, then the developer will undertake an assessment of the plant facilities and the latest

technology available at such a point in time, and this contract period may be extended subject to the DoE requirements at the time and the findings of the assessment.

3.3. Project Alternatives under consideration for the Gas to Power Plant

In accordance with the requirements outlined in Appendix 3 of the EIA Regulations 2014, the consideration of alternatives including site, activity, technology, as well as the "do-nothing" alternative should be undertaken. Thus, the identification of alternatives is a key aspect of the success of the EIA process. In relation to a proposed activity "Alternatives" means different ways of meeting the general purposes and requirements of the proposed activity. The following sections address this requirement.

3.3.1. Site Alternatives

The proposed gas to power plant is to be located on a site within the Richards Bay IDZ Phase 1F within the uMhlathuze Local Municipality, which falls under the jurisdiction of the uThungulu District Municipality in Kwazulu-Natal. The site has been zoned for IDZ industrial development as part of the planning for this IDZ area (refer to Figure 3.7).

The erven on which the proposed facility is planned have been allocated to the developer for this purpose (refer to Figure 3.8; allocation for "Bryomate"[22]). Therefore, the siting of the facility has been predetermined and no feasible siting alternatives within an appropriately zoned area exist. Richards Bay Gas Power 2 (Pty) Ltd considers this area, and specifically the demarcated site, to be highly preferred for the development of a gas to power project from a technical perspective as detailed in Section 3.1.4.

[22] Bryomate has been officially renamed to "Richards Bay Gas Power 2 (Pty) Ltd"

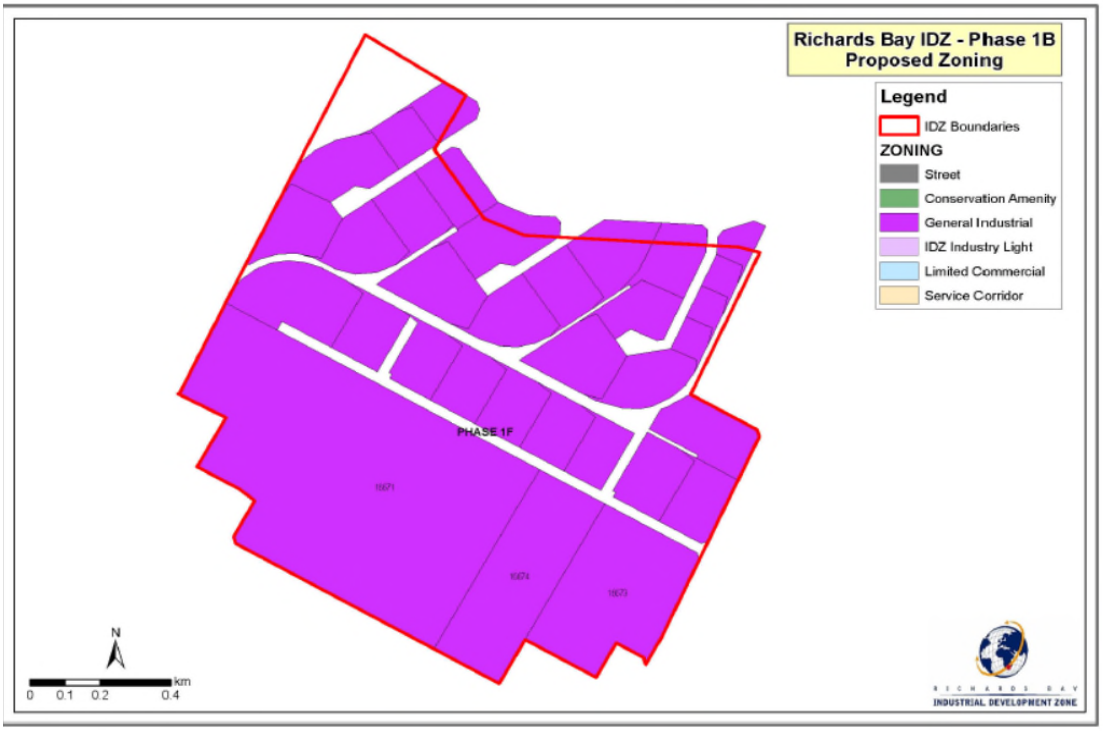

Figure 3.7: Zoning for Phase 1F (Source: uMhlathuze Local Municipality)

3.3.2. Cooling Technology Alternatives

Combined cycle gas to power plants require cooling at the back-end of the thermal cycle. The purpose of the cooling is to condense steam back to water at the end of the steam cycle. There are different types of cooling technologies available (discussed below for comparative purposes) but typically water is used for cooling in power plants.

Due to water availability considerations in the area, dry cooling technology will be used for the project. This is also consistent with the Department of Water and Sanitation requirements. Therefore no alternative technology is considered.

Dry Cooling

Dry-cooling systems use air instead of water to cool the steam exiting a turbine. Dry-cooled systems use no water and can decrease total power plant water consumption by more than 90 percent[23]. The tradeoffs to these water savings are higher operating costs and lower plant efficiencies (Source: http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/water-energy-electricity-cooling-power-plant.html#sources).

[23] Though no water is required for dry-cooling systems, power plants using dry-cooling systems also require water for system maintenance and cleaning

Wet cooling system

Wet-recirculating or closed-loop systems use cooling water in a second cycle to cool the steam. 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. Because wet-recirculating systems withdraw water to replace any water that is lost through evaporation in the cooling tower, these systems tend to have appreciably high water consumption (Source: http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/water-energy-electricity-cooling-power-plant.html#sources).

3.3.3. Fuel type Alternatives

The fuel types that were originally under consideration for Phase 1 of the proposed gas to power plant were diesel; Liquefied Petroleum Gas (LPG), Heavy Fuel Oil (HFO) and Light Fuel Oil (LFO). HFO and LFO were subsequently excluded, in response to comments received on the draft scoping report, due to their high emissions.

It is important to note that the impacts identified and assessed in this EIA Report have considered diesel and LPG as the only fuel sources for Phase 1. Should sustainable supplies of cleaner fuel (e.g. biofuel) become commercially viable in the future then Richards Bay Gas Power 2 (Pty) Ltd should investigate the conversion of the plant to be able to utilise such fuels if technically and financially feasible.

Figure 3.8: RBIDZ Phase 1F Land Allocation. Land allocated to Bryomate for development is indicated in orange.

3.3.4. Operational Alternatives

As previously indicated in this chapter, the power plant could operate at base load or mid-merit energy. This will be dependent on the DoE IPP Programme requirements, as well as those of Eskom.

Base load is defined as the minimum level of demand on an electrical supply system over 24 hours. Base load power sources are those plants which can generate dependable power to consistently meet demand.

Mid-merit is defined as the power supply that fills the gap between peak load and base load where peak load is the maximum level of power demand. This generally translates to an operational period of 8 hours per day.

Table 3.3 below shows the main differences associated with operating the power plant at base load versus mid-merit as proposed by Richards Bay Gas Power 2 (Pty) Ltd.

Table 3.3: Base load versus Mid-merit

	Base load	**Mid-merit**
Number of gas turbines	2	6
Number of steam turbines	1-2	1-2
Number of engines	2	6
Number of operational hours per year	8 000	3 000
Volume of diesel /LPG required	1 000 000m^3	410 000m^3
Number of trucks delivering fuel daily	52	18
Volume of LNG/ NG required	800 000 000m^3	326 000 000m^3
Volume of water required	270 000m^3	50 000m^3

This impact assessment has considered the operation of the facility at base load as a worst-case scenario.

3.3.5. The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing the proposed gas to power plant on the site within the RBIDZ Phase 1F. The no development option assumes the site remains in its current state, i.e. undeveloped and, no power generation takes place within the identified site in the RBIDZ 1F.

The no-go alternative is assessed in Chapter 6 of this EIA Report.

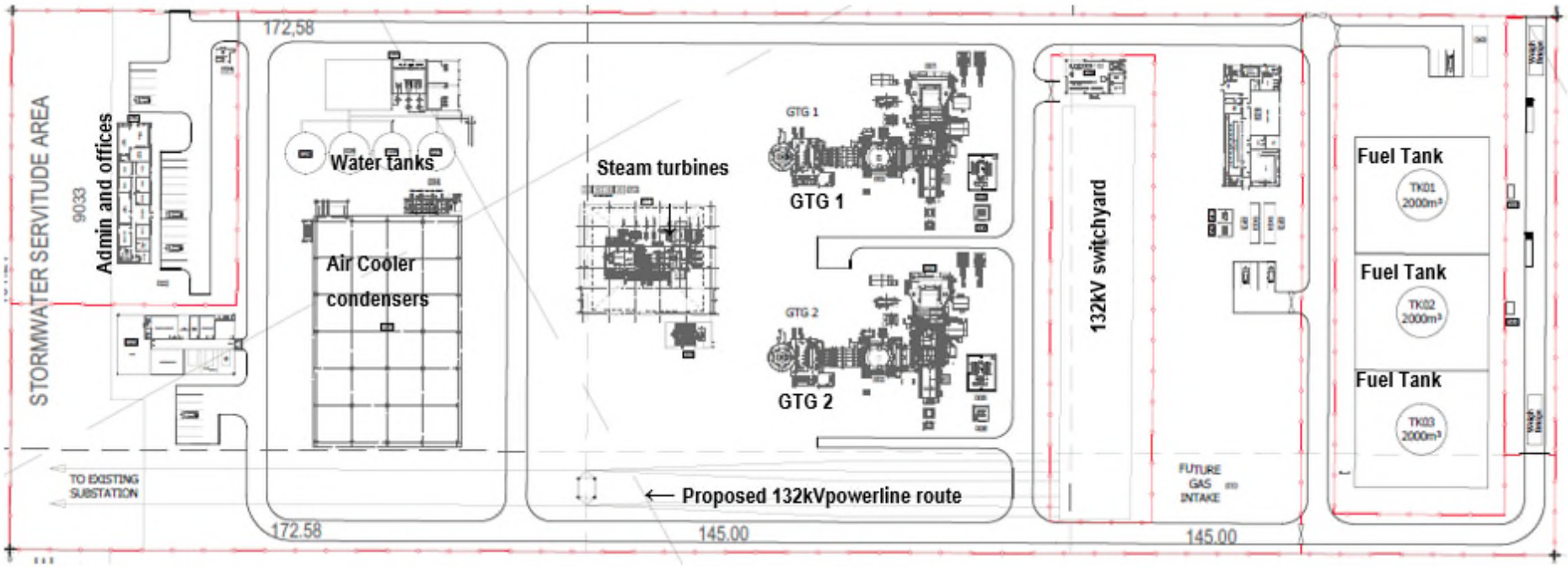

Figure 3.9: Layout of power plant at Baseload

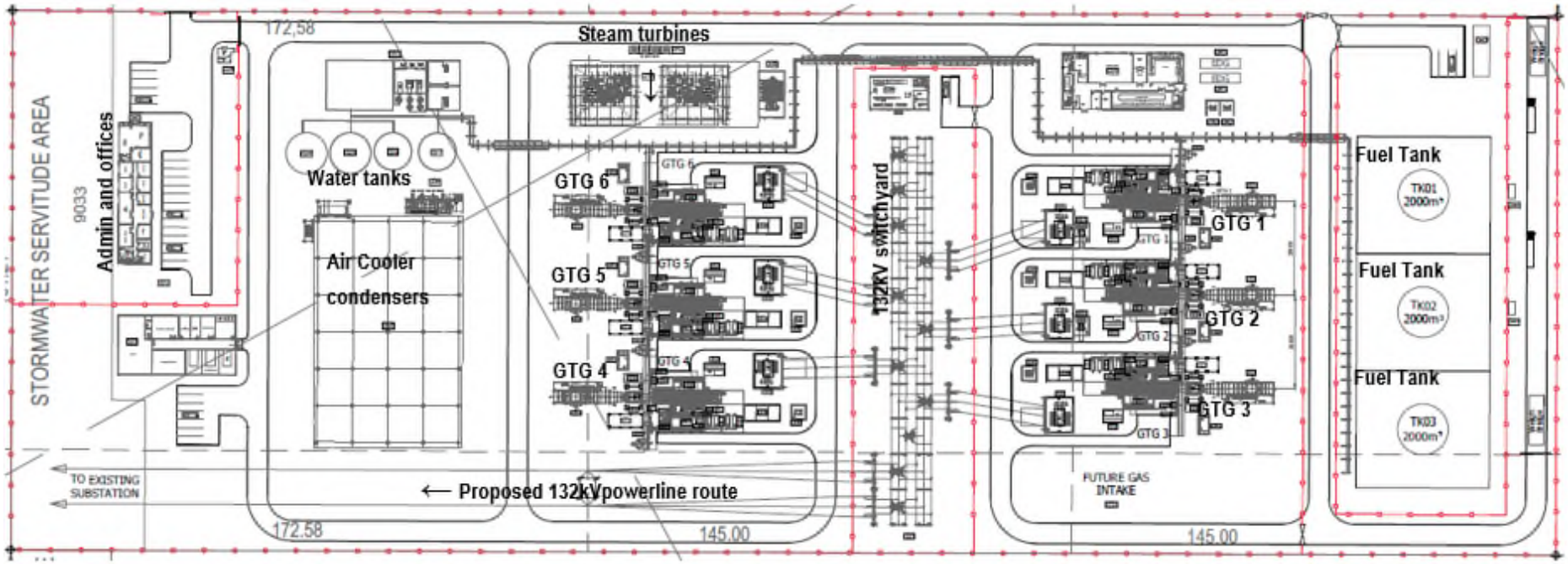

Figure 3.9: Layout of power plant at Mid-merit

3.4. Life-cycle Phases of the proposed Power Plant

3.4.1. Construction of a Gas to Power Plant

Construction of the proposed gas to power plant is expected take between 14-16 months. The construction activity involves the following:

» Prior to initiating construction, a number of surveys will be required including, but not limited to, geotechnical survey, site survey and confirmation of the power station footprint, survey of substation site and power line servitude.
» Access roads will need to be established within the site.
» Site preparation activities will include clearance of vegetation and earthworks (including excavation for foundations). These activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site (as part of cut and fill activities).
» Thereafter civil works will take place which involves concrete works for structures such as foundation, the production unit (which comprises a complete turbine, generator and an auxiliary module), stacks, air cooler condensers, substation and associated infrastructure.
» Mechanical and electrical work will then follow.
» Ancillary infrastructure such as guard house, admin building, workshops and a warehouse will be established.
» As construction is completed in an area, and as all construction equipment is removed from the site, the site will be rehabilitated where practical and reasonable.

3.4.2. Operation of a Gas to Power Plant

Prior to the operation of the power station, testing and trials will need to be undertaken. The proposed facility will create up to 100 permanent employment positions that will be retained for 20-25 years (depending on the length of the Power Purchase Agreement (PPA) signed). It is anticipated that there will be full time security required at the site. In order to operate a gas to power plant, resources are required (input), and processes and outputs occur from the electricity generation process. Inputs include diesel /LPG (ultimately LNG/ NG) and water. The outputs of the process are electricity, wash waste and oily water and by-products. The power station will operate for 24 hours a day and 7 days a week for up to 8000 hours/ annum at base load and 3000 hours/ annum at mid-merit.

3.4.3. Decommissioning of a Gas to Power Plant

The lifespan of the proposed power station is more than 20 years. Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life or if it is no longer required. It is most likely that decommissioning activities of the infrastructure of the facility discussed in this EIA process would comprise the disassembly

and disposal of the infrastructure. This would include the disassembly of the production units and ancillary infrastructure, demolishing of buildings, removal of waste from the site and rehabilitation to the desired end-use.

APPROACH TO UNDERTAKING THE EIA PHASE CHAPTER 4

An Environmental Impact Assessment (EIA) process refers to that process (in line with the EIA Regulations) which involves the identification of and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project/ activity. The EIA process comprises two main phases: i.e. **Scoping Phase** and **EIA Phase**. The EIA process culminates in the submission of an EIA Report (including an Environmental Management Programme (EMPr)) to the competent authority for decision-making. The EIA process is illustrated below:

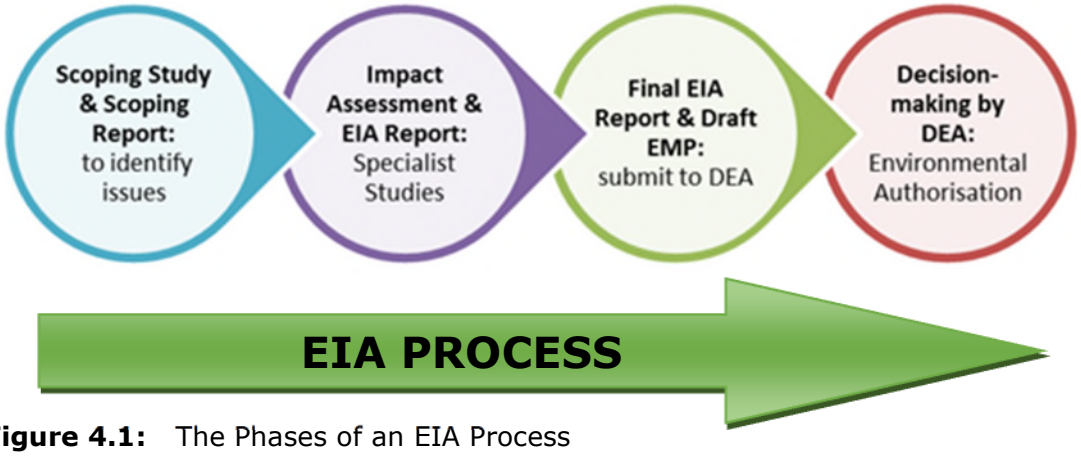

Figure 4.1: The Phases of an EIA Process

The EIA process for the proposed gas to power plant is being undertaken in accordance with sections 24(5) of NEMA (No 107 of 1998). In terms of the EIA Regulations (2014) of GN R982 as well as GN R983, GN R984 and GN R985, a Scoping and EIA Study are required to be undertaken for this proposed project. The environmental studies for this proposed project were undertaken in two phases, in accordance with the EIA Regulations.

4.1. Relevant Listed Activities

In terms of the EIA Regulations, 2014 of GN R983, GN R984 and GN R985; the following 'listed activities' are triggered by the proposed facilities as shown in **Table 4.1** below.

Table 4.1: Listed activities triggered by the proposed Gas-to-Power project

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice) :	Describe each listed activity as per project description
GN 983, 08 December 2014	27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice) :	Describe each listed activity as per project description
		The development area is 7.3ha in extent and will require the clearance of natural vegetation.
GN 983, 08 December 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 ***The development footprint for the gas to power plant will exceed 5ha.***
GN 984, 08 December 2014	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more; ***The total electricity output for the facilities will be up to 400 MW[24].***
GN 984, 08 December 2014	4	The development of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres. ***Three (3) fuel tanks with a capacity of 2000m³ will be used for fuel storage facility, including diesel and Liquefied Petroleum Gas (LPG), until the gas infrastructure is constructed by Transnet and as emergency fuel storage thereafter.***
GN 984, 08 December 2014	6	The development of facilities or infrastructure for any 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. ***An Air Emissions License is required to be obtained for the project in terms of the NEM: Air Quality Act. Combustion installations used primarily for steam raising or electricity generation are Listed Activities (Category 1) in term of Section 21 of the NEM: AQA. Facilities with a design capacity equal to or greater than***

[24] It is anticipated that 300MW will be fuel/ gas generated energy and 100MW will be heat/ steam generated energy.

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice) :	Describe each listed activity as per project description
		50 MW and using liquid fuels are Sub-category 1.2 Listed Activities, while those using gaseous fuels are Sub-category 1.4 Listed Activities. The storage and handling of petroleum products at facilities with a combined storage capacity of 1 000 m3 is a Listed Activity (Category 2, sub-category 2.4) (Government Notice 893, Government Gazette 37054 of 22 November 2016). Special arrangements apply for Sub-category 2.4 Listed Activities depending on the vapour pressure of products being stored. Richards Bay Gas Power 2 propose to store more than 1 000 m³ of diesel. Special conditions for Sub-category refer to the design of the storage tank, Leak Detection and Repair and vapour recovery for road and rail offloading facilities. ***The consequence of listing an activity is described in Section 22 of the NEM: AQA, i.e. that no person may conduct a Listed Activity without a provisional Atmospheric Emission License or an Atmospheric Emission License (AEL).***
GN 984, 08 December 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). ***An Air Emissions License is required to be obtained for the project in terms of the NEM: Air Quality Act.***

On the basis of the above listed activities, a Scoping and an EIA Phase has been undertaken for the proposed project. This process comprised two phases as follows:

» The Scoping Phase includes the identification of potential issues associated with the proposed project through a desktop study and consultation with affected parties and key stakeholders. Areas of sensitivity within the broader site are identified and delineated in order to identify any environmental fatal flaws, and sensitive or no go areas. Following a public review period of the draft report, this phase culminates in the submission of a final Scoping Report and Plan of Study for EIA to the DEA.
» The EIA Phase involves a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase includes detailed specialist investigations and public consultation. Following

a public review period of the draft report, this phase culminates in the submission of a Final EIA Report and an Environmental Management Programme (EMPr), including recommendations of practical and achievable mitigation and management measures, to DEA for review and decision-making.

4.2. Scoping Phase

A Scoping Report was released for public review from 13 November 2015 – 14 December 2015 for a 30-day comment period. Following the review period, a final scoping report was submitted to DEA in January 2016. This together with the Plan of Study for the EIA was accepted by the DEA, as the competent authority, on 29 February 2016. In terms of this acceptance, an EIA was required to be undertaken for the proposed project.

The Scoping Study provided interested and affected parties (I&APs) with the opportunity to receive information regarding the proposed project, participate in the process, and raise issues of concern. The Scoping Report aimed at detailing the nature and extent of the proposed gas to power plant, identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA. This was achieved through an evaluation of the proposed project, involving the project proponent, review of existing information, and a consultation process with key stakeholders that included both relevant government authorities and I&APs.

4.3. EIA Phase

The EIA Phase aims to achieve the following:

» Provide a comprehensive assessment of the social and biophysical environments affected by the proposed project.
» Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed project.
» Comparatively assess any alternatives put forward as part of the project.
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
» Undertake a fully inclusive public participation process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA Report addresses potential direct, indirect, and cumulative impacts (both positive and negative) associated with all phases of the project including design, construction, operation and decommissioning. In this regard the EIA Report aims to provide the relevant authorities with sufficient information to make an informed decision regarding the proposed project.

4.3.1. Tasks completed during the EIA Phase

The EIA Phase for the proposed gas to power plant has been undertaken in accordance with the EIA Regulations published in GN 38282 in December 2014, in terms of NEMA. Key tasks undertaken within the EIA phase included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Undertaking a public participation process throughout the EIA process in accordance with Chapter 6 of Government Notice R982 of 2014 in order to identify any additional issues and concerns associated with the proposed project.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process.
» Undertaking of independent specialist studies in accordance with Appendix 6 of Government Notice R982 of 2014.
» Preparation of an EIA Report in accordance with Appendix 3 of Government Notice R982 of 2014.

These tasks are discussed in detail below.

4.3.2 Authority Consultation

In terms of the Energy Response Plan, the National Department of Environmental Affairs (DEA) is delegated as the competent authority for all energy related projects. As the project is located within the KwaZulu-Natal Province, the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) is the commenting authority for the development of the project. Consultation with the regulating authorities (i.e. DEA and KZN DEDTEA) has continued throughout the EIA process. On-going consultation included the following:

» Submission of the application for authorisation to DEA;
» Submission of the Scoping Report for review by the competent authority from 13 November 2015 – 14 December 2015.
» The Final Scoping Report for the proposed project was submitted in January 2016. The Scoping Report was accepted by DEA in February 2016.
» The EIA Report will be made available for a 30-day public review period.

The following will also be undertaken as part of this EIA process:

» Submission of a final EIA Report to DEA following the 30-day public review period of the draft EIA and the receipt of the comments from the DEA on the draft EIA report.
» If required, an opportunity for DEA and DEDTEA representatives to visit and inspect the proposed project site.

» Notification and consultation with Organs of State (refer to Table 4.2) that may have jurisdiction over the project, including:
  * Provincial departments
  * Parastatals and Non-Governmental Organisations
  * Local Municipality and District Municipality

A record of all authority consultation in the EIA process is included within Appendix C2.

4.3.3. Public Involvement and Consultation

The aim of the public participation process is primarily to ensure that:

» Information containing all relevant facts in respect of the proposed project is made available to potential stakeholders and I&APs.
» Participation by potential I&APs is facilitated in such a manner that all potential stakeholders and I&APs are provided with a reasonable opportunity to comment on the proposed project.
» Comments received from stakeholders and I&APs are recorded and incorporated into the EIA process.

In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their inputs regarding the project, various opportunities for stakeholders and I&APs to be involved in the EIA Phase of the process have been provided, as follows:

» Focus group meetings and a public meeting (pre-arranged and stakeholders invited to attend - for example with directly affected and surrounding landowners).
» Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants).
» Written, faxed or e-mail correspondence.
» The Draft EIA Report has been released for a 30-day public review period from 10 May 2016 – 9 June 2016. The comments received from I&APs will be captured within a Comments and Response Report, and will be included within the EIA Report, for submission to the authorities for decision-making.

In compliance with the requirements of Chapter 6 of the EIA Regulations, 2014, the following summarises the key public participation activities conducted to date.

» **Placement of Site Notices**
  Site notices (in English and Afrikaans) have been placed at visible points along the boundary of the property, in accordance with the requirements of the EIA Regulations.

Further notices will placed at the Richards Bay Public Library. Copies of all the site notices are included within Appendix C3

» **Identification of I&APs and establishment of a database**

Identification of I&APs was undertaken by Savannah Environmental through existing contacts and databases, recording responses to site notices and the newspaper advertisement, as well as through the process of networking. The key stakeholder groups identified include authorities, local and district municipalities, public stakeholders, Parastatals and Non-Governmental Organisations (refer to Table 4.2 below).

Table 4.2: Organs of State Identified for the EIA Phase

Organs of State
National Government Departments
Department of Agriculture, Forestry and Fisheries (DAFF)
Department of Communications
Department of Energy (DoE)
Department of Mineral Resources (DMR)
Department of Public Works (DPW)
Department of Rural Development and Land Reform (DRDLR)
Department of Water and Sanitation (DWS)
Department of Science and Technology (DST)
Department of Trade and Industry (DTI)
Government Bodies and State Owned Companies
Eskom SOC Limited
National Energy Regulator of South Africa (NERSA)
Sentech
South African Civil Aviation Authority (CAA)
South African National Roads Agency Limited (SANRAL)
Telkom SA Ltd
Provincial Government Departments
KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs
Amafa / Heritage KwaZulu Natali
Ezemvelo KZN Wildlife
Local Government Departments
uThungulu District Municipality
uMhlathuze Local Municipality
Non-Governmental Organisations
BirdLife South Africa
Wildlife and Environment Society of South Africa (WESSA)
Endangered Wildlife Trust (EWT)
Richards Bay Clean Air Association

Landowners
Richards Bay Industrial Development Zone (tenant)
Neighbouring landowners and tenants

All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C5). While I&APs were encouraged to register their interest in the project from the onset of the process undertaken by Savannah Environmental, the identification and registration of I&APs has been on-going for the duration of the EIA phase of the process.

» **Newspaper Advertisements**
During the scoping phase, newspaper adverts were placed to notify and inform the public of the propose project and the availability of the Scoping report for public review. These adverts were placed in the following newspapers:

» The Mercury (13 November 2015); and
» Zululand Observer (16 November 2015).

During the EIA phase, a second round of newspaper adverts has been placed to inform the public of the availability of the Draft EIA report in the following newspapers:

» The Mercury (6 May 2016); and
» Zululand Observer (9 May 2016).

Refer to Appendix C2.

» **Consultation**
In order to accommodate the varying needs of stakeholders and I&APs, the following opportunities have been provided for I&AP issues to be recorded and verified through the EIA process as outlined in Table 4.3 below:

Table 4.3: Consultation undertaken with I&APs for the gas to power plant

Scoping Phase	Activity	Date
	Placement of site notices on-site.	11 August 2015
	Distribution of letters announcing the EIA process and the availability of the Scoping Report for review for a 30-day comment period. These letters were distributed to organs of state departments, ward councillors, landowners within the study area, neighbouring landowners and key stakeholder groups.	13 November 2015
	30-day review period for the Scoping Report for public comment.	13 November 2015 – 14 December 2015

	The EIA process and the availability of the Scoping Report for review was advertised in The Mercury and Zululand Observer newspapers.	13 November 2015 16 November 2015
	Richards Bay Industrial Development Zone (RBIDZ) Environmental Review Committee Meeting	11 August 2015
EIA Phase	Placement of site notices on-site.	22 April 2016
	Focus Group meetings will be held with the City of uMhlathuze Local municipality and ward councillors, the Richards Bay Clean Air Association, Tata Steel and uThungulu District Municipality.	22 April 2016
	Distribution of letters announcing the availability of the EIA Report for review for a 30-day comment period. These letters will be distributed to organs of state departments, ward councillors, landowners within the study area, neighbouring landowners and key stakeholder group.	09 May 2016
	The availability of the EIA Report and the date of the Public Meeting will be advertised in the Mercury and Zululand Observer newspapers.	6 May 2016 9 May 2016
	30-day review period of the EIA Report for public comment	10 May 2016 – 9 June 2016
	Public Participation meetings to be held during the 30-day comment period: » Richards Bay Industrial Development Zone (RBIDZ) Environmental Review Committee Meeting » Public Meeting	17 May 2016

Records of all consultation undertaken are included in Appendix C6.

4.3.4. Identification and Recording of Issues and Concerns

Issues and comments raised by I&APs over the duration of the EIA process have been synthesised into a Comments and Response Report. The Comments and Response Report includes detailed responses from members of the EIA project team and/or the project proponent. This is included in Appendix C7.

4.3.5. Assessment of Issues Identified through the Scoping Process

A number of investigations have been undertaken for the RBIDZ Phase 1F within which the proposed development is planned. Therefore, a large amount of information regarding the affected environment and potential environmental issues was available. This has included the following:

» Thorn-ex, September 2010. Environmental Risk Evaluation and Guidelines for the Richards Bay Industrial Development Zone.

» Sivest, August 2010. Environmental Risk Assessment of Richards Bay IDZ 1A, 1B, 1C, 1D & 1F.
» NEMAI Consulting, September 2014. Richards Bay Industrial Development Zone Phase 1F – Installation of Bulk Infrastructure Services, Richards Bay, KwaZulu Natal: Draft Scoping Report.
» NEMAI Consulting, September 2015. Richards Bay Industrial Development Zone Phase 1F - Environmental Impact Assessment Report.
» Environmental Resources Management, November 2015. Independent Power Producers Programme: EIA for a Floating Power Plant, Port of Richards Bay – Draft Scoping Report.

This information formed the basis of the identification and evaluation of the potential impacts associated with the proposed project during the Scoping Phase. Issues which require investigation within the EIA Phase as identified through the Scoping Study, as well as the specialists involved in the assessment of these impacts are indicated in Table 4.4 below.

Table 4.4: Specialist consultants appointed to evaluate the potential impacts associated with the proposed project

Specialist	Area of Expertise	Refer Appendix
Candice Hunter of Savannah Environmental (with external review by Neville Bews)	Social (including consideration of land use and traffic impacts)	Appendix F
Mark Zunckel of uMoya-Nilu	Air Quality and Air Emissions License	Appendix G
Adam Teixeira-Leite of Eco-Pulse	Ecology	Appendix H

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of the gas to power plant. Issues were assessed in terms of the following criteria:

» The **nature**, a description of what causes the effect, what will be affected, and how it will be affected
» The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)
» The **duration**, wherein it is indicated whether:
  * The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1
  * The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2
  * Medium-term (5–15 years) – assigned a score of 3
  * Long term (> 15 years) - assigned a score of 4

- Permanent - assigned a score of 5

» The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
- 0 is small and will have no effect on the environment
- 2 is minor and will not result in an impact on processes
- 4 is low and will cause a slight impact on processes
- 6 is moderate and will result in processes continuing but in a modified way
- 8 is high (processes are altered to the extent that they temporarily cease)
- 10 is very high and results in complete destruction of patterns and permanent cessation of processes

» The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
- Assigned a score of 1–5, where 1 is very improbable (probably will not happen)
- Assigned a score of 2 is improbable (some possibility, but low likelihood)
- Assigned a score of 3 is probable (distinct possibility)
- Assigned a score of 4 is highly probable (most likely)
- Assigned a score of 5 is definite (impact will occur regardless of any prevention measures)

» The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high

» The **status**, which is described as either positive, negative or neutral

» The degree to which the impact can be reversed

» The degree to which the impact may cause irreplaceable loss of resources

» The degree to which the impact can be mitigated

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

S = (E+D+M) P; where

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

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

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)

» **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)

» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area)

As per the requirements of the EIA Regulations, specialist studies are required to assess the cumulative impacts. The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section should address whether the construction of the proposed development will result in:

» Unacceptable risk
» Unacceptable loss
» Complete or whole-scale changes to the environment or sense of place
» Unacceptable increase in impact

The specialists were required to conclude if the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area.

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. An EMPr is included as Appendix I.

4.3.6. Assumptions and Limitations

The following assumptions and limitations are applicable to the studies undertaken within this EIA Phase:

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development site identified by the developer represents a technically suitable site for the establishment of the proposed gas to power plant.
» It is assumed correct that the proposed connection to the National Grid is correct in terms of viability and need.
» Studies assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Every possible precaution was taken to reduce the effect of the above-mentioned limitations on the data collected for this study.

Refer to the specialist studies in Appendices F – H for specialist study specific limitations.

4.4. Regulatory and Legal Context

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for energy generation projects of this

nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As energy development is a multi-sectoral issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process for the project and the related statutory environmental assessment process.

4.4.1. Regulatory Hierarchy

At **National Level**, the main regulatory agencies are:

» *Department of Energy (DoE):* This Department is responsible for policy relating to all energy forms, and is responsible for forming and approving the IRP (Integrated Resource Plan for Electricity).
» *National Energy Regulator of South Africa (NERSA):* This body is responsible for regulating all aspects of the electricity sector, and will ultimately issue licenses for solar energy developments to generate electricity.
» *Department of Environmental Affairs (DEA):* This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for the project, and charged with granting the relevant environmental authorisation.
» *South African National Roads Agency (SANRAL):* This Agency is responsible for the regulation and maintenance of all national routes.
» *Department of Water and Sanitation:* This Department is responsible for water resource protection, water use licensing and permits.
» *Department of Mineral Resources (DMR):* Approval from the DMR may be required to use land surface contrary to the objects of the Act in terms of Section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that the proposed activities do not sterilise a mineral resource that might occur on site.

At the **Provincial Level**, the main regulatory agencies are:

» *Provincial Government of KwaZulu-Natal – KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs:* This Department is the commenting authority for this project.
» *Amafa / Heritage KwaZulu Natali*: This department identifies, conserves and manages heritage resources throughout the KwaZulu-Natal Province.
» *Ezemvelo KZN Wildlife*: Ezemvelo KZN Wildlife is the provincial agency mandated to carry out biodiversity conservation and associated activities in the province of KwaZulu-Natal.

At the **Local Level,** the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In Kwazulu Natal,

both the local and district municipalities play a role. The local municipality is the uMhlathuze Local Municipality which forms part of the uThungulu District Municipality.

4.4.2 Legislation and Guidelines that have informed the preparation of this EIA Report

The following legislation and guidelines have informed the scope and content of this EIA Report:

» National Environmental Management Act (Act No. 107 of 1998)
» EIA Regulations, published under Chapter 5 of NEMA (GNR R982 in Government Gazette No 38282 of December 2014)
» International guidelines – the Equator Principles and the International Finance Corporation and World Bank Guidelines.

Several other Acts, standards or guidelines have also informed the project process and the scope of issues assessed in the EIA Report. A listing of relevant legislation applicable to the proposed project is provided in Table 4.5.

Table 4.5: Review of relevant environmental policies, legislation, guidelines and standards applicable to the proposed project and EIA

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation.	National Department of Environmental Affairs (DEA) KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN DEDTEA)	In terms of the EIA Regulations, 2014 of GN R983, GN R984 and GN R985 a scoping and EIA process is required to be undertaken for the proposed project. This EIA Report will be submitted to the competent and commenting authority in support of the application for authorisation.
National Environmental Management Act (Act No 107 of 1998)	In terms of the Duty of Care provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	National DEA (as regulator of NEMA).	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section will find application during the EIA phase and will continue to apply throughout the life cycle of the project.
National Environmental Management:	The National Environmental Management Waste Act (No 56 of 2008) regulates waste management in order to	National DEA (hazardous waste)	The proposed development does not include activities that require a Waste

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
Waste Act (Act No 59 of 2008)	protect the health and environment of South African citizens. This is achieved through pollution prevention, institutional arrangements and planning matters, national norms and standards and the licensing and control of waste management activities. Regulation 921 Act contains activities listed in Categories A and B that would require licensing from the provincial or national authorities. In order to obtain licences for these application a Basic Assessment or EIA process, respectively, should be followed according to the requirements stated in NEMA. Category C includes activities which require that the relevant norms and standards be applied. This includes the storage of waste.	KZN DEDTEA (general waste)	Management Licence. However, the measures recommended for the management of waste within the EMPr (Appendix I) will be applicable throughout the life of the facility..
National Water Act (Act No 36 of 1998)	The National Water Act (Act No 36 of 1998) regulates the surface and subsurface water of South Africa. Water is considered a scarce commodity and should therefore be adequately protected. Amongst other, the act deals with the protection of water sources, water uses, water management strategies and catchment management, dam safety and general powers and functions. The purpose of the act is to ensure that South Africa's water resources are protected,	Department of Water and Sanitation (DWS)	The proposed development does not include activities that require a Water Use Licence. However, measures for the management of water recommended within the EMPr (Appendix I) will be applicable throughout the life of the facility.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	used, developed, conserved, managed and controlled. Water uses under S21 of the Act must be licensed unless such water use falls into one of the categories listed in S22 of the Act or falls under general authorisation in terms of S39 and GN 1191 of GG 20526 October 1999. In terms of Section 19, the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing or recurring.		
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004 - NEMBA) was promulgated for the management and conservation of South Africa's biodiversity through the protection of species and ecosystems and the sustainable use of indigenous biological resources. In terms of section 52(1) (a), of the NEMBA, a national list of ecosystems that are threatened and in need of protection was gazetted on 9 December 2011 (Government Notice 1002 (Driver et. al, 2004). The list classified all threatened or protected ecosystems in South Africa in terms of four categories; Critically Endangered (CR),	National DEA KZN DEDTEA	The study area falls within both the Savanna Biome (one of the four main biomes in KwaZulu-Natal as described by Mucina and Rutherford, 2006)) and regionally within the Sub-Escarpment Savanna Bioregion (Mucina & Rutherford, 2006). At a local scale, the study area falls within the Maputaland Wooded Grassland type according to the KZN Vegetation Map (EKZNW, 2012),which is regarded as Endangered (EN) in terms of its threat status with a moderate

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	Endangered (EN), Vulnerable (VU), or Protected.		degree of protection, following the revision of the KZN vegetation map. An Ecological Assessment has been undertaken and is included in Appendix H.
National Environmental Management: Biodiversity (Act No 10 of 2004)	GNR 598: The Alien and Invasive Species (AIS) Regulations provides for the declaration of weeds and invader plants.	Department of Agriculture, Forestry and Fisheries (DAFF)	This Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies are included in the EMPr (refer to Appendix I). In addition, measures for weed control and management have also been included in the EMPr.
Conservation of Agricultural Resources Act (Act No 43 of 1983)	The Conservation of Agricultural Resources Act (Act No 43 of 1983) requires the maintenance of riparian vegetation and provides a list of invasive alien vegetation that must be controlled or eradicated.	DAFF	An Ecological Assessment has been undertaken and is included in Appendix H. Measures for the control of invasive vegetation has been discussed in the EMPr which is provided in Appendix I.
National Heritage Resources Act (Act No 25 of 1999)	The National Heritage Resources Act (Act No 25 of 1999) was promulgated for the protection of National Heritage Resources and the empowerment of civil society to conserve their heritage resources. In terms of Section 38 of this act, certain listed activities require	South African Heritage Resources Agency (SAHRA) Amafa / Heritage KwaZulu Natali	The surveys undertaken in the area adequately captured the heritage resources. The heritage resources identified have low local significance ratings. Almost all of the sites are archaeological and have previously been

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	authorisation from provincial agencies: » the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length; » the construction of a bridge or similar structure exceeding 50m in length; » any development or other activity which will change the character of a site * exceeding 5 000m^2 in extent;or * involving three or more existing erven or subdivisions thereof; » the re-zoning of a site exceeding 10 000m^2 in extent.		identified during heritage impact assessments conducted by Gavin Anderson. The only built environment heritage resource is 5.5km to the north of the proposed development area. The buildings at this site are associated with the railway infrastructure and are well away from the development. There are no known sites which require mitigation or management plans. No further heritage work is required for the proposed development. Should the contractor come across any items that may be of heritage significance, the relevant mitigation measures included in the EMPr must be implemented (refer to Appendix I).
Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)	The Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002) sets out the requirements with which applicants for prospecting rights, mining rights and mining permits must comply in Sections 16, 22 and 27 of the MPRDA.	Department of Mineral Resources (DMR) DEA	Should material not be sourced commercially and a borrow pit(s) is considered necessary, the Contractor shall source and apply for the relevant permit from the DEA.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.		
National Environmental Management: Air Quality Act (Act No 39 of 2004)	The National Environmental Management: Air Quality Act (Act No 39 of 2004 - NEMAQA) provides for the setting of national norms and standards for regulating air quality monitoring, management and control and describes specific air quality measures so as to protect the environment and human health or well-being by: » preventing pollution and ecological degradation; and » promoting sustainable development through reasonable resource use. S18, S19 and S20 of the Act allow certain areas to be declared and managed as "priority areas". Declaration of controlled emitters (Part 3 of Act) and controlled fuels (Part 4 of Act) with relevant emission standards. The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.	National DEA uThungulu District Municipality uMhlathuze Local Municipality	An Air Emissions License is required to be obtained for the project in terms of the NEM: Air Quality Act. Combustion installations used primarily for steam raising or electricity generation are Listed Activities (Category 1) in term of Section 21 of the NEM: AQA. Facilities with a design capacity equal to or greater than 50 MW and using liquid fuels are Sub-category 1.2 Listed Activities, while those using gaseous fuels are Sub-category 1.4 Listed Activities. The storage and handling of petroleum products at facilities with a combined storage capacity of 1 000 m3 is a Listed Activity (Category 2, sub-category 2.4) (Government Notice 893, Government Gazette 37054 of 22 November 2016). Special arrangements apply for Sub-category 2.4 Listed Activities depending on the vapour pressure of

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	Dust control regulations promulgated in November 2013 may require the implementation of a dust management plan. GNR831 of 01 November 2013 establishes emission standards and reporting requirements for small boilers (i.e. boilers with a capacity between 10MW and 50MW).		products being stored. Richards Bay Gas Power 2 propose to store more than 1 000m^3 of diesel. Special conditions for Sub-category refer to the design of the storage tank, Leak Detection and Repair and vapour recovery for road and rail offloading facilities. The consequence of listing an activity is described in Section 22 of the NEM: AQA, i.e. that no person may conduct a Listed Activity without a provisional Atmospheric Emission License or an Atmospheric Emission License (AEL).
National Forests Act (Act No 84 of 1998)	The purpose of this act is to amongst others, promote the sustainable management and development of forests for the benefit of all. The act defines the following: "*Forest*" includes- (a) a natural forest, a woodland and a plantation; (b) the forest produce in it; and "*Natural forest*" means a group of indigenous trees- (a) whose crowns are largely contiguous; or (b) which have been declared by the Minister to be a natural forest under section 7(2);	DAFF KZN DEDTEA	A permit or license is required for the destruction of protected tree species and/or indigenous tree species within a natural forest. Whilst the proposed site does not fall within a "natural forest", the following tree species were identified on site according to the Ecological Impact Assessment:

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	(c) the ecosystems which it makes up A license is required to cut, disturb, damage or destroy any indigenous tree in a natural forest; or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any tree, or any forest product derived from an indigenous tree in a natural forest. Further, the minister may publish a list of protected trees. No person may- (a) cut, disturb, damage or destroy any protected tree; or (b) possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, or any forest product derived for a protected tree, except- if they have a license to do.		
National Veld and Forest Fire Act (Act No 101 of 1998)	In terms of S13 the landowner would be required to burn firebreaks to ensure that should a veldfire occur on the property, that it does not spread to adjoining land. In terms of S13 the landowner must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from spreading, not causing erosion, and is reasonably free of inflammable material. In terms of S17, the applicant must have such equipment,	DAFF	While no permitting or licensing requirements arise from this legislation, this Act will find application during the construction and operational phase of the project The relevant management and mitigation measures have been included in the EMPr (refer to Appendix I).

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	protective clothing, and trained personnel for extinguishing fires.		
Environment Conservation Act (Act No 73 of 1989)	In terms of Section 25 of the ECA, the national noise-control regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996, legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities.	DEA KZN DEDTEA uMhlathuze Local Municipality	The facility is located more than 1000m from the closest potential noise-sensitive receptors and therefore the potential of a noise impact would be low. This is in line with point 5.4 (h) of SANS 10328:2003, that states that if industry is to be situated further than 1000m from noise-sensitive developments the activity is unlikely to have any acoustical implications. No further studies in this regard are therefore required and no permits are required.
Hazardous Substances Act (Act No 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death by reason of their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or	Department of Health uMhlathuze Local Municipality	It is necessary to identify and list all the Group I, II, III and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	dumping of such substances and products. » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; » Group IV: any electronic product; » Group V: any radioactive material. The use, conveyance or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
National Road Traffic Act (Act No 93 of 1996)	The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed.	Provincial Department of Transport (provincial roads) South African National Roads Agency Limited (national roads)	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include: » Route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts. The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		limitations (length) of 22m. » Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).
Provincial Legislation/ Policies / Plans			
KZN Conservation Management Act, 1997	The KZN Conservation Management Act, 1997 (No 9 of 1997) provides for the establishment of the KZN Conservation and prescribes its powers, duties and functions which include: » Direct Nature conservation management; and » Direct Protected areas management. This is currently carried out by Ezemvelo KZN Wildlife (EKZNW).	DEDTEA Ezemvelo KZN Wildlife (EKZNW)	Whilst most plant species identified at the site were species of 'Least Concern', there were two (2) species of plant identified which are 'specially protected plant species' in terms of the Natal Conservation Ordinance. These are *Crinum delagoense* (Candy striped Crinum, 'Declining' threat status) and the SA Endemic *Ledebouria ovatifolia* (identification of this species was made

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
			difficult as it was not flowering at the time of the survey). Both species were observed occurring in patches amongst other grasses/herbs in the grassland community. These are protected under Schedule 12 (Specially Protected Indigenous Plants) of the KZN Conservation Ordinance No. 15 of 1974. *A permit needs to be applied for with regards to relocating any of these species.*
EKWNW Norms and Standards on Biodiversity Offset for KwaZulu-Natal	The Provincial Norms and Standards on Biodiversity Offset for KwaZulu-Natal have been developed by Ezemvelo KZN Wildlife (Ezemvelo) (2009, 2013). The document provides details on how Ezemvelo, as the provincial biodiversity authority, requires offsets to be investigated and what information must be provided in an Offset Report.	Ezemvelo KZN Wildlife (Ezemvelo)	An offset has already been agreed to under the EIA carried out for the RBIDZ.
Local Legislation / Policies / Plans			
uThungulu District Municipality (UDM) Integrated Development Plan (IDP) (2012/2013-2014/2015)	The district with the support of its social partners like Cooperative Governance and Traditional Affairs (COGTA) is currently implementing innovative renewable and clean energy projects. The most notable projects in UDM are the Biogas and Wonderpot projects. Local economic development opportunities that will	uThungulu District Municipality	New developments in the UDM to be in line with the IDP.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	promote job creation are one of the key strategic objectives of the district municipality.		
uThungulu District Municipality (UDM) Spatial Development Framework (SDF) (2012)	Richards Bay, Msunduzi, Newcastle and Port Shepstone has been identified as provincial Secondary Nodes and thus urban centres with good existing economic development and the potential for growth and services to the regional economy. The SDF states that a major economic sector is manufacturing which is located in Richards Bay. It is important to continue enforcing investor confidence through the provision of infrastructure. It also notes the need to encourage alternative energy use in future developments given constraints in the electrification industry is critical.	uThungulu District Municipality	New developments in the UDM to be in line with the SDF.
uMhlathuze Local Municipality (ULM) Integrated Development Plan (IDP) (2012-2017)	Key issues of the ULM include climate change, low levels of skills development and literacy, high rates if unemployment, low economic growth and high levels of poverty.	uMhlathuze Local Municipality	New developments in the ULM to be in line with the IDP.
uMhlathuze Spatial Development Framework (2007)	As part of the SDF, four (4) spatial development goals were identified. These include: (i) Promote Sustainable urban Development, (ii) Environmental management and Conservation, (iii) Promote Economic Development (Permitting and encouraging diverse land	uMhlathuze Local Municipality	New developments in the ULM to be in line with the SDF.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	uses at appropriate locations to develop the economy. Boosting those economic sectors/activities that have the potential to grow and create employment and income.), and (iv) Provision of a minimum Level of Service (LOS) to all (New developments should, as far as possible, be serviced by existing infrastructure networks. Indicate where infrastructure investment is needed to provide minimum LOS).		
Richards Bay Environmental Management Framework	An Environmental Management Framework (EMF) was developed for an area of approximately 25 000 hectares within the uMhlathuze Municipality. This area is of strategic importance to the country because it contains the Port of Richards Bay and the nationally designated IDZ and the purpose of an EMF was to secure environmental protection and promote sustainability and cooperative environmental governance. The overall aim of the EMF is to guide decision-making in the area. The EMF notes that Phase 1 F falls within the Coastal Plain Commercial-Industrial Zone (Zone 7 of the EMF). It is located in the Alton North Area, a few kilometres to the north of the other IDZ sites. The Nsezi Rail Yard lies immediately to the west of this phase. The Richards Bay Cemetery lies to	Richards Bay IDZ	New developments are to be in line with the Richards Bay Environmental Management Framework.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	the north-east. The area to the south-east of the site is used for light industrial development. The EMF Zone 7 objective is 'To promote sustainable commercial and industrial development that is able to secure ecosystem productivity over the long-term.' There is still space to advance industrial development but the prevailing environmental constraints on these sites may limit the extent to which this potential could be realised. The IDZ objectives must be promoted in this phase but this must take cognisance of the environmental constraints.		
Standards			
Noise Standards	Four South African Bureau of Standards (SABS) scientific standards are considered relevant to noise. They 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	Local Municipality	The recommendations that the standards make are likely to inform decisions by authorities, but non-compliance with the standards will not necessarily render an activity unlawful per se.

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	propagation by the Concave method'. The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes.		
Air Standards SANS 69 - South African National Standard - Framework for setting & implementing national ambient air quality standards, SANS 1929 - South African National Standard - Ambient Air Quality - Limits for common pollutants.	The South African Bureau of Standards (SABS), through a technical committee, developed ambient air quality limits, based on international best practice for particulate matter less than 10 µm in aerodynamic diameter (PM10), dust fallout, sulphur dioxide, nitrogen dioxide, ozone, carbon monoxide, lead and benzene. These ambient limits were derived from international best practice and what was regarded to be achievable in the South African context, taking both the natural environment and socio-economic status into account. The SANS limits informed the newly promulgated SA Standards	Local Municipality	The recommendations that the standards make are likely to inform decisions by authorities, but non-compliance with the standards will not necessarily render an activity unlawful per se.
Air Quality IFC Air Emissions and Ambient Air Quality. Environmental, Health and Safety	The World Bank group through the IFC has emission guidelines for power plants. These guidelines are applicable to new facilities. Please note that the emission values are normalised to 6%	Local Municipality	The recommendations that the standards make are likely to inform decisions by authorities, but non-compliance with the standards will not

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
Guidelines. Washington DC, International Finance Corporation	excess oxygen, while the South African standards are normalised to 10% excess oxygen.		necessarily render an activity unlawful per se.
Waste Management IFC Environmental, Health, and Safety (EHS) Guidelines: General EHS Guidelines: Environmental Waste Management	Waste management should be addressed through a Waste management system that addresses issues linked to waste minimization, generation, transport, disposal, and monitoring. Facilities that generate waste should characterize their waste according to composition, source, types of wastes produced, generation rates, or according to local regulatory requirements. Small Quantities of Hazardous Waste: Hazardous waste materials are frequently generated in small quantities by many projects through a variety of activities such as equipment and building maintenance activities. Examples of these types of wastes include: spent solvents and oily rags, empty paint cans, chemical containers; used lubricating oil; used batteries (such as nickel-cadmium or lead acid); and lighting equipment, such as lamps or lamp ballasts. IFC EHS Waste Guidelines should be adhered to where practical.	Local Municipality	The recommendations that the IFC make are likely to inform decisions by authorities, but non-compliance with the standards will not necessarily render an activity unlawful per se.
The Equator Principles (June 2003)	» The Equator Principles (EPs) are a voluntary set of standards for determining, assessing	Local Municipality	The recommendations that the standards make are likely to inform decisions by

Legislation / Policy / Guideline	Applicable Requirements	Relevant Authority	Compliance requirements
	and managing social and environmental risk in project financing. Equator Principles Financial Institutions (EPFIs) commit to not providing loans to projects where the borrower will not or is unable to comply with their respective social and environmental policies and procedures that implement the EPs. » The Equator Principles were developed by private sector banks. The banks chose to model the Equator Principles on the environmental standards of the World Bank and the social policies of the International Finance Corporation (IFC).		authorities, but non-compliance with the standards will not necessarily render an activity unlawful per se.

DESCRIPTION OF THE RECEIVING ENVIRONMENT CHAPTER 5

This section of the EIA Report provides a description of the environment that may be affected by the proposed gas to power plant in the Richards Bay Industrial Development Zone (RBIDZ). This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as collected field data, and aims to provide the context within which this EIA is being conducted. A comprehensive description of the ecological, social and ambient air quality aspects of the affected environment is included within the specialist reports contained within the **Appendices F – H**.

5.1. Regional and Local Setting

The KwaZulu-Natal (KZN) Province is situated in the east of South Africa. The province shares its boundaries with the Mpumalanga, Free State and Eastern Cape Provinces. The proposed development falls under the jurisdiction of the uMhlathuze Local Municipality (ULM) and within the greater uThungulu District Municipality (UDM). The ULM is situated on the coast of the Indian Ocean. It is one of six (6) municipalities that form part of the UDM. In 2002 Richards Bay and Empangeni, as well as the surrounding rural and tribal areas merged to form the "City of uMhlathuze" covering an area of approximately 800km² and supporting approximately 300 000 people.

The gas to power plant and associated infrastructure is proposed to be located on erven 17455, 17443 and 17442 within the Richards Bay Industrial Development Zone (IDZ) Phase 1F (refer to Figure 5.1 and Figure 5.2). Phase 1F of the IDZ falls within the Coastal Plain Commercial-Industrial Area Zone (Zone 7 of the EMF). Zone 7 represents fairly flat land on the sandy coastal plain. The land in Phase 1F is zoned as general industrial. Therefore it is used primarily for light and heavy industrial purposes, business and commerce, and forms the economic hub of the municipality. The 2005 IDZ Designation Notice promoted the area for "a Ferro-Metals Cluster as well as RHI Refractories". The Tata Steel Ferrochrome Smelter was subsequently established in this phase.

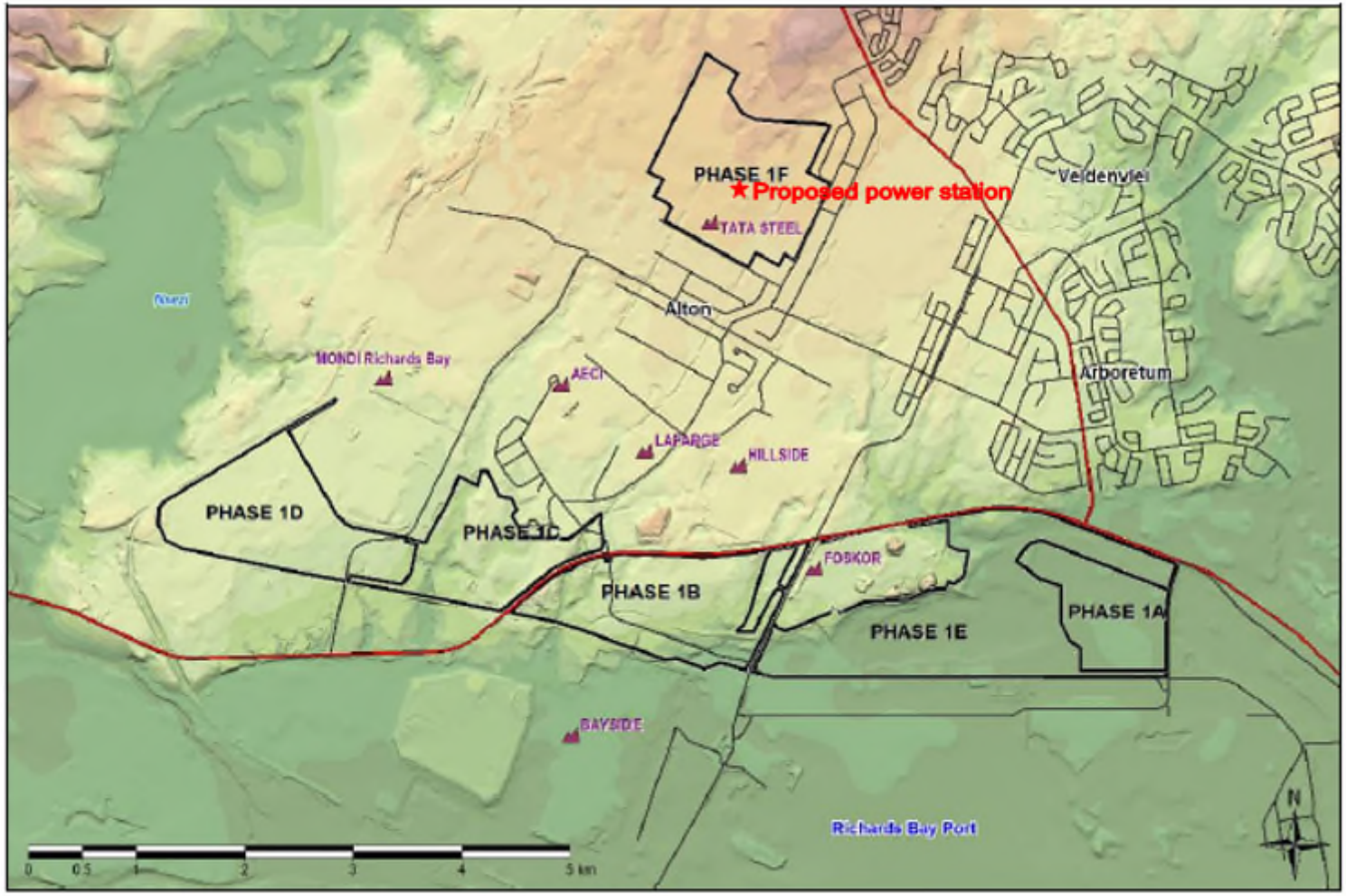

Figure 5.1: Context of the Gas to Power Plant site within the RBIDZ (Source: Thorn-Ex, 2011)

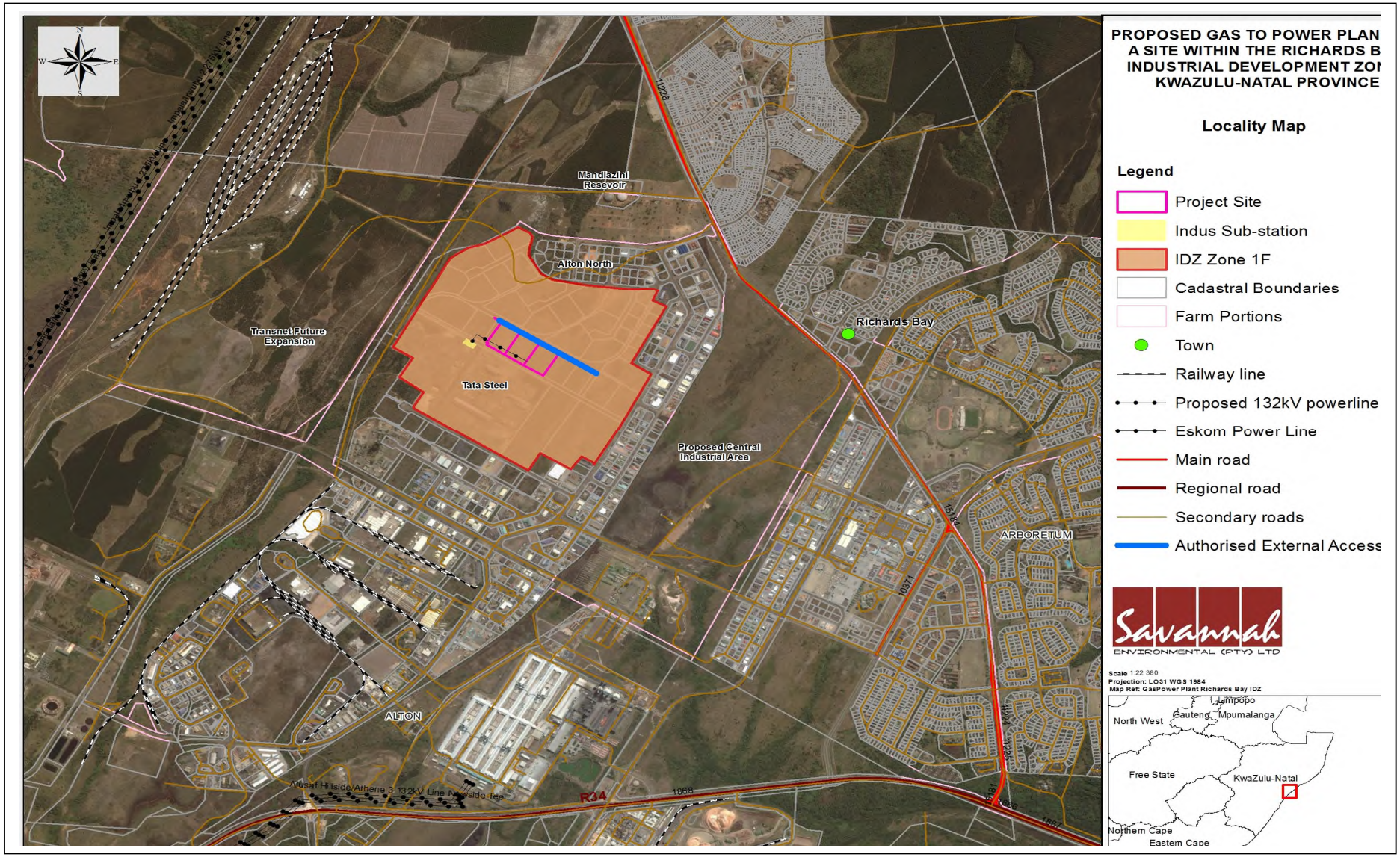

Figure 5.2: Site map of the gas to power plant within the RBIDZ

5.2. Land Use

The site is zoned as IDZ Industrial by the uMhlatuze municipality. IDZ Industry provides for lower impact industries as compared to General Industrial zonation. In terms of land use, the quaternary catchment is characterised by intense past land-use modifications from agriculture, mining, tourism, residential, recreational and industrial development activities.

The study area within the IDZ Phase 1F is bordered by mixed-use industrial developments as well as residential areas and open areas. The broader surrounding area contributes significantly to the stormwater drainage that runs through the study site. Potential impacts include a loss of undeveloped areas locally. No specific specialist study was undertaken in terms of land use as the proposed development within the RBIDZ does occur in close proximity to existing commercial/industrial areas.

5.3. Climatic Conditions

The study area is located within the coastal belt of KZN, which ranges from 15 to 65km wide along the east coast of South Africa, from sea level to an altitude of 450m. The temperate sub-tropical climate experienced in Richards Bay is attributed to its sub-tropical latitudes, the location adjacent to the warm Indian Ocean and the low elevation, and the relative position and strength of the semi-permanent high-pressure system resident over the Indian Ocean. Collectively these factors result in generally warm and sunny conditions throughout the year. These conditions are occasionally interrupted in winter by the passage of coastal lows and cold front systems that move up the coast, introducing cooler temperatures and cloudy conditions with strong winds.

The average monthly maximum and minimum temperatures are shown in Figure 5.3 with the average monthly rainfall per month. The average summer maximum temperatures exceed 28°C from December to March, when it is also very humid. Winters are mild with the average minimum temperature of 17.3 °C (SAWB, 1998). The average annual rainfall at Richards Bay is 1 228 mm (SAWB, 1998). The majority of rainfall occurs from October to March and this period is usually associated with convective summer storms. Winter rainfall is not uncommon and is associated with the passage of cold fronts.

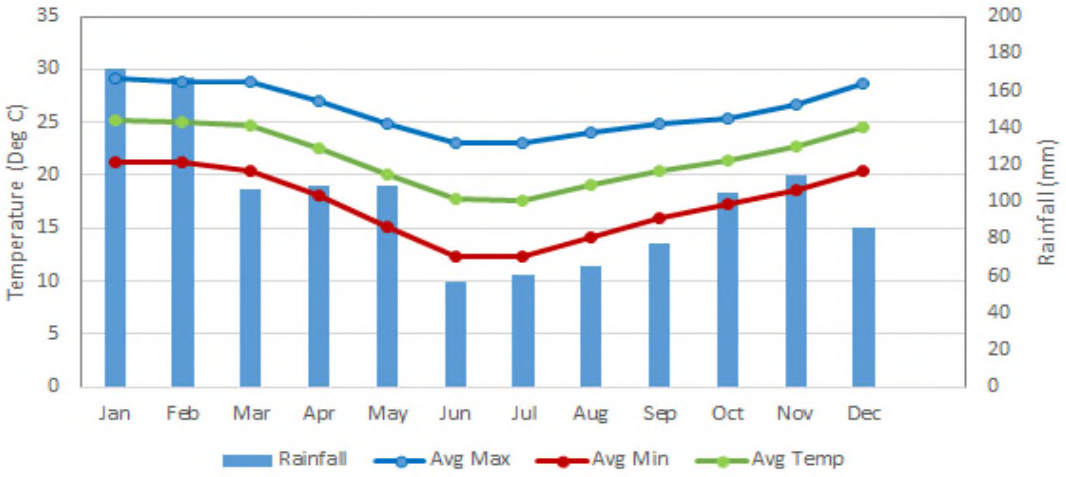

Figure 5.3: Average monthly maximum, minimum and daily temperature in Richards Bay (SAWB, 1992) and the average monthly rainfall in mm (SAWB, 1998)

The South African Weather Services (SAWS) station at the Richards Bay Airport provides a good representation of the prevailing wind direction across the region. The windrose at Richards Bay Airport for the 5-year period 1 January 2010 to 31 December 2014 is shown in Figure 5.4. The predominant winds are associated with the Indian Ocean high pressure system and its movement relative to Richards Bay, with coastal lows and the passage of frontal systems. The winds are generally aligned with the coastline and in Richards Bay winds occur predominantly in the sector north to north-northeast and in the sector south to southwest. 32% of all winds occur from the northerly sector. Most of these winds are light to moderate with just 6% exceeding 8.8 m/s. The winds from the south to south-west account for 17% of all winds. While these winds are generally light to moderate, they are strong at times and exceed 11.1 m/s on occasions. These strong winds are usually associated with the passage of deep coastal lows ahead of cold frontal systems.

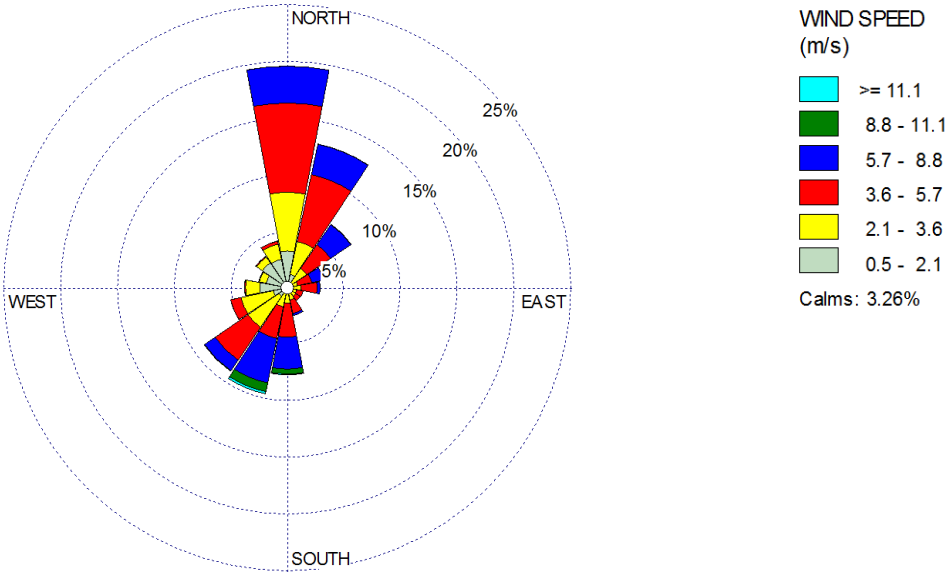

Figure 5.4: Windrose at Richards Bay Airport 2010 to 2014 (SAWB, 1998)

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

5.4. Ambient Air Quality

Ambient air quality in Richards Bay is influenced by a number of sources of air pollution, including large and smaller industry, transportation, agricultural burning and mining. Emissions from industrial facilities include SO_2, NO_X, particulate matter and fluoride. Operations at the Port of Richards Bay include the ore export terminal and the coal terminal, which is a source of particulates. Other activities at the port include the handling of break bulk cargo and petrochemical products which emit particulates and volatile organic compounds (VOCs). Emissions from shipping and port side vehicles and equipment are also sources of SO_2, NO_X, particulates and VOCs.

The Richards Bay Clean Air Association (RBCAA) and the uMhlathuze Municipality (UM) conduct ambient air quality monitoring in the area. Monitoring is also done by some industrial facilities. Data collected by the RBCAA is reported monthly to the South African Ambient Air Quality Information System (SAAQIS) which is hosted and managed by SAWS. The RBCAA monitoring stations that are closest to the proposed Gas to Power Plant site are Brakenham, the CBD and Arboretum. These monitoring stations provided a measure of exposure to air pollutants in the closest residential areas. The ambient monitoring data for 2012, 2013 and 2014 at these monitoring stations indicates the following:

» Occasional exceedances of the National Ambient Air Quality Standards (NAAQS) in terms of particulates (PM_{10}), all occurring in winter.
» General compliance with SAAQS SO_2 limit value of 350 µg/m^3. There is also a clear seasonal cycle in SO_2 concentrations with higher values in winter.
» Ambient concentrations of SO_2 and NO_2 measured at Arboretum are well below the respective NAAQS in 2015.

5.5. Ecoregion

The study area falls within the Natal Coastal Plain (Ecoregion 13.03) which can be characterized by plains with a low relief (Kleynhans *et al.,* 2005). Drainage density is generally regarded as low with stream frequency being low-medium, with few perennial streams originating in this region (large rivers include the Mfolozi, Mkuze and Mhlatuzane rivers). Coastal bushveld/grassland dominates the vegetation, with limited patches of sand forest and valley thicket also occurring.

5.6. Biophysical Characteristics of the Study Area

5.6.1. Topography and Hydrology

The study area is located on the Maputaland Coastal Plain. The Maputaland Coastal Plain is characterised by relatively flat to slightly undulating paeleodune fields. The majority of these areas feature approximately north/south orientated drainage systems linked with the dune-slacks and depressions created in these historic windblown landscapes.

The topographical characteristics of the area give rise to a local landscape that is characterised by an interconnected network of hydrological ecosystems that sustains a combination of locally important habitats and species which contribute to the maintenance of one of South Africa's biodiversity hotspots. The existence of water-logged areas on the plain has necessitated earlier construction of drainage channels to mitigate potential flooding, particularly in the industrial area of Alton. The eastern parts of the IDZ extend into the historical floodplain of the study area where alluvial and estuarine elements are still present.

Water is a limiting factor for further industrial development because of its availability and variability. The complex hydrological regime in the RBIDZ represents various surface water features (lakes, wetlands, rivers and streams) that have strong linkages with the groundwater features (various coastal aquifers). This situation generates a very sensitive environment in which negative impacts on the groundwater will be reflected in the surface water bodies and vice-versa. The hydrological network also has strong ecological linkages, giving rise to unique aquatic, estuarine and marine habitats. This complex situation makes the groundwater-surface water interaction highly vulnerable to development and contamination risks are a general concern in the area. A Strategic Level Assessment of the Geohydrological Conditions in the uMhlathuze Municipal Area was undertaken by Golder in 2004. This study defined the groundwater characteristics of the area and it serves as an information tool for prospective developers to understand potential geohydrological risks and to guide the level of investigation required to address these risks. In this regard, the proposed Project site falls within an area classified as "not considered sensitive" (refer to Figure 5.6).

Wetland systems were identified on the north-western and eastern portions of the site (Nemai Consulting, 2015; refer to Figure 5.5). The wetland assessment stated that wetland units in blue should be retained due to their respective relatively natural and moderately modified condition and the services they render whereas the wetland unit in red could be developed as it was largely modified and the services it offers have largely been impacted on by a drain that had been cut into it (Nemai Consulting, 2015). A general construction method statement for the infill of wetlands is provided in Nemai Consulting, 2015 EIA Report.

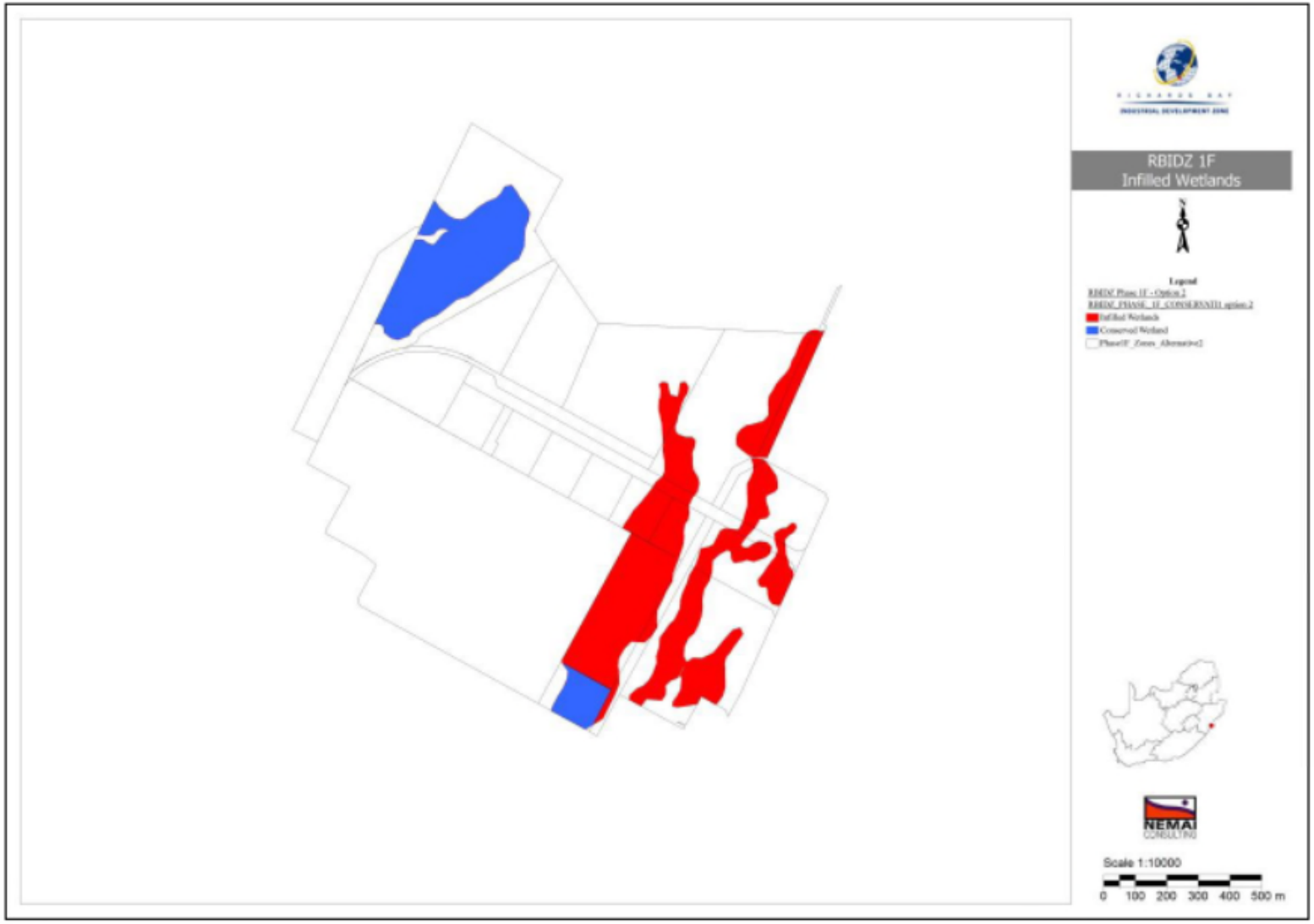

Figure 5.5: Wetlands identified within IDZ 1F, showing wetlands which will be infilled (red) and those to be conserved (blue) (NEMAI Consulting, 2015)

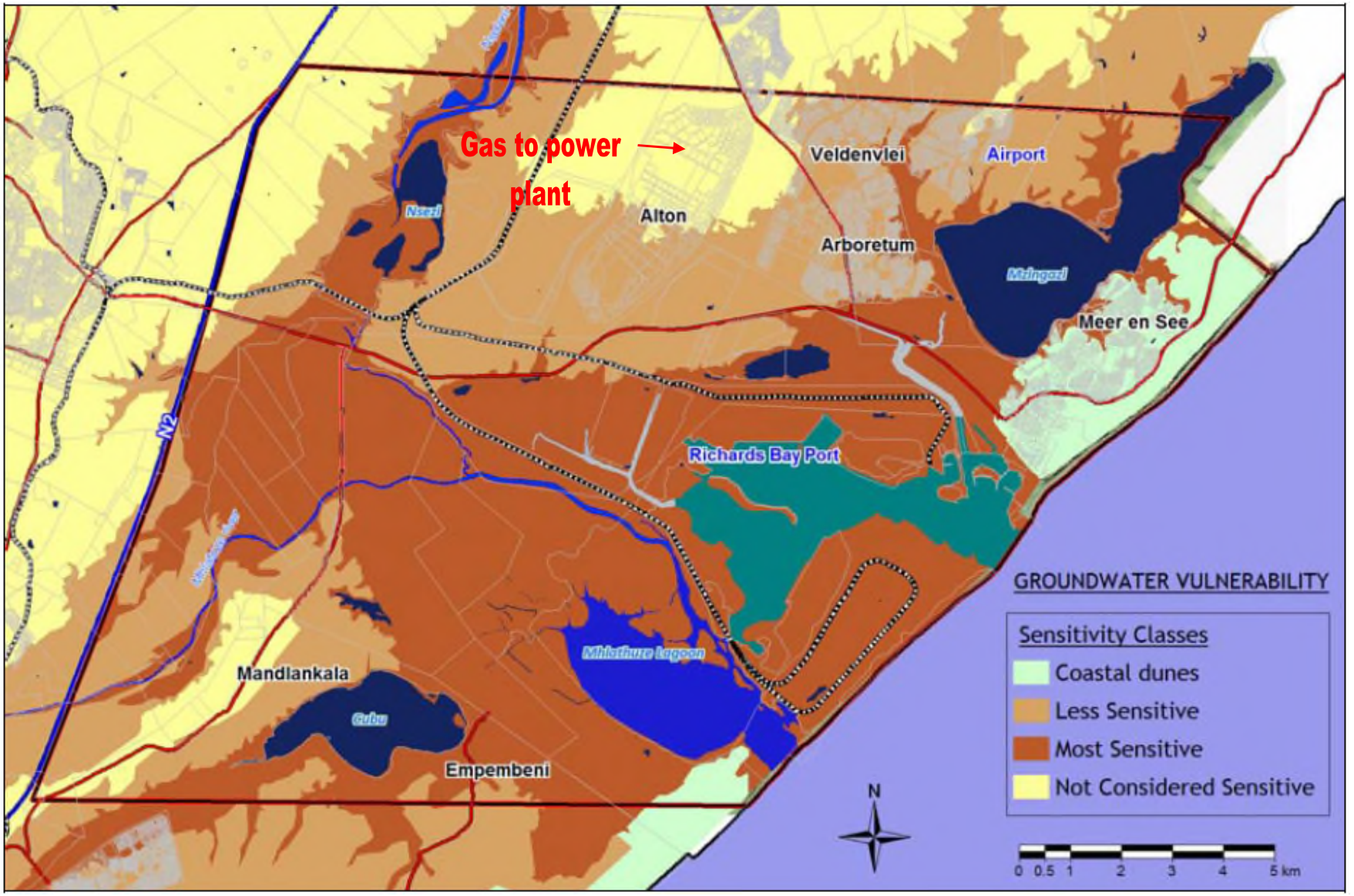

Figure 5.6: Groundwater Vulnerability Classes (Source: Thornhil, 2010)

As part of the Wetland Offset Plan, the conservation and rehabilitation of the wetlands in blue was assessed in light of the proposed loss of the wetlands in red and it was found that wetlands in red provides the following contributions:

» To wetland functionality = 0.23 ha; and
» To ecosystem conservation = 10.4 ha.

These results indicate that, due to its existing healthy state, rehabilitation and protection of the blue wetland, including its 30m buffer zone, will contribute little wetland gain in terms of functionality, particularly when compared with the 14.82 ha required to offset the losses incurred by allowing development. Thus, additional offset area will be required to meet this target. Preservation of the blue wetland will meet the estimated Ecosystem Conservation Target, and should certainly be zoned as conservation amenity within the Phase 1F development. A Wetland Management Plan has been compiled as part of the Nemai Consulting EIA Report, 2015 and the main activities for wetland rehabilitation include:

» Appropriate securing (fencing) of designated wetland areas and erection of informative and educational signage;
» Eradication of invasive alien plant species in all wetland areas through removal and sustained treatment (on-going maintenance programme);
» The clearing and safe disposal of any waste found in all wetland areas with specific attention to wetlands in red, including the drainage canal;
» The planting of appropriate indigenous plant species, as per sustainable urban drainage system (SUDS) requirements; and
» The replacement of the northern portion of the drainage canal with a pipeline system (and suitable erosion prevention methods) allowing for platforming of this section for possible development.

5.5.2. Geology and Soils

The study area is located on the Maputaland Coastal Plain, characterised by relatively flat to slightly undulating paeleodune fields comprised of recent (Quaternary Age) sedimentary deposits of Aeolian/marine origin (~18 000 years old) and comprising mainly yellowish and argillaceous redistributed sands (Berea and Muzi Formations of the Maputaland Group, respectively). In addition, the DAFF Soil Classes information shows that the site occurs on imperfectly drained sandy soils, with favourable water-holding properties. These soils are usually highly erodible (Nemai Consulting, 2015).

Geotechnical Conditions

The geology and the hydrological regime of the area have given rise to geotechnical conditions that represent constraints to development. An Engineering Geology Study,

undertaken by Golder in 2005, broadly classified areas for the purpose of identifying constraints to development as well as difficult founding conditions, or other geotechnical factors affecting urban development (refer to Figure 5.7). The zonal prefix (A-D) is based on the severity of the geotechnical or development constraints, or a combination of both, for a specific unit. They serve as an early warning for engineers and developers. The geotechnical and development constraint categories of the environmental sensitive zones are:

» **A** have no restrictions on development.
» **B** are developable, but with minor geotechnical and/or development constraints
» **C** is developable but with more costly geotechnical and/or development constraints. More detailed geotechnical investigations may be required.
» **D** recommends no development, or more detailed geotechnical investigations required.

In this regard, the proposed Project site falls within conditions classified as **A** and/or **B**.

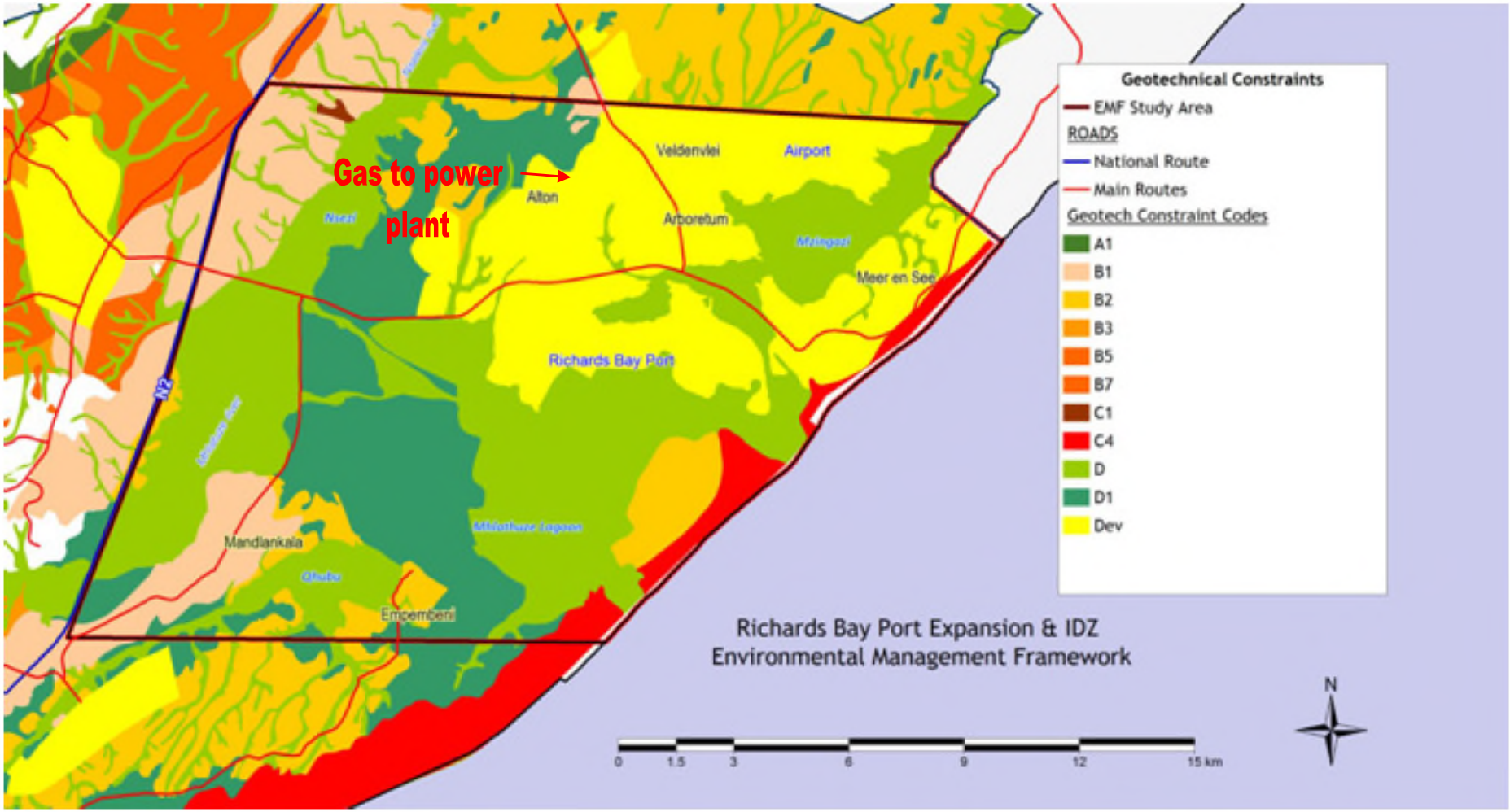

Figure 5.7: Geotechnical Conditions (Source: Thornhill, 2010)

5.5.3. Agricultural Potential

According to the Agricultural Geo-Referenced Information System (AGIS), the Project site is located on an area that is considered to have a moderate agricultural potential in terms of arable land. Various factors have constraints that prohibit crop production and lead to insignificant agricultural activities except that of grazing. The proposed project site is surrounded by existing farming and forestry activity and other industry to the south east and north (NEMAI Consulting, 2014). The proposed project site has been identified for industrial development as part of the IDZ planning. This, together with the limited size of the site and surrounding land use render this site of low importance form an agricultural perspective.

5.5.4. Ecological History of the site

According to the Biodiversity Study of Alton North Richards Bay undertaken in 2005 by O'Connor and Associates, the site has experienced two environmental perturbations that are judged to have had 'an enormous influence on its biodiversity and ecological functioning'. The first is associated with the planting of historic *Pinus and Eucalyptus sp*. tree plantations (Google Earth™ imagery shows the area under plantation forestry between 2004 – 2012, refer to Figure 5.8). In addition to the direct loss of indigenous vegetation through land transformation, the introduction of evergreen species into seasonal vegetation results in a concomitant increase in transpirational losses and leaves the area susceptible to alien and weed invasion. A second impact has been the canalisation of water flow in the area, with a consequent effect being the lowering of the water table within the pre-existing dryland component of the environment. Based on the history of ecological disturbance at the site (O'Connor and Associates, 2005) remaining open grassland habitat is largely degraded and secondary in nature, with signs of earthworks, vehicle/human tracks, tarred roads (former airfield)and general soil disturbance associated with historic plantation forestry.

Figure 5.8: Google EarthTM maps showing the site in 2004 (western half under plantation forestry, eastern half operating as a light airfield)

5.5.5. Flora

Scott-Shaw and Escott (2011) described the RBIDZ Phase 1F study area as falling within Forest, Wetland and Indian Ocean Coastal Belt Biomes. The RBIDZ Phase 1F study area traverses four (4) vegetation types-namely Freshwater Wetlands: Subtropical Freshwater Wetlands; Freshwater Wetlands: Subtropical Freshwater Wetlands: Coastal Lakes and Pans; KwaZulu-Natal Coastal Forests: Maputaland Moist Coastal Lowlands Forest and Maputaland Wooded Grassland (Scott-Shaw and Escott, 2011).

At a local scale, the proposed project site falls within the Maputaland Wooded Grassland (refer to Figure 5.9). The Maputaland Wooded grassland vegetation type is found in KwaZulu-Natal Province and southern Mozambique. In South Africa, it occurs from the Mozambique border near KwaNgwanase southwards to Sileza, Sibaya, Mseleni, Mbazwana, Sodwana Bay, Ozabeni, eastern and western shores of Lake St Lucia, KwaMbonambi and as far south as near Richards Bay (Mucina and Rutherford, 2006).

This vegetation type is listed as Endangered with a national conservation target of 25%. About 17% of this vegetation type is statutorily conserved mainly in the Greater St Lucia Wetland Park. Some 46% is transformed mostly due to plantations and partly for cultivated land. The southern half of the area is not protected and it is here that over 90% of the extent of the vegetation type has been transformed—mostly to pulpwood timber plantations, cane fields and informal settlements. Alien species include the scattered populations of *Chromolaenaodorataand Lantana camara* (Mucina and Rutherford, 2006).

Terrestrial threatened ecosystems

The South African National Biodiversity Institute (SANBI) in conjunction with the DEA released a draft report in 2009 entitled "Threatened Ecosystems in South Africa: Descriptions and Maps", to provide background information on the List of Threatened Ecosystems. The purpose of the report was to present a detailed description of each of South Africa's ecosystems and to determine their status using a credible and practical set of criteria. The list classified all threatened or protected ecosystems in South Africa in terms of four categories; Critically Endangered (CR), Endangered (EN), Vulnerable (VU), or Protected. According to the Nemai Consulting EIA Report, 2015, the Critically Endangered Kwambonambi Hygrophilous Grasslands was listed as the only terrestrial threatened ecosystem recorded in the RBIDZ Phase 1F.

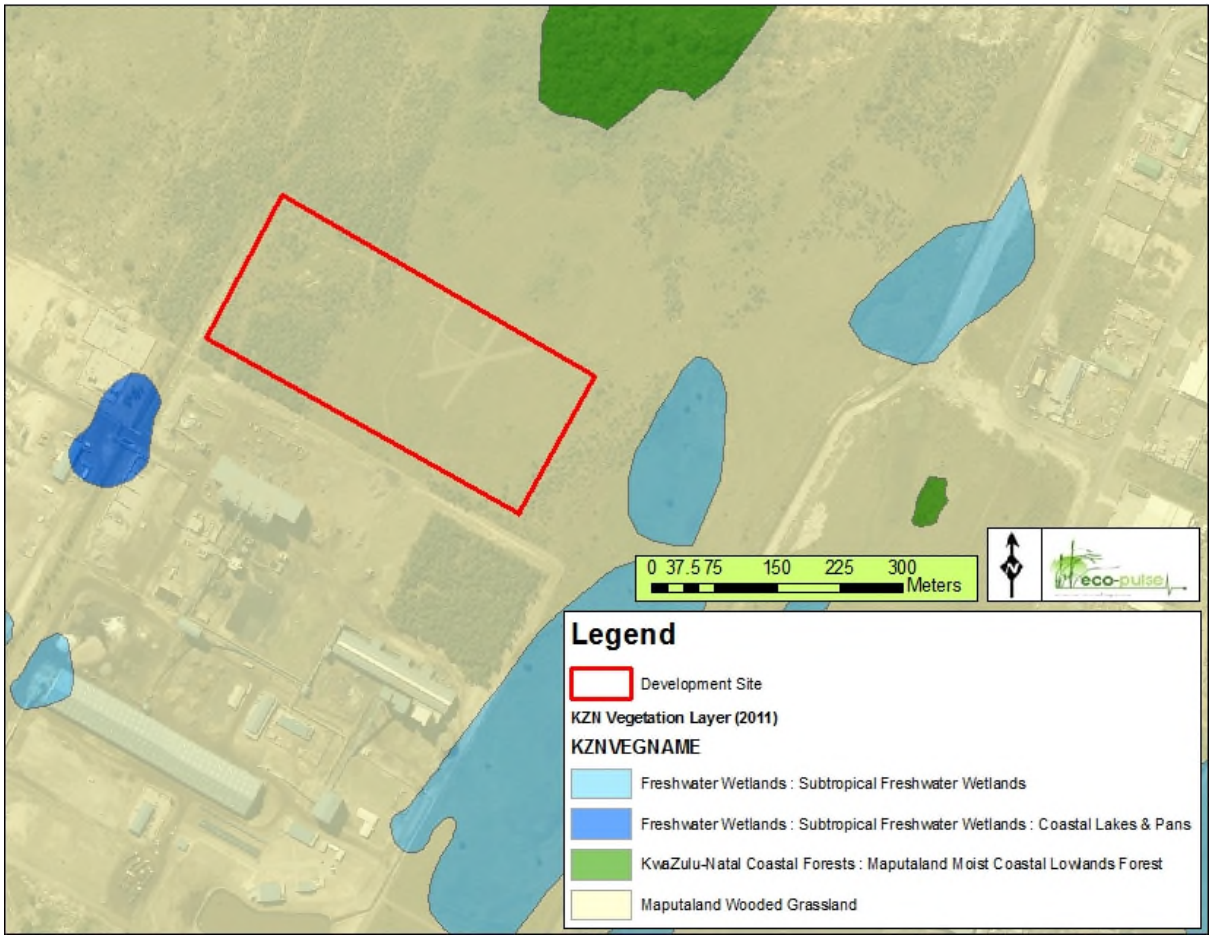

Figure 5.9 Map showing the different regional vegetation units classified according to Ezemvelo KZN Wildlife's Provincial Vegetation Map (2011), with the location of the proposed site indicated in "red"

The broader grassland community was found to be dominated by a number of indigenous grasses, including *Aristida junciformis subsp. junciformis, Themeda triandra, Perotis patens* and *Imperata cylindrica* with patches of *Melinis repens* and *Sporobolus africanus* among other subordinate grasses characteristic of disturbance, overgrazing and previous cultivation. The majority of grasses encountered are typical 'Increaser' grass species characteristic of disturbed/overgrazed veld. The KZN endemic sedge, *Cyperus natalensis*, was found in relatively high abundance amongst the other grass species. Short woody and herbaceous indigenous low shrubs dominated much of the grassland, with the main species being the short aromatic shrublet, *Helichcrysum kraussii,* and the dwarf woody shrublet *Parinari capensis subsp. incohata* (Sand mobola plum). Small indigenous trees (early growth stage) including mainly *Syzgium cordatum* (Waterberry, uMdoni tree) and *Dichrostachys cinerea* were subdominant and interspersed amongst *Strychnos spinosa* and *Brachylaena discolor*. Other woody species such as *Hyphaene coriacea* (lala palm), *Phoenix reclinata* and *Albizia adianthifolia* were present, albeit at very low abundance levels with only one or two specimens of each species observed. Small herbaceous and flowering plants were observed scattered within the broader grassland community and at generally low levels of abundance, with the main ones being *Hypoxis angustifolia, Justicia*

peteolaris, Lobelia coronopifolia, Commelina Africana, Tephrosia purpurea and *Vernonia centauroides.* A full list of flora identified on the site is provided in Annexure B of the Terrestrial Ecological Impact Assessment (attached as Appendix H).

Whilst most plant species identified at the site were species of 'Least Concern', there were two (2) species of plant identified which are 'specially protected plant species' in terms of the Natal Conservation Ordinance No. 15 of 1974. These are *Crinum delagoense* (Candy striped Crinum, 'Declining' threat status) and the SA Endemic *Ledebouria ovatifolia* (identification of this species was made difficult as it was not flowering at the time of the survey). Both species were observed occurring in patches amongst other grasses/herbs in the grassland community, with the location of these plant species shown in the Environmental Sensitivity Map for the project site (refer to Appendix B). These are protected under Schedule 12 (Specially Protected Indigenous Plants) of the Natal Conservation Ordinance No. 15 of 1974. A permit needs to be applied for with regards to relocating any of these species.

As a result of the disturbance created by forestry and other human activities (model airfield), a number of Invasive Alien Plants (IAPs) and exotic weeds characterise the site, with the most abundant woody alien plant being *Psidium guajava* (Guava), which has invaded areas of the grassland and was observed scattered amongst other species across the broader vegetation community as well as in dense patches just west of the old airfield buildings. Other species such as *Richardia brasiliensis*, *Cuscata campestris*, *Sesbania bispinosa* and *Acacia mearnsii* were observed at low levels and scattered throughout the unit.

5.5.6. Fauna

» **Mammals**

A diversity of mammal species could potentially occur within the study area, including a number of locally common small mammal species such as Duiker, Vervet Monkey, Tete Veld Rat, Natal Multimammate Mouse, Pygmy Mouse and the Wahlberg's Epauletted Fruit Bat (all listed as being of Least Concern). Species encountered at the broader RBIDZ Phase 1F site in the past (NEMAI Consulting, 2015) included Scrub hare, Common house mouse, House rat and Grey Duiker (all common species of Least Concern). The generally high level of disturbance and transformation in the area means that many of the larger species, which would have occurred in the area historically, have become locally extinct. The dominant small mammal species are therefore likely to be those with one or more of the following traits:

* Have generally small range requirements and broad habitat requirements;
* Tolerance for noise/light disturbance;
* Characterised by high reproductive and survival rates; and
* The ability to move easily between vegetation patches.

A number of small mammal species of conservation concern (including mice, shrews and moles) could occur within the grassland habitat at the site based on available distribution records (these are listed in Appendix H, the Ecology Impact Assessment).

The majority of larger mammal species are likely to have been eradicated or have moved away from the area due to high levels of habitat transformation and degradation. This is mainly a result of historical disturbance (forestry) and increased development pressure and human disturbances in the area. Smaller mammal species are extremely vulnerable to human impacts, poaching as well as dogs and feral cats. It is therefore highly unlikely that the site constitutes significant habitat for any species of threatened mammal species as well as for mammal species in general.

» **Avifauna (birds)**

The South African Bird Atlas Project (SABAP) aims to map the distribution and relative abundance of birds in southern Africa and relies heavily on data uploaded by "citizen scientists". Species records found in the SABAP database for the project area: Quarter Degree Grid Squares 2832CA (available online at http://sabap2.adu.org.za/) were interrogated. Whilst the majority of species recorded are considered locally common birds, there are a number of bird species that are considered to be of conservation concern based on their conservation/threat status . The distributional ranges and habitat requirements/preferences for each bird species of conservation concern was reviewed (based on available literature) in an attempt to estimate the likelihood of these species occurring within the terrestrial grassland habitat in the study area. Based on this assessment, only a few conservation significant avifauna (bird species) could potentially occur within terrestrial grassland habitats at the site, including:

* Woolly-necked Stork, *Ciconia episcopus*
* Swamp Nightjar, *Caprimulgus natalensis*
* African marsh-harrier ,*Circus ranivorus*
* Martial Eagle**,** *Polemaetus bellicosus*

The only bird species observed at the site was a pair of Hamerkop (Least Concern), utilising the canal to the west. A previous ecological survey by NEMAI Consulting in 2015 recorded sixteen (16) locally common bird species of Least Concern (no species of conservation importance recorded) within the broader Phase 1F site.

» **Reptiles**

Twelve (12) reptile species of conservation importance have been recorded within the Richards Bay region and could potentially occur in the study area. All reptile species are sensitive to major habitat alteration and fragmentation. As a result of human presence in the area as well as on the site; coupled with extensive habitat transformation (industrial area) and high levels of disturbance, alterations to the original reptilian fauna are expected to have already occurred to a great extent with

the disappearance of reptile diversity in the area as a result. No reptile species were observed at the site during the field survey, however the numerous remaining dead tree stumps scattered across the site (post-forestry activities and harvesting of timber) could provide suitable but highly limited habitat for locally common species of snakes, lizards and skinks. A previous ecological survey by NEMAI Consulting in 2015 recorded only three common reptile species of Least Concern occurring in the broader RBIDZ Phase 1F area, including *Agama aculeata distanti* (Distant's Ground Agama), *Lygodactylus capensis capensis* (Common Dwarf Gecko) and *Acanthocercus atricollis atricollis* (Southern Tree Agama).

» **Amphibians**

Rare, threatened and endangered Amphibian (frog) species potentially occurring within the grassland habitat in the study area were investigated at a desktop level by comparing the habitat requirements and distributional ranges of key species of conservation concern occurring in KZN (based on a review of available literature). The findings reveals that threatened/endangered frog species occurring in KZN are unlikely to occur in the study area due to their restricted ranges and species-specific habitat requirements/preferences that are unlikely to be satisfied at the site. No frog species were observed at the site during field investigations and are likely to be restricted to the adjacent canal to the west and the large wetland areas to the east and north-west of the site. During a previous ecological survey by NEMAI Consulting in 2015, only two species of locally common frog species of Least Concern were in the broader RBIDZ Phase 1F area, namely the common Guttural toad (*Amietophrynus gutturalis*) and Bubbling Kassina (*Kassina senegalensis*).

» **Invertebrates**

Invertebrate species of conservation significance that are highlighted in the Terrestrial Systematic Conservation Plan (CPLAN) for KZN (EKZNW, 2010) for areas adjacent to the study site include a variety of endemic invertebrates which are terrestrial grassland and forest specialists. No invertebrates of conservation importance were observed at the site during field investigations, with only a few locally common beetles (e.g. Net-winged beetle - Lycus sp.) and butterflies (Danus chrysippus, Junonia oenone) of 'Least Concern' observed.

5.7. Heritage

5.7.1. Heritage and Archaeology

The surveys undertaken in the area adequately captured the heritage resources. The heritage resources identified have low local significance ratings. Almost all of the sites are archaeological and have previously been identified during heritage impact assessments conducted by Gavin Anderson. The only built environment heritage resource is 5.5km to the north of the proposed development area. The buildings at this site are associated with the railway infrastructure and are well away from the development. There are no known sites which require mitigation or management plans. No further heritage work is recommended for the proposed development.

5.7.2. Palaeontology (Fossils)

The area is underlain by yellowish redistributed sand which is rated as having low fossil sensitivity. A palaeontological assessment is therefore not necessary for this development.

5.8. Baseline Socio-Economic Environment

The purpose of the section is to provide an overview of the current socio-economic baseline environment and context in which the proposed project will take place within the ULM, which is located within the jurisdiction of the UDM, in the KZN Province. This section of the report will provide a strategic understanding of the socio-economic profile of the study area, in order to develop a better understanding of the socio-economic dynamics as a background to the development of the project. The data presented in this section has been largely derived from the KZN Census 2011 Municipal Report, latest municipalities IDP's and the Census Survey 2011 (Stats SA), as well as the Local Government Handbook 2012.

5.8.1. Population

KZN is the country's third smallest province of the nine provinces, with a total area of 94 361km^2 taking up 7.7% of South Africa's (SA) land area in terms of area. KZN has the second largest population in SA, with 10.3 million people living in KZN (Census 2011). The proposed development will be constructed in ULM, which is situated within the jurisdiction of the UDM. The population of the UDM in 2011 was approximately 907 519 people, of which 33 459 people reside in the ULM. The population growth rate in the UML was 1.5% from 2001 to 2011 (see Table 5.1). The ULM is a densely populated area of about 420 people per square km in comparison with the UDM and KZN having a population density of 110 /km^2.

Table 1.1: Population statistics (Source: Census 2011)

Census 2011	Area (km^2)	Population total	Population density /km^2	Population growth rate % (2001 - 2011)
KZN Province	94 361 km^2	10 822 734	110/km^2	0.7%
uThungulu DM	8 213 km^2	907 519	110 /km^2	0.2%
uMhlathuze LM	793 km^2	334 459	420 /km^2	1.5%

5.8.2. Population groups and languages

It is evident that:

» The most dominant population group is the Black population throughout the province, district and local municipality. The black population comprises 87.7% of the ULM population.
» Figure 5.10 demonstrates that the proposed site is located in a sparsely populated area (this is due to the proposed site being located within an industrial region).
» The most spoken language in the local area is Zulu followed by English. Approximately 81.3% of the ULM speaks Zulu. This indicates that in addition to English, Zulu should also be used for communication processes throughout the EIA project.

5.8.3. Age composition and gender differentiation

The age distribution of the population is very similar throughout the local area with the greatest proportion of the population falling within the age group of 15-64 years (Economically Active Population). Approximately 67.4% of the ULM population comprise the Economically Active Population (EAP); this implies that there is a larger human resource base for development projects to involve the local population with the ULM. The gender differentiation is also quite similar where there are slightly more females in the province, district and local municipalities.

The dependency ratio indicates the number of individuals that are below the age of 15 and over the age of 64, that are dependent on the Economically Active Population (EAP) (Individuals that are aged 15-64 that are either employed or actively seeking employment). Dependents increase the burden on the EAP / productive population and local municipalities to maintain basic needs, upbringings and pensions. The dependency ratio of the ULM is 48.2% of the population, meaning that almost half of the population is dependent on the EAP. According to the ULM IDP 2012-2017, the local municipality has high levels of poverty. The current welfare dependency on grants, packages offered by the municipality will start to strain the municipality due to the municipality's financial situation. The IDP states that it is therefore necessary to introduce strategic objectives to enable job opportunities in the area and economic development programmes.

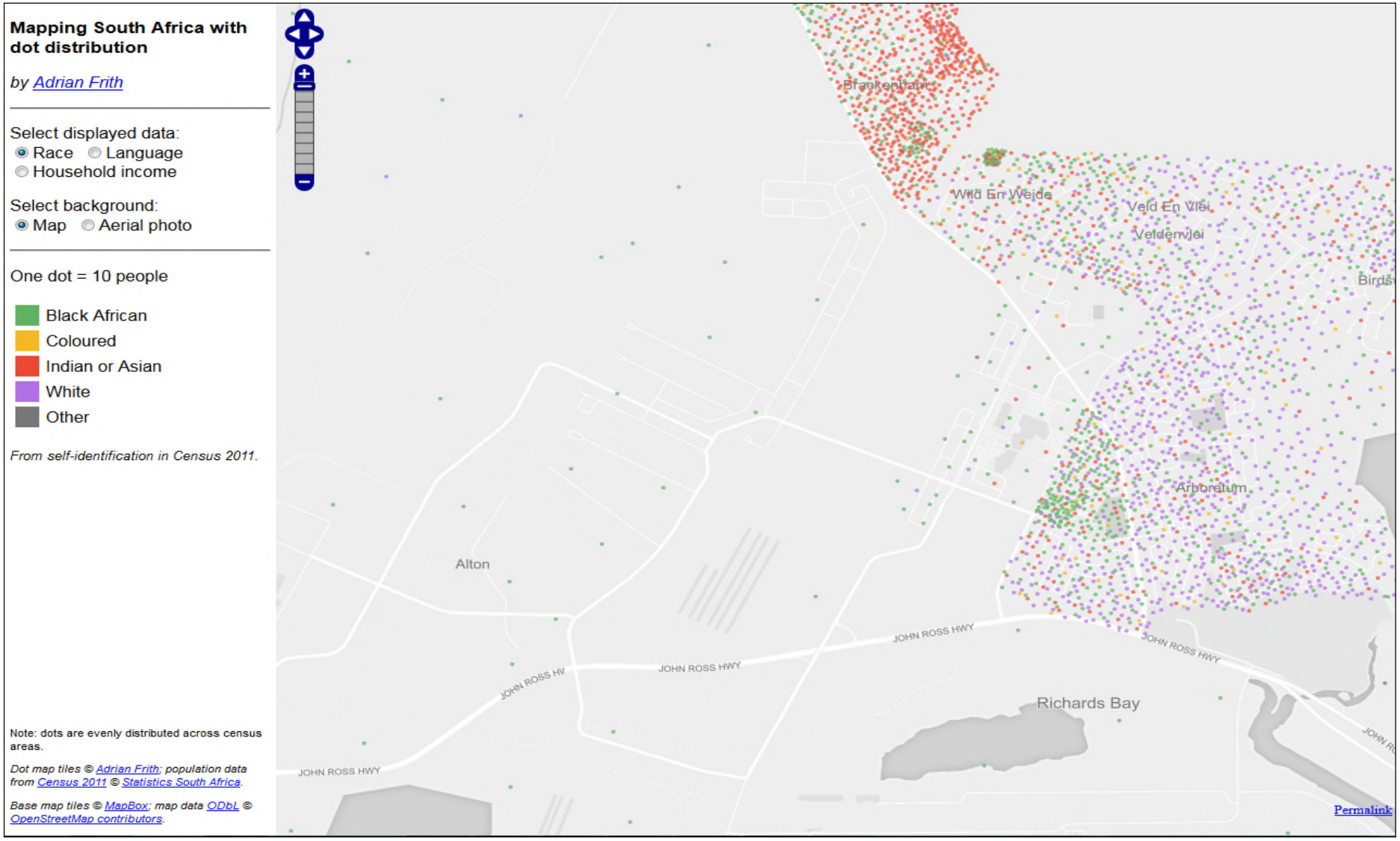

Figure 1.10: Distribution of population groups in the local area (Source: http://dotmap.adrianfrith.com/)

5.8.4. Unemployment

The ULM is largely populated by the potentially economically active population. There are 119 588 economically active (employed or unemployed but looking for work) people in the ULM, and of these 31% are unemployed (as demonstrated in Table 5.2). This implies that there is an efficient number of human capital available for any kind of work, but also that there is space for training and developing economically active population in the relevant fields needed. This could increase the employment level and decrease the poverty level in the local area. Local workers should be utilised as much as possible for the proposed development in order to alleviate local unemployment.

Table 5.2: Distribution of population aged 15-64 years by employment status (Source: Census 2011)

	Number of employed people (2011)	Number of unemployed people (2011)
KZN	1 978 330	983 807
uThungulu DM	140 045	77 301
uMhlathuze LM	81 902	37 686

5.8.5. Household income levels

It is evident that the ULM has a high number of households fall within a low income category and within the poverty level, this being 56.5% of the local population. A low percentage of households fall within the middle income category (33.2% of the population) and high income category (10.3%). The high percentage of low income households indicates that that there is a high demand for employment opportunities which will help decrease the dependence on forms of assistance either from government and or non-government organisations. The high poverty level of 56.5% has social consequences such as not being able to pay for basic needs and services. The lower average income levels indicate a higher demand for employment opportunities in the economy. However skill levels are less likely to improve unless education levels improve which will lead to more skilled people which will in turn lead to the opportunity to earn higher income levels. This means that there should be less focus on the quantity of job creations and more focus on the quality of jobs created.

5.8.6. Education levels

Education levels in the area are moderate. Almost half of the population aged 20 years and older in the municipality have only some secondary education or less (in the ULM this being 46.5% of the population); this indicates that almost half of the local population are semi- skilled or unskilled. Approximately half of the local population either have a matric or have a higher qualification; this reflects the industrial nature of the region and the level of skills available (Richards Bay Industrial Development Zone). Approximately 38.6% of

the ULM have a matric and 14.6% of the local population have higher education; indicating that a relatively significant proportion of the population are skilled or highly skilled. The Municipality has a responsibility to facilitate the improvement of literacy levels of the community and to ensure an adequate skills base to foster enterprise growth and job creation. Scarce skills need to be transferred by partnership relations with industries and the different organisations that exist in the area (ULM IDP 2012-2017).

The Municipality faces a challenge with regard to a marketable and skilled work force, thereby creating a gap in productivity, which in turn has a negative impact on the economic growth path (ULM IDP 2012-2017). The skills profile of the area indicates that the availability of local labour for the proposed project which is limited to low-skilled construction workers as well as possible skilled and highly skilled workers. Therefore majority of the necessary employees required for the proposed project can be sourced from the local area.

5.8.7. Household trends

The number of households in the UDM is approximately 202 976 and approximately 86 609 households within the ULM (see Table 5.3). The average household size in the UDM is 4.3 and ULM is 3.6 people per household.

Table 5.3: Number of households and average household size (Source: Census 2011)

Census 2011	Number of households	Average household size
KZN	2 539 429	3.9
uThungulu DM	202 976	4.3
uMhlathuze LM	86 609	3.6

Majority of the population live in urbanised areas within formal dwellings. ULM has the highest number of households with access to formal housing. The continuous increase in the number of households will have an upward impact on electricity demand thus requiring greater electrical capacity.

5.8.8. Access to services

A large number of people in the local municipality have access to basic services (refer to Appendix F for further detail on access to basic services). There is still room for improvement in the provision of basic services more specifically in the rural/farm areas (ULM IDP 2012-2017), to expand basic services such as refuse removal and sanitation. The ULM IDP 2012-2017 states that water, electricity, sanitation, waste removal and social amenities are key critical services which have been identified by communities that are required to meet their basic needs. Limited funding and the increasing numbers of the community daily increases the levels of backlogs. A weakness the ULM currently faces is weak and/or poor quality basic services infrastructure to rural areas which discourages

investors. An objective of the ULM includes improving the living environment of households in the informal settlements through incremental access to basic services and structured in situ upgrading (where suitable).

5.8.9. Health

Within the municipal area there are four hospitals and twenty three health clinics. Generally, there seems to be a need for additional health facilities in remote Traditional Authority areas (ULM IDP 2012-2017). HIV/AIDS is an epidemic which is increasing at an alarming rate and affects communities negatively. Provision of basic health services and effective healthcare infrastructure, increased financial and human resources in healthcare, awareness and education and poverty alleviation programmes will reduce the increased incidents of HIV/AIDS and communicable diseases (ULM IDP 2012-2017).

5.8.10. Economic base

The economic base is defined as the main industries that provide employment opportunities and drive economic growth in a study area. The following is an overview of the economic base in local municipality.

uMhlathuze's Economy has the following components; Local Economic Development, Agriculture, Tourism, Other sectors such as mining, construction and manufacturing (refer to Table 5.4). Key issues that relate to the ULM economy include, increase in unemployment, large portion of the population subject to conditions associated with poverty, little or no diversity in the economy, declining resource base and the impacts of climate change.

Table 5.4: Key sectoral contributions to the economy in the ULM (Source: ULM IDP 2012-2017)

Economic Sector	(2001) %	(2008) %
Manufacturing	46.6	45.9
Community Services/ Social	12.9	10.4
Trade	6.2	6.3
Financial/ Real Estate/ Business	8.3	10.7
Agricultural/ Forestry/ Fishing	4.9	3.2
Construction	2.5	2.2
Transport/ Communication	11.5	9.1
Mining/ Quarrying	6	11.6
Electricity	1.1	0.6

The economic sectors that have shown a slight increase are financial and mining. The increase in the mining sector has been significant in that this sector is the second largest economic contributor above community services. The global economic reception affected

the uMhlathuze area and the impact was severely felt during years 2008-2010. This is one of the reasons there has been a slight decrease in the economic performance in the area.

5.8.11. Socio-Economic Environment Summary

Summary and key challenges of the local area:

The socio-economic profile provided an overview of the study area. The following is a summary of the key baseline findings as a result of the study conducted on the UDM and the ULM in KZN. In summary, the area was found to have the following general characteristics:

» The population of the UDM in 2011 was approximately 907 519 people, of which 33 459 people reside in the ULM.
» The most dominant population group is the Black population throughout the province, district and local municipality. The black population comprises 87.7% of the ULM population and the most spoken language in the ULM is Zulu.
» The female population is slightly more prominent in the UDM, ULM and KZN.
» 67.4% of the ULM population comprise the Economically Active Population (EAP); this implies that there is a larger human resource base for development projects to involve the local population with the ULM. The dependency ratio is high at 48.2% of the ULM population which puts pressure the EAP and local municipalities.
» There is high unemployment rate in the LM (31%) with a large economically active population seeking employment opportunities. Local workers should be utilised as much as possible for the proposed development in order to alleviate local unemployment
» The ULM has a high number of households which falls within a low income category and within the poverty level. Poverty level and the majority of the population falling within the low income level in the ULM is approximately 56.5% which demonstrates the need for job creation; the high demand for employment can be addressed (although marginally) through direct job creation during the construction and operation phase of the proposed development.
» The education levels in the ULM area are generally low. Almost half of the population aged 20 years and older in the municipality have only some secondary education or less (in the ULM this being 46.5% of the population); this indicates that almost half of the local population are semi- skilled or unskilled. This reflects the relatively poor education of the region.
» The skills profile of the area indicates that the availability of local labour for the proposed project which is largely limited to low-skilled construction workers, semi-skilled workers and a small number of skilled workers available
» Majority of the population live in urbanised areas within formal dwellings.

» ULM area is considered to be generally well serviced in terms of the extent and level of infrastructure available in terms of basic services however the ULM has weak/poor quality basic services and infrastructure.
» The economic sectors that have shown a slight increase over the years are financial and mining. The increase in the mining sector has been significant in that this sector is the second largest economic contributor above community services.

ASSESSMENT OF IMPACTS: GAS TO POWER PLANT AND ASSOCIATED INFRASTRUCTURE CHAPTER 6

The gas to power plant and associated infrastructure is proposed to be located on erven 17455, 17443 and 17442 within the Richards Bay Industrial Development Zone (IDZ): Phase 1F. The proposed plant net output, at International Standards Organisation (ISO) Reference Conditions, is expected to be up to 400 MW, to be developed in two (2) phases to operate with liquid fuel such as diesel and/ or Liquefied Petroleum Gas (LPG) in Phase 1 and ultimately Liquid Natural Gas (LNG) or Natural Gas (NG) in Phase 2 of the development. It is anticipated that 300MW will be fuel/ gas generated energy and 100MW will be heat/ steam generated energy.

The main infrastructure associated with the facility includes the following:

» Up to six (6) Gas Turbines (this is dependent on the DoE's Gas IPP Programme and the requirements of gas power stations to run at either base-load or mid-merit)
» 1-2 steam turbines utilising the heat from all the engines for power production in a steam cycle.
» The power plant will comprise multiple engine halls, each of ~60MW. Each engine hall will typically comprise one engine. Stacks associated with engine halls will be up to 20m in height.
» Access roads within project locality boundaries.
» Three (3) fuel tanks with a capacity of 2000m^3 each which will be used as an interim fuel storage facility until the gas infrastructure is constructed by the DoE and Transnet. Two (2) fuel unloading stations will be associated with these tanks.
» Water storage facilities for process water and fire-fighting purposes.
» An HV-Yard and Substation, adjacent to the power plant.
» A new 132kV power line to connect into the Municipal grid, connecting directly to the Indus Substation bordering the site.
» Guard house, admin building, workshops and a warehouse.

Water volumes of between 50 000m^3 and 270 000m^3 [25]per annum are expected to be required for the project. The volume of water required will be supplied via the Richards Bay IDZ water supply network that has an allotment from the local water authority. Every effort is being made to reduce these volumes further, including the potential for recycling condensation from air cooled condensers if such equipment will form part of the final plant design. The Richards Bay IDZ has undertaken to provide the water to the site under its long-term lease agreement with Richards Bay Gas Power 2 (Pty) Ltd. The Richards Bay

[25] Exact water requirements are unconfirmed at this stage and are therefore best estimates. Once the final technology has been selected, water volumes will be confirmed.

IDZ have provided Richards Bay Gas Power 2 (Pty) Ltd with a letter of confirmation that the volumes required would be supplied (refer to Appendix C9).

The establishment of a Gas Power Plant is comprised of various phases, including pre-construction, construction, operation, and decommissioning.

The **pre-construction activities** include:

- Conduct pre-construction surveys including:
  - Geotechnical survey by geotechnical engineer.
  - Site survey and confirmation of the substation footprint.
  - Survey of substation site and power line servitude.
  - Survey of internal access routes.
  - Environmental walk-through surveys.

The **construction activities** involved for the proposed Gas Power Plant will include the following:

- Establishment of access roads:
  - Establishment of internal access roads: up to 6 m wide permanent roadway within the site for use during construction and operation phase.
- Undertaking site preparation including:
  - Clearance of vegetation at the footprint for infrastructure.
  - Site establishment of offices/ admin/ workshops with ablution facilities, parking, area for placement of gas turbines, water and fuel tanks, substation and power line, etc.
  - Excavations for foundations.
- Civil Works / construction of structures
  - Concrete works for structures such as foundation, the production unit (which comprises a complete turbine, generator and an auxiliary module), stacks, and air cooler condensers.
  - Ancillary infrastructure such as guard house, admin building, workshops and a warehouse will be established.
  - Mechanical work will then follow.
- Construct Substation and power line:
  - A 132 kV substation will be required to facilitate grid connection to the Indus Substation.
  - Substation components.
  - Security fencing around high-voltage (HV) Yard.
- Commissioning of the facility
- Undertake site rehabilitation:
  - Remove all construction equipment from the site.
  - Rehabilitation of temporarily disturbed areas where practical and reasonable.

The duration of the construction period is anticipated to be approximately 14-16 months.

The **operational activities** will include the following:

» The operation of the power plant
» Maintenance:
  * Oil and grease – turbines.
  * Transformer oil – substation.
  * Waste product disposal.

The expected operational lifetime of the proposed gas to power plant will be 25-40 years.

The **decommissioning**[26] **activities** will include the following:

» Site preparation, disassembly of production units and associated infrastructure and demolishing of buildings and stacks.

Environmental impacts of the proposed gas to power plant and its associated infrastructure are expected to be associated with the construction, operation and decommissioning of the facility. The majority of the environmental impacts associated with the facility will occur during the construction phase. Environmental issues associated with **construction and decommissioning** activities of the gas to power plant are similar and include, among others:

» Impact on ecology (flora, fauna and avifauna) and potential loss of protected species.
» Social impacts (positive and negative).

Environmental issues specific to the **operation** of the proposed gas to power plant include, among others:

» Impacts on Air quality due to emissions
» Social impacts (positive and negative).

A number of potential issues requiring further investigation and assessment were identified during the Scoping phase of the project. In accordance with the accepted Plan of Study for EIA, the following detailed specialist investigations were undertaken during the EIA

[26] The power plant infrastructures which will be utilised for the proposed gas to power plant are expected to have a lifespan of 25 - 40 years (with maintenance). Equipment associated with this facility would only be decommissioned once it has reached the end of its economic life. Although a high level assessment on the impacts associated with decommissioning phase of the facility have been included, it must be noted that decommissioning activities will need to be undertaken in accordance with the relevant legislation applicable at that time, which may require the amendment of the decommissioning mitigation measures proposed in this EIAr to be revisited and amended. It should therefore be noted that listed activities related to decommissioning have not been applied for and are not assessed in detail in this report.

phase of the project in order to ensure that potential environmental impacts associated with the proposed project are limited through the implementation of appropriate mitigation measures:

» Air Quality and Emissions
» Ecological Impacts
» Social Impacts

The EIA process has involved input from specialist consultants, the project proponent, as well as input from key stakeholders (including government authorities) and interested and affected parties engaged through the public consultation process.

This chapter serves to assess the identified potentially significant environmental impacts associated with the proposed gas to power plant and associated infrastructure (power line and substation, and internal access roads), and to make recommendations for the management of the impacts, which are included in the Environmental Management Programme (refer to **Appendix I**).

6.1. Assessment of Alternatives

The following alternatives have been considered in the EIA:

6.1.1. Site Alternatives

The proposed gas to power plant is to be located on a site within the Richards Bay IDZ Phase 1F. The site has been zoned for IDZ industrial development as part of the planning for this IDZ area. According to the Nemai Consulting EIA Report (2015), the RBIDZ is intended to promote the competitiveness of the manufacturing sector and to encourage beneficiation of locally available resources. Its objectives include the following:

» Develop and establish a purpose built world-class industrial park incorporating a delimited Customs Controlled Area and linked to the Richards Bay International Port;
» Provide quality infrastructure including ICT and transport infrastructure, business and utility services;
» Attract foreign and local investment projects which:-
  * create jobs
  * export led
  * sustainable
» Make arrangements for and mobilise financial, human and other resources for the development of the RBIDZ; and
» Promote, foster and mentor BEE and SMME business opportunities in and around the zone.

The erven on which the proposed facility is planned have been allocated to the developer for this purpose (i.e. Industry). Therefore, the siting of the facility has been predetermined through the IDZ planning process and no feasible siting alternatives within an appropriately zoned area exist.

6.1.2. Cooling Technology

Combined cycle gas to power plants require cooling at the back-end of the thermal cycle. The purpose of the cooling is to condense steam back to water at the end of the steam cycle. There are different types of cooling technologies available, the two main being wet cooling and dry cooling, (discussed in detail in Chapter 3, section 3.3.2) but typically water is used for cooling in power plants. Due to water availability considerations in the area, dry cooling technology will be used for the project. This is also consistent with the Department of Water and Sanitation requirements. Therefore no alternative technology is considered.

6.1.3. Fuel Types

The fuel types that were originally under consideration for Phase 1 of the proposed gas to power plant were diesel; Liquefied Petroleum Gas (LPG), Heavy Fuel Oil (HFO) and Light Fuel Oil (LFO). HFO and LFO were subsequently excluded, in response to comments received on the draft scoping report, due to their high emissions.

It is important to note that the impacts identified and assessed within this chapter (Section 6.3) have considered diesel and LPG as the only fuel sources for Phase 1. Should sustainable supplies of cleaner fuel (e.g. biofuel) become commercially viable in the future then Richards Bay Gas Power 2 (Pty) Ltd should investigate the conversion of the plant to be able to utilise such fuels if technically and financially feasible.

6.1.4. Operational Alternatives

The power plant could operate at base load or mid-merit electricity supply levels. This will be dependent on the DoE IPP Programme requirements, as well as those of Eskom.

» *Base load*
Base load is defined as the minimum level of demand on an electrical supply system over 24 hours. Base load power sources are those plants which can generate dependable power to consistently meet demand.

» *Mid-merit*
Mid-merit is defined as the power supply that fills the gap between peak load and base load where peak load is the maximum level of power demand. This generally translates to an operational period of 8 hours per day.

Table 6.1 indicates the main differences associated with operating the power plant at base load versus mid-merit as proposed by Richards Bay Gas Power 2 (Pty) Ltd.

Table 6.1: Base load versus Mid-merit

	Base load	**Mid-merit**
Number of gas turbines	2	6
Number of steam turbines	1-2	1-2
Number of engines	2	6
Number of operational hours per year	8 000	3 000
Volume of diesel /LPG required	1 000 000m^3	410 000m^3
Number of trucks delivering fuel daily	52	18
Volume of LNG/ NG required	800 000 000m^3	326 000 000m^3
Volume of water required	270 000m^3	50 000m^3

This impact assessment has considered the operation of the facility at base load as a worst-case scenario.

6.2. Assessment of Potential Ecology Impacts

According to the Biodiversity Study of Alton North Richards Bay undertaken in 2005 by O'Connor and Associates, the site has experienced two environmental perturbations that are judged to have had 'an enormous influence on its biodiversity and ecological functioning'. The first is associated with the planting of historic *Pinus and Eucalyptus sp*. tree plantations (Google Earth™ imagery shows the area under plantation forestry between 2004 – 2012, refer to Figure 6.1). In addition to the direct loss of indigenous vegetation through land transformation, the introduction of evergreen species into seasonal vegetation results in a concomitant increase in transpirational losses and leaves the area susceptible to alien and weed invasion. A second impact has been the canalisation of water flow in the area, with a consequent effect being the lowering of the water table within the pre-existing dryland component of the environment. Based on the history of ecological disturbance at the site (O'Connor and Associates, 2005) remaining open grassland habitat is largely degraded and secondary in nature, with signs of earthworks, vehicle/human tracks, tarred roads (former airfield) and general soil disturbance associated with historic plantation forestry.

Figure 6.1: Google EarthTM maps showing the site in 2004 (western half under plantation forestry, eastern half operating as a light airfield)

Evident from site visits undertaken in April 2016, most parts of the proposed development area have been transformed, largely due to informal dumping of rubble and domestic refuse, tarred roads (former airfield) and also foot paths. However, habitats such as grasslands still exist. This habitat transformation, together with elevated human presence and impacts such as disturbance, hunting and persecution, has negatively impacted on large mammal occurrence, particularly ungulates and predators (Nemai Consulting EIA Report, 2016). Therefore, care should be exercised in order to negate the negative ecological impacts through further habitat fragmentation.

Generally, the potential negative impacts will be associated with the loss of habitat and species of conservation concern (as detailed in Section 6.2.2), and are considered to be of an acceptable significance and magnitude if appropriate mitigation measures are implemented and construction is implemented in a sensitive manner. The proposed development will cause disruption during the construction phase, but as long as mitigation measures are implemented, these disruptions should have minimal lasting effect on the ecosystems of the proposed development. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix H** Ecology Report for more details).

6.2.1. Results of the Ecological Study

A single terrestrial vegetation community was identified for the proposed development site, characterised based on floristic composition, vegetation structure and level of degradation/transformation. The site consisted of a coastal sandy wooded grassland community comprised of a range of different grasses, geoxylic suffrutices, dwarf shrubs, small trees and herbaceous flora reminiscent of the Maputaland Wooded Grassland type. Two principal sub-communities were identified within the broader wooded grassland community:

» *Aristida junciformis subsp. junciformis – Helichcrysum kraussii* wooded grassland; and
» *Themeda triandra - Parinari capensis subsp. incohata* wooded grassland.

The broader grassland community was found to be dominated by a number of indigenous grasses, including namely *Aristida junciformis subsp. junciformis, Themeda triandra, Perotis patens* and *Imperata cylindrica* with patches of *Melinis repens* and *Sporobolus africanus* among other subordinate grasses characteristic of disturbance, overgrazing and previous cultivation. The majority of grasses encountered are typical 'Increaser' grass species characteristic of disturbed/overgrazed veld. The KZN endemic sedge, *Cyperus natalensis*, was found in relatively high abundance amongst the other grass species. Short woody and herbaceous indigenous low shrubs dominated much of the grassland, with the main species being the short aromatic shrublet, *Helichcrysum kraussii,* and the dwarf woody shrublet *Parinari capensis subsp. incohata* (Sand mobola plum). Small indigenous trees (early growth stage) including mainly *Syzgium cordatum* (Waterberry, uMdoni tree) and *Dichrostachys cinerea* were subdominant and interspersed amongst *Strychnos spinosa* and *Brachylaena discolor*. Other woody species such as *Hyphaene coriacea* (lala palm), *Phoenix reclinata* and *Albizia adianthifolia* were present, albeit at very low abundance levels with only one or two specimens of each species observed. Small herbaceous and flowering plants were observed scattered within the broader grassland community and at generally low levels of abundance, with the main ones being *Hypoxis angustifolia, Justicia peteolaris, Lobelia coronopifolia, Commelina Africana, Tephrosia purpurea* and *Vernonia centauroides.* A full list of 51 species of flora identified on the site is provided in Annexure B of the Ecological Impact Assessment (refer to **Appendix H**).

Whilst most plant species identified at the site were species of 'Least Concern', there were two (2) species of plant identified which are 'specially protected plant species' in terms of the Natal Conservation Ordinance No. 15 of 1974. These are *Crinum delagoense* (Candy striped Crinum, 'Declining' threat status) and the SA Endemic *Ledebouria ovatifolia* (identification of this species was made difficult as it was not flowering at the time of the survey). Both species were observed occurring in patches amongst other grasses/herbs in the grassland community (refer to Figure 6.2). These are protected under Schedule 12 (Specially Protected Indigenous Plants) of the Natal Conservation Ordinance No. 15 of 1974. A permit needs to be applied for with regards to relocating any of these species.

As a result of the disturbance created by forestry and other human activities (model airfield), a number of Invasive Alien Plants (IAPs) and exotic weeds characterise the site, with the most abundant woody alien plant being *Psidium guajava* (Guava), which has invaded areas of the grassland and was observed scattered amongst other species across the broader vegetation community as well as in dense patches just west of the old airfield buildings. Other species such as *Richardia brasiliensis*, *Cuscata campestris*, *Sesbania bispinosa* and *Acacia mearnsii* were observed at low levels and scattered throughout the unit.

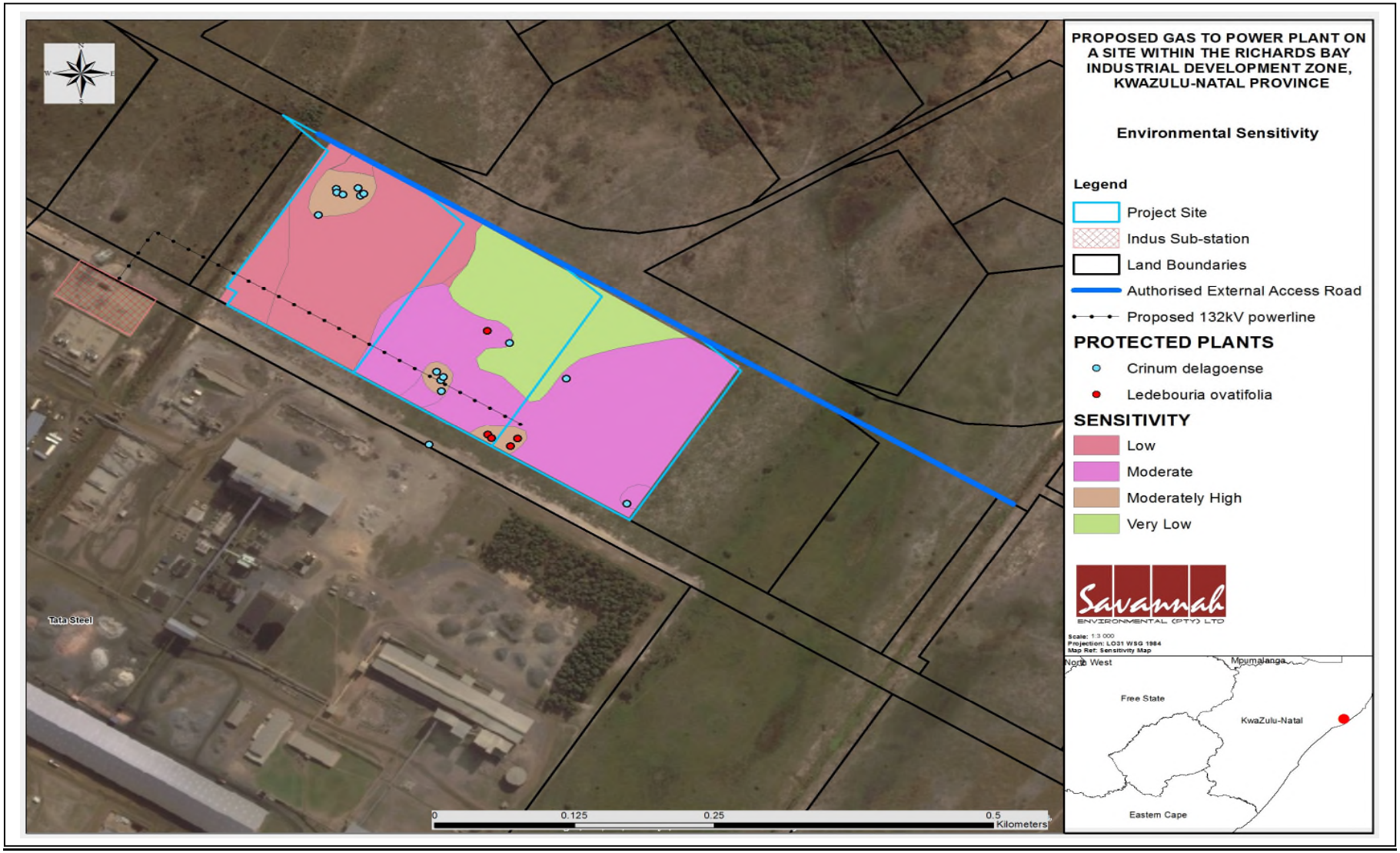

Figure 6.2: Environmental sensitivity map for the project study area illustrating ecologically sensitive areas in relation to the gas to power plant as well as the location of protected plant species (Refer to **Appendix B** for A3 maps)

A summary of the terrestrial ecological assessment findings is provided in Table 6.2.

Table 6.2: Summary of the main findings of the terrestrial ecological assessment

Intrinsic/ecological value	Applicability to Study Site
Species level aspects of biodiversity	
Protected species of fauna/flora.	None observed but largely intact coastal forest habitat in the north may potentially harbour Red Data Listed (RDL) species of both flora and fauna.
Threatened species (Red Data List).	
Keystone species performing a key ecological role (e.g. key predator, primary producer).	None
Large or congregatory species populations.	None
Endemic species or species with restricted ranges.	Two South African Endemic plant species recorded: *Ledebouria ovatifloia* and *Hyphaene coriacea.*
Previously unknown species.	None
Community and ecosystem level aspects of biodiversity	
Distinct or diverse communities or ecosystems.	Maputaland wooded grassland (Endangered status)
Unique ecosystems.	
Locally adapted communities or assemblages.	
Species-rich or diverse ecosystems.	
Communities with a high proportion of endemic species or species with restricted ranges.	Maputaland wooded grassland
Communities with a high proportion of threatened and/or declining species.	*Crinum delagoense,* Declining threat status
The main uses and users of the area and its ecosystem goods and services: important ecosystem services (e.g. important water yield area, coastal buffer), valued ecosystem goods (e.g. harvestable goods important for lives and / or livelihoods), valued cultural areas.	Grazing for livestock the only use identified
Landscape level aspects of biodiversity	
Key ecological processes (e.g. seed dispersal, pollination, primary production, carbon sequestration).	Grassland ecosystems are associated with a number of key ecological processes and are known to provide a range of important ecosystem goods and services to society. They typically support a rich diversity of grasses, wild flowers, invertebrates, reptiles, birds and other animals. Other services provided by these ecosystems include their role in reducing runoff and attenuating downstream

Intrinsic/ecological value	Applicability to Study Site
	flooding, assisting with binding topsoil and controlling erosion as well as their role in storing carbon, especially in the topsoil.
Areas with large congregations of species and/or breeding grounds.	None
Migration routes/corridors.	The habitat has been quite largely fragmented by existing industrial developments and past development.
Importance as a link or corridor to other fragments of the same habitat, to protected or threatened or valued biodiversity areas.	
Importance and role in the landscape with regard to a range of 'spatial components of ecological processes', comprising processes tied to fixed physical features (e.g. soil or vegetation interfaces, river or sand movement corridors, upland-lowland interfaces) and flexible processes (e.g. upland-lowland gradients and macro-climatic gradients), as well as important movement or migration corridor for species.	

Wetlands

As discussed in Chapter 5 (Section 5.1) wetland systems were identified on the north-western and eastern portions of the site. The wetland assessment carried out for the Nemai Consulting EIA Report, 2015 identified wetland units that should be retained due to their respective relatively natural and moderately modified condition and the services they render, and the wetland unit that could be developed as it was largely modified and the services it offers have largely been impacted on by a drain that had been cut into it. As part of the Wetland Offset Plan, the conservation and rehabilitation of the wetlands (that should be retained) as assessed in light of the proposed loss of the wetlands (that can be developed), and it was found that wetlands that should be retained provides the following contributions:

» To wetland functionality = 0.23 ha; and
» To ecosystem conservation = 10.4 ha.

These results indicate that, due to its existing healthy state, rehabilitation and protection of the wetland, including its 30m buffer zone, will contribute little wetland gain in terms of functionality, particularly when compared with the 14.82 ha required to offset the losses incurred by allowing development. Thus, additional offset area will be required to meet this target. Preservation of the identified wetland will meet the estimated Ecosystem

Conservation Target, and should certainly be zoned as conservation amenity within the Phase 1F development. A Wetland Management Plan has been compiled as part of the Integrated Water Use License (IWULA) submitted together with the Nemai Consulting EIA Report (2015), and the main activities for wetland rehabilitation include:

» Appropriate securing (fencing) of designated wetland areas and erection of informative and educational signage;
» Eradication of invasive alien plant species in all wetland areas through removal and sustained treatment (on-going maintenance programme);
» The clearing and safe disposal of any waste found in all wetland areas with specific attention to wetlands in red, including the drainage canal;
» The planting of appropriate indigenous plant species, as per sustainable urban drainage system (SUDS) requirements; and
» The replacement of the northern portion of the drainage canal with a pipeline system (and suitable erosion prevention methods) allowing for platforming of this section for possible development.

Approval has been obtained by the RBIDZ to commence with construction activities related to the upgrade of the railway line to the RBIDZ, upgrade of Medway Road at 1A and development within the RBIDZ 1F in terms of the National Water Act (Act No. 36 of 1998) in March 2016 (refer to Appendix J). In this regard, whilst wetlands in close proximity to the site has been adequately assessed, the proponent must take cognisance of the Wetlands Offset Plan and the rehabilitation measures as proposed in the Nemai Consulting EIA Report, 2015 ensuring that there are no further impacts, as it is a key aspect for achieving the estimated Ecosystem Conservation Target.

6.2.2. Pre-construction/Initial planning phase ecological impacts

Nature: *Destruction/damaging of indigenous vegetation during initial site walk-about and pre-construction planning surveys*

This impact relates to the potential destruction/disturbance of vegetation by machinery and employees accessing the site during pre-construction surveys for the various infrastructures planned. As a result of the largely disturbed/secondary nature of the grassland community on the site, combined with the fact that the site will be cleared almost entirely of vegetation during the construction phase, the magnitude of the impact on the general vegetation is likely to be moderate. Importantly though, a number of protected plant species occur in the grassland community at the site and surrounds which could be impacted, increasing the magnitude of impact to a moderate level where unmitigated.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (18)**

Status	Negative	Negative
Reversibility	Recoverable	Recoverable
Irreplaceable loss of resources?	Possible	Unlikely
Can impacts be mitigated?	This impact can be mitigated through onsite access control and management measures to limit impacts to protected plants in particular during site surveys.	

Mitigation:

Reducing the probability, magnitude and extent of disturbance to vegetation during pre-construction site surveys will be possible through onsite mitigation measures that can be implemented to minimise the magnitude and extent of disturbance. These include:

- » Preconstruction walk-through of the development footprint for species of conservation concern that would be affected and that can be translocated.
- » Demarcate areas identified as harbouring protected plants using suitable measures (such as fencing these areas or using perimeter stakes with high visibility/barrier tape for example).
- » Undertake plant rescue and translocation prior to any clearing/disturbance of the site occurring, in line with the requirements and recommendations of the Plant Rescue Translocation and Protection Plan (Appendix H).
- » Accessing the site during site initial planning/surveys walk-throughs by foot only (limiting vehicle access to the southern fence line and firebreak associated with the adjacent Tata steel factory) and being careful not to disturb/damage protected plants by avoiding areas with high densities of protected plants.
- » Contractor induction and staff/labour environmental awareness training needs are to be identified and implemented through staff/contractor environmental induction training. This should include basic environmental training based on the requirements of the EMPr. A copy of the EMPr is to be made available on site at all times.
- » Temporary access routes should be designed to limit potential impact on the environment.
- » No harvesting of plants for any purpose is to be permitted.

Residual:

Negligible: The impact of pre-construction surveys on the vegetation at the site is likely to be minimal and since the entire site will be subject to vegetation clearing during construction in any case, residual impacts are actually likely to be negligible. If mitigatory actions are properly and timeously employed, the extent of the impact can potentially be reduced to the development site footprint only (avoiding adjacent/surrounding habitats) and any potential impacts on protected plants can be avoided entirely.

Nature: *Direct impacts to fauna (wildlife) during initial pre-construction site surveys*

Pre-construction surveys of site can result in mortalities or damage to local wildlife (fauna/animals) as a result of vehicles/machinery accessing the area. There is a slight possibility that fauna of conservation importance such as Red Data and protected species may be killed, injured or damaged. Activities occurring within a close proximity to natural habitat have the potential to lead to increased pressure on natural resources through illegal hunting/poaching/trapping of wildlife for various uses such as food/medicinal purposes. This is particularly relevant to areas where protected/Red data species may occur and remote areas that have not been impacted to a high degree by local communities.

	Without Mitigation	With Mitigation
Extent	Local (2)	Site only (1)
Duration	Short term (2)	Short term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Very improbable (2)
Significance	**Low (24)**	**Low (5)**
Status	Negative	Negative
Reversibility	Recoverable	Reversible
Irreplaceable loss of resources?	Possible	Unlikely
Can impacts be mitigated?	This impact can be effectively mitigated at the site through appropriate management practices to limit and restrict disturbing activities where possible.	

Mitigation:

Most wildlife that could utilise the site is likely to move into undisturbed surrounding areas as human presence increases at the site. If managed properly, the extent and probability of this impact occurring can also be reduced quite significantly. This impact can be best managed through practical on-site mitigation measures aimed at reducing the possibility of incidents occurring. These include:

- Education of workers/employees onsite on not to harm wildlife unnecessarily will assist in mitigating this impact. Contractor induction and staff/labour environmental awareness training needs are to be identified and implemented through staff/contractor environmental induction training. This should include basic environmental training based on the requirements of the EMPr, including training on avoiding and conserving local wildlife. A copy of the EMPr is to be made available on site at all times.
- No wild animal may under any circumstance be hunted, snared, captured, injured, killed, harmed in any way or removed from the site during initial site surveys. This includes animals perceived to be vermin (such as snakes, rats, mice, etc.). Workers are to be informed of this requirement.
- Any fauna/animal found on the site during initial clearing may not under any circumstance be hunted, snared, captured, injured, killed, and harmed in any way. Such animals must rather be moved to the closest point of natural or semi-natural vegetation outside the area to be stripped.
- The handling and relocation of any animal perceived to be dangerous/venomous/poisonous must be undertaken by a suitably trained individual.
- Accessing the site during site initial planning/surveys walk-throughs by foot only (limiting vehicle access to the southern fence line and firebreak associated with the adjacent Tata steel factory).
- All vehicles accessing the site should adhere to a low speed limit (30km/h is recommended) to avoid collisions with susceptible species such as reptiles (snakes and lizards).
- No litter, food or other foreign material should be disposed of on the ground or left around the site or within adjacent natural areas but should be retained and disposed of at proper waste receptacles off-site.

Residual:

Low: Without mitigation this impact is likely to be limited in terms of extent and intensity as a result of existing human activity in the area, associated with the adjacent industry and grazing livestock and the concomitant reduction in the faunal populations at the site which has already occurred. Where access to natural areas is supervised and onsite teams involved in surveys are properly managed, the probability of this impact occurring and the extent of the impact can be reduced significantly and the risk of incurring residual impacts may be considered relatively low as a result.

Nature: *Artificial noise disturbance impact on local wildlife during initial pre-construction site surveys*

Local wildlife (fauna) generally respond to disturbances caused by human activities according to the magnitude, timing, and duration of the particular disturbance. Human activities can affect an animal's ability to feed, rest, and breed if it is unable to habituate to the disturbance caused (Rodgers & Schwikert, 2003). Anthropogenic activities occurring within a close proximity to natural habitats containing fauna (wildlife) during initial site surveys can lead to both the physical disturbance of habitats supporting animal life by machinery/labourers (already discussed above) as well as the disturbance of fauna due to noise pollution at the site caused by survey teams and vehicles accessing the site. Locally common species already occurring in the surrounding area are likely to be less sensitive to noise disturbance (due to the proximity of existing human development) and can probably become habituated at the site. Impacts are likely to be very short-lived during the pre-construction phase and affecting only a few areas of natural habitat where sensitive species may occur and will probably mainly affect local bird species that can quite easily migrate to other similar habitat in the area.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (15)**
Status	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Noise pollution and disturbance of local wildlife will be difficult to mitigate altogether, but the intensity and extent of the resultant disturbance can be managed to a degree.	

Mitigation:

If managed properly, the extent and probability of this impact occurring can be potentially reduced. The following mitigation measures apply:

» Ensure that survey teams accessing the site conduct themselves in an acceptable manner while on site.
» No activities should be permitted at the site after dark (between sunset and sunrise), except for security personnel guarding the development site.

Residual:

Low/negligible: Residual impacts to fauna are unlikely to persist as wildlife disturbed during initial site surveys are likely to readily migrate to other remaining habitat in the area outside of the development site.

6.2.3. Construction phase ecological impacts

Nature: *Destruction/damaging of indigenous vegetation during site clearing and construction of infrastructure*

With the change of land use from largely untransformed/undeveloped land (semi-natural grassland) to an artificial facility, indigenous vegetation will be lost through the stripping of vegetation and clearing of the land to make way for bulk earthworks and construction and other general disturbance within the development footprint. This impact relates to the complete removal or partial destruction/disturbance of vegetation by machinery and workers. Since the gross majority of the site (>95%) will be required for power plant infrastructure, it is anticipated that the loss of natural vegetation and species within the development footprint will be almost complete. The initial removal of vegetation during pre-construction site clearing may be exacerbated further during construction by machinery and workers operating outside of the construction footprint and disturbing indigenous vegetation outside of the site for the purposes of gaining access or through accidental incursions into natural areas adjacent to or beyond the development footprint.

Where the condition of the affected ecosystem is either good or fair/moderate, the impact significance should be dictated by the ecosystem threat status only and condition should not influence the rating (EKZNW, 2009). If development will have a residual impact on threatened ecosystems (i.e. Critically Endangered, Endangered, Vulnerable) that are not degraded/transformed (i.e. the affected area supports more than 25% of the species that would be expected to occur on an undisturbed site in a comparable vegetation type or ecosystem), the significance would be at least medium (EKZNW, 2009). As a result of the largely disturbed/secondary nature of the grassland community on the site, the magnitude of the impact on the general vegetation is likely to be relatively low with the implementation of mitigation measures. Furthermore, since adjacent areas beyond the site will also be cleared to make way for the various servitudes and road network required for the broader Phase 1F site, disturbance of areas beyond the site will also be of a low impact magnitude. Importantly though, a number of protected plant species occur in the grassland community at the site and surrounds which would be destroyed/lost during site clearing if not properly mitigated, thus impact magnitude is considered moderate in this context.

Relevant Listed activities:
GN 983, Activity 27 and Activity 28 (i)

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**High (65)**	**Medium (50)**
Status	Negative	Negative
Reversibility	Irreversible	Recoverable

Irreplaceable loss of resources?	Yes	Unlikely
Can impacts be mitigated?	This impact will be inherently difficult to mitigate based on the proposed development location on semi-natural grassland and the extent of hardened/artificial surfaces to be developed which will require >95% of the site to be stripped of vegetation. Loss of protected plant species can be readily mitigated.	

Mitigation:

Reducing the probability, magnitude and extent of this impact will not be practically possible or feasible given that >95% of the site will be cleared entirely of vegetation and transformed to hardened artificial surfaces. However, there are possible mitigation measures that can be implemented to minimise the magnitude and extent of disturbance. These include:

- » Undertake pre-construction plant rescue and translocation prior to any clearing/disturbance of the site occurring, in line with the requirements and recommendations of the Plant Rescue Translocation and Protection Plan (*contained in Appendix I). This is ideally dealt with during pre-construction*.
- » Contractor induction and staff/labour environmental awareness training needs are to be identified and implemented through staff/contractor environmental induction training. This should include basic environmental training based on the requirements of the EMPr. A copy of the EMPr is to be made available on site at all times.
- » Physically demarcate the construction zone using suitable measures (including pegs, fences, orange bonnox fencing, hazard tape, etc.) and include this on a master layout plan for the site. All demarcation work is to be signed off by the ECO.
- » Limit construction activities, site camps and equipment lay-down areas to disturbed areas within the development footprint and alongside the existing Tata steel north perimeter fence firebreak to the south of the site. No construction camps, etc. to be located within natural grassland areas in areas adjacent to the development site. All site camps and lay-down area, etc. are to be signed off by the ECO.
- » Restrict vegetation clearing to the development footprint only through appropriate project design and specifying and supervising access control and 'No-Go' areas (i.e. those areas outside of the demarcated development/construction site).
- » Manage the extent of disturbance by supervising clearing activities during pre-construction to ensure these are limited to the designated development zone only. The ECO and/or Contractor's EO is to provide supervision and oversight of vegetation clearing activities and other activities which may cause damage to the environment at the initiation of the project.
- » Temporary access routes should be designed to limit potential impact on the environment.
- » Where access is required to areas surrounding the development site, a 5m buffer may be used for access. Where possible, cut vegetation to ground-level rather than removing it completely, leaving root systems intact to ensure rapid re-colonization in areas that are not to be permanently hardened.
- » Rehabilitation and re-vegetation of areas disturbed outside of the development footprint is to be undertaken as soon as practically possible, *as per the relevant rehabilitation guidelines contained in Section 4.4.4 of the Ecological Impact Assessment (Appendix H).*
- » An appropriate fining system should be developed and implemented for any infringements to the EMPr.
- » No harvesting of plants for firewood, medical purposes or other uses is to be permitted.
- » No open fires to be permitted on the site and in surrounding areas.

Residual:
Moderate: Vegetation clearing is likely to be one of the greatest direct impacts on the terrestrial ecology in the study area. If mitigatory actions are properly and timeously employed, the extent of the impact can potentially be reduced to the development site footprint only (avoiding adjacent/surrounding habitats). Impact severity is likely to remain relatively high, however, and will be a permanent residual impact due to the loss of vegetation and transformation to hardened surfaces.

Nature: *Loss/degradation and fragmentation of habitat as a result of vegetation clearing and construction of infrastructure*

Vegetation clearing and disturbance of the semi-natural grassland vegetation at the development site will not only reduce the availability of habitat (refugia/breeding/nesting sites) and food for local wildlife but may also temporarily or even permanently restrict corridor movement between natural areas through associated fragmentation of natural habitat and the severing of natural ecological linkages/corridors. Excavations required during the construction phase would also have a direct impact on moles through loss of habitat, with the overall extent of impact related to the proportion of area developed. Loss of habitat will also have a deleterious impact on ants. The effect of fragmentation will generally be greater for fauna than for flora and is typically lower for grasslands when compared with wooded/forest communities and have a relatively minor impact on small mammals such as rodents and shrews because only a limited proportion of habitat with respect to the broader grassland community will be transformed, with sufficient adjacent habitat retained for the overall impact to be slight. Nocturnal species such as hares would generally avoid disturbance through their nocturnal habit requirements. Due to the broader plans to develop the entire RBIDZ Phase 1F site, loss of habitat connectivity and fragmentation of habitats will occur across the site, leaving little remaining connectivity in the form of wildlife corridors.

Relevant Listed activities:
GN 983, Activity 27 and Activity 28 (i)

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	**Medium (50)**	**Medium (36)**
Status	Negative	Negative
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	This impact will be inherently difficult to mitigate based on the proposed development location on semi-natural grassland and the extent of hardened/artificial surfaces to be developed (>95% of the site).	

Mitigation:
Reducing the probability, magnitude and extent of this impact will not be practically possible or feasible given that >95% of the site will be cleared entirely of vegetation and transformed to hardened artificial surfaces. However, there are possible mitigation measures that can be implemented to minimise the magnitude and extent of disturbance. These include:

- » Contractor induction and staff/labour environmental awareness training needs are to be identified and implemented through staff/contractor environmental induction training. This should include basic environmental training based on the requirements of the EMPr. A copy of the EMPr is to be made available on site at all times.
- » Physically demarcate the construction zone using suitable measures (including pegs, fences, orange bonnox fencing, hazard tape, etc.) and include this on a master layout plan for the site. All demarcation work is to be signed off by the ECO.
- » Limit construction activities, site camps and equipment lay-down areas to disturbed areas within the development footprint and alongside the existing Tata steel north perimeter fence firebreak to the south of the site. No construction camps, etc. to be located within natural grassland areas in areas adjacent to the development site. All site camps and lay-down area, etc. are to be signed off by the ECO.
- » Restrict vegetation clearing to the development footprint only through appropriate project design and specifying and supervising access control and 'No-Go' areas (i.e. areas outside of the construction site).
- » Manage the extent of disturbance by supervising activities during construction to ensure these are limited to the designated construction zone only. Natural areas outside of the development footprint are to be considered 'No-Go' areas. Access through and construction activities within the No-Go areas are strictly prohibited in these areas and needs to be controlled.
- » Temporary access routes should be designed to limit potential impact on the environment.
- » Where access is required to areas surrounding the development site, a 5m buffer may be used for access. Where possible, cut vegetation to ground-level rather than removing it completely, leaving root systems intact to ensure rapid re-colonization in areas that are not to be permanently hardened.
- » Rehabilitation and re-vegetation of areas disturbed outside of the development footprint is to be undertaken as soon as practically possible, as per the relevant rehabilitation guidelines contained in Section 4.4.4 of the Ecological Assessment.
- » An appropriate fining system should be developed and implemented for any infringements to the EMPr.
- » No open fires to be permitted on the site and in surrounding areas.

Residual:

Moderate: If mitigatory actions are properly and timeously employed, the extent of the impact can potentially be reduced to the development site only, however as this impact will be unavoidable at the site, residual impacts including the loss of habitat and fragmentation of habitat/reduced connectivity will remain.

Nature: *Soil erosion and sedimentation caused by initial vegetation stripping and other construction activities*

Vegetation stripping/clearing will temporarily denude the vegetation on the site and expose the soils to erosive elements in the immediate to short-term. This could be exacerbated by water flowing down trenches and access roads, as well as from trench de-watering activities. Soil erosion can result in the loss of valuable topsoil and formation of erosion gullies. This can cause localized habitat loss or alteration due to increased sediment deposition or erosion of natural areas adjacent to the construction site as well. Some of the key ecological effects related to the erosion/deposition of sediment may include:

» Habitat alteration due to increased sediment deposition or erosion of areas;
» Reductions in photosynthetic activity and primary production caused by sediments impeding light penetration;
» Reduced density and diversity of organisms as a result of habitat degradation, blanketing of sites and the establishment of more tolerant taxa or exotic species; and
» Exposure disturbed sites to invasion by weeds and other undesirable plants.

Relevant Listed activities:
GN 983, Activity 27 and Activity 28 (i)

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (32)**	**Low (21)**
Status	Negative	Negative
Reversibility	Recoverable	Reversible
Irreplaceable loss of resources?	Possible	Unlikely
Can impacts be mitigated?	Soil erosion and sedimentation linked to vegetation stripping/clearing and other construction activities can be mitigated through appropriate best-practice erosion control/management practices.	

Mitigation:
If managed properly, the probability, intensity and extent of this impact can be reduced quite significantly and would be best achieved through the onsite implementation of practical 'best practice environmental management' measures designed to control storm water runoff volumes/velocities, erosion and resultant sedimentation. These include:

» Schedule vegetation clearing such that this is completed immediately before construction, to avoid prolonged exposure of the soil to weather elements.
» Vegetation clearing and construction should ideally proceed mainly during the dry, winter months where possible in order to minimize the risk of soil erosion linked to high runoff rates.
» Vegetation/soil clearing and construction activities must only be undertaken during agreed working times (as agreed to between the contractor and project manager/ECO) and permitted weather conditions.
» If heavy rains are expected, construction activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.
» Any disturbed surfaces outside of the area to be developed must be re-vegetated as soon as practically possible to prevent erosion of bare/exposed soils.
» Dewater any excavated trenches required for the development in a manner that does not cause erosion and does not result in silt-laden water flowing downslope. Water must be pumped out into a well-vegetated area to facilitate sediment trapping.
» Run-off generated from cleared and disturbed areas such as access roads must be controlled using suitable erosion control measures (e.g. sand bags, earthen berms, etc.). Sediment barriers (e.g. silt fences, sandbags, hay bales, earthen filter berms or retaining walls) must be established to counter erosion and sedimentation where necessary.

- » Sediment barriers should be regularly maintained and cleared so as to ensure effective drainage.
- » All temporary soil berms, sandbags and silt fences must only be removed once construction has been completed and vegetation cover has successfully re-colonised any disturbed areas outside of the construction zone.
- » Erosion/sediment control measures such as silt fences, concrete blocks and/or sand bags must also be placed around soil/material stockpiles to limit sediment runoff from stockpiles. The slope and height of stockpiles must be limited to 2m to avoid collapse. If soil stockpiles are to be kept for more than 3 months they must be hydroseeded.
- » Disturbed surfaces are to be paved or re-vegetated as soon as practically possible after construction has been completed to prevent erosion of bare/exposed soils. Rehabilitation and re-vegetation of areas disturbed outside of the development footprint is to be undertaken as soon as practically possible, *as per the relevant rehabilitation guidelines contained in Section 4.4.4 of the Ecological Impact Assessment.*

Residual:

Low: Without mitigation this impact can be considered somewhat significant due to the sandy/erodible nature soils at the site. Although impacts would be localized, erosion is likely to persist or worsen over time if not addressed properly and regularly through an appropriate monitoring and management programme for the site. Rapid and effective rehabilitation and re-vegetation of exposed soils outside of the development footprint will be important for reducing erosion risk linked with storm water runoff and thus reducing the overall potential for residual impacts (i.e. erosion and sedimentation in adjacent areas).

Nature: *Pollution of soils and habitat during construction of the power plant facility*

Waste products and pollutants, generated during the construction phase of the development may include fuels and oils from construction vehicles, cement and concrete products, paints and other hazardous substances; as well as solid waste in the form of building material and litter from labourers. These can potentially enter the surrounding natural grassland environments either directly through disposal/mismanagement of waste products/pollutants or more indirectly through surface runoff during rainfall events. These contaminants have the capacity to negatively affect soil ecosystems including sensitive or intolerant species of flora and fauna. Where significant changes in soil quality occur, this will ultimately result in a shift in flora and soil microbes species composition, favouring more tolerant species and encouraging the invasion of early successional and alien invasive species and potentially resulting in the localised exclusion of any sensitive species.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status	Negative	Negative
Reversibility	Recoverable	Reversible
Irreplaceable loss of resources?	Possible	Unlikely

Can impacts be mitigated?	Potentially hazardous pollutant/waste streams can be effectively managed onsite through best practice pollution control measures that will be able to effectively mitigate potential impacts to natural resources.

Mitigation:

If managed properly, the probability and extent of this impact can be reduced quite significantly. This impact can be best managed through practical on-site mitigation measures aimed at reducing the possibility of incidents through waste and pollution control measures as well as developing contingency measures to deal with any significant pollution events should these arise. These include:

» All employees handling fuels and other hazardous materials are to be properly trained in their safe use, environmental restrictions and methods for proper disposal.
» Ensure that all workers on site are aware of the proper procedure in case of a fire occurring on site.
» Ensure adequate fire-fighting equipment is available and train workers on how to use it.
» The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, bitumen, paint, etc.) needs to be administered.
» Construction materials liable to spillage are to be stored in appropriate containment structures (e.g. drip-trays).
» No refuelling, servicing or chemical storage should occur outside the established construction camp. Hazardous storage and re-fuelling areas must be bunded prior to their use on site during the construction period. The bund wall should be high enough to contain at least 110% of any stored volume.
» Drip trays should be utilised at all fuel/chemical dispensing areas. Provide drip-trays beneath standing machinery/plant.
» Vehicle maintenance should not take place on site unless a specific lined and bunded area is constructed within the construction camp for such a purpose.
» Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater.
» An emergency spill response procedure must be formulated and staff is to be trained in spill response. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spillages of fuels, oils and other potentially harmful chemicals should be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the construction site must be removed and rehabilitated timeously and appropriately.
» Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site.
» Sanitation – portable toilets (1 toilet per 10 users is the norm) to be provided where construction is occurring and away from watercourses such as rivers and wetlands. Workers need to be encouraged to use these facilities and not the natural environment.
» Provide adequate rubbish bins and waste disposal facilities on-site and educate/encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal.
» Clear and completely remove from site all general waste, constructional plant, equipment, surplus rock and other foreign materials once construction has been completed.

» No litter, refuse, wastes, rubbish, rubble, debris and builders waste must be placed, dumped or deposited on adjacent/surrounding properties during or after the construction period.
» Recycling/re-use of waste is to be encouraged.
» Ensure that no refuse/waste is burnt on the site or on surrounding premises.

Residual:

Low: Without mitigation this impact can be considered quite severe where activities are not managed properly at the site. Although impacts would be localized, pollution of soils and water by environmental contaminants such as wastes and hazardous products stored at the site can persist in the environment for some time and can be difficult to rectify. With proper mitigation, the risk of incurring residual impacts can be lowered significantly.

Nature: *Direct impacts to fauna (wildlife) by construction machinery and workers*

Construction activities can result in mortalities or damage to local wildlife (fauna/animals) as a result of vehicles and machinery operating in the areas and involved with earthworks, site clearing, construction of infrastructure, etc. During initial vegetation clearing and earth works, fauna of conservation importance such as Red Data and protected species may be killed, injured or damaged. Construction activities occurring within a close proximity to natural habitat can lead to increased pressure on natural resources through illegal hunting/poaching/trapping of wildlife for various uses such as food/medicinal purposes. This is particularly relevant to areas where protected/Red data species may occur and remote areas that have not been impacted to a high degree by local communities.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Medium term (3)	Short term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (27)**	**Low (10)**
Status	Negative	Negative
Reversibility	Recoverable	Reversible
Irreplaceable loss of resources?	Possible	Unlikely
Can impacts be mitigated?	This impact can be effectively mitigated at the site through appropriate management practices to limit and restrict disturbing construction activities where possible.	

Mitigation:

Most wildlife that could utilise the site is likely to move into undisturbed surrounding areas as human presence increases at the site. If managed properly, the extent and probability of this impact occurring can also be reduced quite significantly. This impact can be best managed through practical on-site mitigation measures aimed at reducing the possibility of incidents occurring. These include:

» Education of workers/employees onsite on not to harm wildlife unnecessarily will assist in mitigating this impact. Contractor induction and construction staff/labour environmental awareness training needs are to be identified and implemented through staff/contractor environmental induction training. This should include basic environmental training based on the requirements of the EMPr, including training on avoiding and conserving local wildlife. A copy of the EMPr is to be made available on site at all times.

- » Manage the extent of disturbance by supervising construction to ensure these are limited to the designated construction zone only.
- » No wild animal may under any circumstance be hunted, snared, captured, injured, killed, harmed in any way or removed from the construction site or surrounding areas. This includes animals perceived to be vermin (such as snakes, rats, mice, etc.). Construction workers are to be informed of this requirement.
- » Any fauna/animal found on the construction site may not under any circumstance be hunted, snared, captured, injured, killed, and harmed in any way. Such animals must rather be moved to the closest point of natural or semi-natural vegetation outside the construction zone.
- » The handling and relocation of any animal perceived to be dangerous/venomous/poisonous must be undertaken by a suitably trained individual.
- » Construct a temporary perimeter fence around the construction site and site camps (where practically possible) to restrict access of wildlife onto the construction site and likewise to restrict workers to the construction site and camp.
- » All construction vehicles accessing the site should adhere to a low speed limit (30km/h is recommended) to avoid collisions with susceptible species such as reptiles (snakes and lizards).
- » No litter, food or other foreign material should be disposed of on the ground or left around the site or within adjacent natural areas and should be placed in demarcated and fenced rubbish and litter areas that are animal proof.

Residual:

Low: Without mitigation this impact is likely to be limited in terms of extent and intensity as a result of existing human activity in the area, associated with the adjacent industry and grazing livestock and the concomitant reduction in the faunal populations at the site which has already occurred. Where access to natural areas is restricted and onsite staff/workers properly managed, the probability of this impact occurring and the extent of the impact can be reduced significantly and the risk of incurring residual impacts may be considered relatively low as a result.

Nature: *Artificial noise and light disturbance impacts on local wildlife during construction*

Local wildlife (fauna) generally respond to disturbances caused by human activities according to the magnitude, timing, and duration of the particular disturbance. Human activities can affect an animal's ability to feed, rest, and breed if it is unable to habituate to the disturbance caused (Rodgers & Schwikert, 2003). Construction activities occurring within a close proximity to natural habitats containing fauna (wildlife) can lead to both the physical disturbance of habitats supporting animal life by construction machinery/labourers (already discussed above) as well as the disturbance of fauna due to noise and light pollution at the site during the construction process. Locally common species already occurring in the surrounding area are likely to be less sensitive to noise disturbance (due to the proximity of existing human development) and can probably become habituated at the site. Impacts are likely to be relatively short-lived over the course of the construction process and affecting only a few areas of natural habitat where sensitive species may occur and will probably mainly affect local bird species that can quite easily migrate to other similar habitat in the area.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)

Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (18)**
Status	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Noise pollution and disturbance of local wildlife will be inherently difficult to mitigate altogether, but the intensity and extent of the resultant disturbance can be managed to a degree.	

Mitigation:

If managed properly, the extent and probability of this impact occurring can be potentially reduced. The following mitigation measures apply:

» Manage the extent of disturbance by supervising vegetation clearing ad construction activities to ensure these are limited to the designated construction zone only.
» Ensure that construction workers accessing the site conduct themselves in an acceptable manner while on site, both during work hours and after hours.
» Temporary noise pollution from construction activities should be minimized by ensuring the proper maintenance of construction equipment and vehicles, and tuning of engines and mufflers as well as employing low noise equipment where possible.
» No activities should be permitted at the site after dark (between sunset and sunrise), except for security personnel guarding the construction site.

Residual:

Low: Residual impacts are unlikely to persist to a large extent as wildlife disturbed during initial clearing and construction are likely to readily migrate to other remaining habitat in the area outside of the impacted zone.

6.2.3. Operation phase ecological impacts

Nature: *Increased spread or introduction of declared weeds and Invasive Alien Plants post-construction*

Although this impact is generally initiated during the construction phase, it is typically an operational issue as recovery of natural vegetation communities following disturbance can be a lengthy process. In many cases, the disturbance of soils and clearing of vegetation within natural areas (and adjacent habitats) prior to and during construction can create an ideal opportunity and optimal conditions for weeds and Invasive Alien Plants (IAPs) to invade disturbed areas. IAPs can have far reaching detrimental effects on native biota and has been widely accepted as being a leading cause of biodiversity loss. They typically have rapid reproductive turnover and are able to outcompete native species for environmental resources, alter soil chemistry and stability, promote erosion, change litter accumulation, reduce food supply for fauna and soil properties and promote of suppress fire. Failure to manage stripping of vegetation, topsoil and rehabilitation can lead to serious IAP infestation which compromises the quality of habitat provided by the naturally occurring vegetation community. Clearing and disturbance can also result in an increase in 'edge habitat' immediately adjacent to disturbed areas. Edge habitat is characterized by a predominance of generalist and alien species that are usually highly competitive species which can invade areas of established vegetation, resulting in a loss of sedentary species of mature habitats which are normally considered sensitive. Edge habitat effects will be typically lower for grasslands when compared with wooded communities such as forests and woodland. The spread of existing alien plants within natural areas can be exacerbated if not properly managed, and new alien plant species may be introduced to natural areas as a result of human disturbance.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Medium term (3)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Improbable (3)
Significance	**Medium (30)**	**Low (18)**
Status	Negative	Negative
Reversibility	Recoverable	Reversible
Irreplaceable loss of resources?	Possible	Unlikely
Can impacts be mitigated?	The impacts of alien plant within disturbed adjacent areas can be effectively mitigated through the implementation of appropriate alien plant management programme with proper follow-up treatment/control operations.	

Mitigation:

Mitigation would be best achieved through the development and implementation of an Invasive Alien Plant (IAP) Control and Eradication Programme for the site. This will need to be implemented as per the ***Invasive Alien Plant Eradication and Control Programme*** in Section 4.4.3 for areas adjacent to or surrounding the development that may be disturbed during construction and where invasive alien plants (IAPs) and other undesirable plant species (weeds for example) colonise these sites. IAP control is likely to be required for the duration of the operation of the project until the site has been decommissioned and adequately rehabilitated.

Residual:

Negligible: If not monitored and properly controlled on a regular basis, the scale and magnitude of infestation of invasive alien plants and weeds is likely to increase rapidly and may persist for the entire lifecycle of the project. Areas likely to be affected will be minimal due to plans to

develop the broader IDZ Phase 1F site, hence residual impacts are likely to be negligible in the long-term.

Nature: *Soil erosion and sedimentation linked to storm water runoff from the operating power plant facility*

During operation, poorly managed storm water runoff from the developed site (runoff from impermeable surfaces created such as roads, buildings, rooftops, etc.) could cause erosion, with the loss of topsoil and sedimentation of adjacent areas being the most critical negative ecological consequences. The negative ecological effects of erosion and sedimentation are discussed above under pre-construction impacts.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Long term (4)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (40)**	**Low (14)**
Status	Negative	Negative
Reversibility	Recoverable	Reversible
Irreplaceable loss of resources?	Possible	Unlikely
Can impacts be mitigated?	Soil erosion and sedimentation linked to storm water runoff from the site can be mitigated through appropriate best-practice storm water and erosion control/management practices.	

Mitigation:

If managed properly, the probability, intensity and extent of this impact can be reduced quite significantly and would be best achieved through the onsite implementation of an Operational Storm Water Management Plan designed to attenuate and control the volume and velocity of storm water runoff generated from hardened surfaces associated with the operational power plant facility. The following should be considered when developing this plan:

» Manage surface runoff from hardened surfaces without causing increased peak discharge, soil saturation in non-wetland areas and erosion and sedimentation.
» The site should be well graded to permit water to readily drain away and to prevent ponding of water anywhere on the surface of the ground.
» Overland flow routes and erosion and sediment trapping control measures should cater for large rainfall events given the high summer rainfall in this region.
» An appropriate SUDS (Sustainable Urban Drainage System) should be implemented, characterized by a combination of open, grass-lined channels/swales and stone-filled infiltration ditches that will encourage infiltration across the site, provide for the filtration and removal of pollutants and provide for some degree of flow attenuation by reducing the energy and velocity of storm water flows.
» It is suggested that semi-pervious materials be used for roads that allow for some infiltration rather than using totally impermeable tarred road surfaces, as this will assist with reducing storm water runoff.
» The provision of swales/mini ponds adjacent to roads is recommended to provide additional attenuation capacity where necessary.

» All storm water detention and attenuation structures must be located within the development footprint.
» A "first flush" treatment system should be considered in the storm water design to ensure that the initial flux of polluted surface runoff is contained, tested and treated before being discharged to the environment.
» Storm water outlets should be designed in the form of multiple smaller storm water outlets rather than a few large outlets in order spread out surface flow and avoid flow concentration as far as possible.
» Development design can also promote the conservation and efficient utilisation of water, implement rainwater harvesting measures, the recycling / re-use through grey water systems and using water efficient fittings. Rainwater harvesting and storage should be promoted on-site by installing appropriate systems to collect rainwater from roofs/gutters, etc. in closed-top tanks or landscaped features for irrigation and non-potable purposes.
» Storm water management systems should be designed with longevity in mind and should require little maintenance by catering for silting.

Residual:

Low: Without mitigation this impact can be considered quite severe due to the sandy/erodible nature soils at the site. Although impacts would be localized, erosion is likely to persist or worsen over time if not addressed properly and regularly through an appropriate monitoring protocol for the site. Rapid and effective rehabilitation and re-vegetation of exposed soils will be important for reducing erosion risk in adjacent areas linked with storm water runoff from the developed site.

Nature: *Pollution of soils and habitat during operation of the power plant facility*

Fuels (stored in 3 fuel tanks onsite with a capacity of 2000m^3 each) and oils/grease stored and handled at the proposed gas powered power plant during operation and maintenance, including any liquid and solid waste produced, could enter adjacent environments if not managed adequately and could lead to pollution of the adjacent habitat, flora and fauna. The same applies to any flammable and/or hazardous substances such as fuels that will be stored and used at the site for the necessary operation of the facility. *Potential negative ecological consequences of hazardous substances on ecosystems and biodiversity have been discussed under construction phase impacts.*

Relevant listed Activity:
GNR 984, Activity 1

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (22)**
Status	Negative	Negative
Reversibility	Recoverable	Reversible
Irreplaceable loss of resources?	Possible	Unlikely
Can impacts be mitigated?	Potentially hazardous pollutant/waste streams can be effectively managed onsite through best practice pollution control	

	measures that will be able to effectively mitigate potential impacts to natural resources.

Mitigation:

If managed properly, the probability and extent of this impact can be reduced quite significantly. This impact can be best managed through practical on-site mitigation measures aimed at reducing the possibility of incidents through waste and pollution control measures as well as developing contingency measures to deal with any significant pollution events should these arise. These include:

- All employees handling fuels and other hazardous materials at the operational facility are to be properly trained in their safe use, environmental restrictions and methods for proper disposal.
- Ensure that all workers on site are aware of the proper procedure in case of a fire occurring on site.
- Ensure adequate fire-fighting equipment is available and train staff/workers on how to use it.
- The proper storage and handling of hazardous substances (e.g. fuel, oil, grease, etc.) needs to be administered.
- Any materials liable to spillage are to be stored in appropriate containment structures such as bunded areas capable of containing at least 110% of any stored volume.
- Drip trays should be utilised at any necessary fuel dispensing areas.
- An emergency spill response procedure must be formulated and staff is to be trained in spill response. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spillages of fuels, oils and other potentially harmful chemicals should be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the construction site must be removed and rehabilitated timeously and appropriately.
- Contaminated water containing fuel, oil, grease or other hazardous substances must never be released into the adjacent environment. It must be disposed of at a registered hazardous landfill site.
- Provide adequate rubbish bins and waste disposal facilities on-site and educate/encourage staff not to litter or dispose of solid waste in the adjacent natural environment but to use available facilities for waste disposal.
- No litter, refuse, waste products, rubbish, rubble, debris, etc. must be placed, dumped or deposited on adjacent/surrounding properties.
- Recycling/re-use of waste is to be encouraged at the site where possible.
- No refuse/waste is burnt or buried on the site or on surrounding premises.

Residual:

Low: Without mitigation this impact can be considered quite severe where operational activities and waste generated are not managed properly at the site. Although impacts would probably be highly localized, pollution of soils and water by environmental contaminants such as wastes and hazardous products stored/handled at the site can persist in the environment for some time and the residual impact of environmental pollution can be difficult to rectify. With proper mitigation, the risk of incurring residual impacts can be lowered significantly.

Nature: *Direct impacts to fauna (wildlife) by staff accessing the operational power plant facility*

Wherever there are human activities occurring within a close proximity to natural habitat, this can lead to increased pressure on natural resources through illegal hunting/poaching/trapping of wildlife by staff/workers accessing the power plant facility. This is likely to remain a risk as long as humans occupy the site but is likely to be less significant due to the existing close proximity of industrial activities and livestock grazing which has likely depleted the faunal communities occurring in the surrounding areas.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (14)**
Status	Negative	Negative
Reversibility	Recoverable	Reversible
Irreplaceable loss of resources?	Possible	Unlikely
Can impacts be mitigated?	This impact can be effectively mitigated at the site through appropriate management practices to limit and restrict disturbing construction activities where possible.	

Mitigation:

Wildlife are probably unlikely to utilise the site (apart from vermin) and would be contained within adjacent natural areas. If managed properly, the extent and probability of this impact occurring can also reduced significantly. This impact can be best managed through practical on-site mitigation measures aimed at reducing the possibility of incidents occurring. These include:

- Education of staff/employees accessing and working on the property on not to harm wildlife unnecessarily will assist in mitigating this impact.
- Any fauna/animal found on the power plant site may not under any circumstance be hunted, snared, captured, injured, killed, and harmed in any way. This includes animals perceived to be vermin (such as snakes, rats, mice, etc.). Such animals must rather be moved to the closest point of natural or semi-natural vegetation outside the facility. Employees/workers are to be informed of this requirement.
- The handling and relocation of any animal perceived to be dangerous/venomous/poisonous must be undertaken by a suitably trained individual.
- Construct a suitable perimeter fence around the power plant facility to restrict access of wildlife onto the site and likewise to restrict/control access of staff to adjacent natural areas.
- No open fires to be permitted on the site and in surrounding areas.

Residual:

Low: Without mitigation this impact can be potentially high but is likely to be limited in terms of extent and intensity as a result of existing human activity in the area, associated with the adjacent industry and grazing livestock and the concomitant reduction in the faunal populations at the site which has already occurred. Where access to adjacent natural areas is restricted and onsite staff/workers properly managed, the probability of this impact occurring and the extent of the impact can be reduced significantly and the risk of incurring residual impacts may be considered relatively low as a result.

Nature: *Artificial noise and light disturbance impacts on local wildlife during site operation*

Longer term noise and light pollution impacts are likely to persist during the operational life-span of the power plant facility but is unlikely to create significant ecological impacts due to the proximity of existing human disturbance/industrial activity in the area. *Potential negative ecological consequences on ecosystems and biodiversity linked to noise and light pollution have been discussed under construction phase impacts*.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (24)**
Status	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Noise pollution and disturbance of local wildlife will be inherently difficult to mitigate altogether, but the intensity and extent of the resultant disturbance can be managed to a degree.	

Mitigation:

During operation, noise reduction could be implemented but may be difficult given the nature of the operational activities associated with the proposed power plant development.

- Due to the low potential significance of this impact, where noise and light reduction measures can be implemented, this should be done but is not considered critical. Explore the possibility of using low-intensity noise and lighting where possible (this is however unlikely to assist with reducing this impact due to the future large-scale development of the broader Phase IDZ 1F site).
- Education of employees/workers accessing the site on how to conduct themselves in an acceptable manner while on site, both during work hours and after hours.

Residual:

Negligible: Whilst operational activities will continue to create noise and artificial light disturbance throughout the life-span of the project (until closure and rehabilitation of the site has been successfully completed), residual impacts are unlikely to persist to a large extent as wildlife disturbed are likely to readily migrate to other remaining habitat in the area outside of the impacted zone.

6.2.4. Decommissioning phase ecological impacts

Nature: *Soil erosion and sedimentation*

Where any bare/exposed soils are left unvegetated once the project has been decommissioned, these are inherently vulnerable to erosion and can result in excessive removal/loss of topsoil and the resultant sedimentation of downslope/adjacent habitats.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Improbable (2)

Significance	**Low (24)**	**Low (14)**
Status	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Soil erosion and sedimentation linked to decommissioning activities can be mitigated through appropriate best-practice erosion control/management practices.	

Mitigation:

If managed properly, the probability, intensity and extent of this impact can be reduced quite significantly and would be best achieved through the onsite implementation of practical 'best practice environmental management' measures designed to control storm water runoff volumes/velocities, erosion and resultant sedimentation during decommissioning activities. These include:

- » If heavy rains are expected, decommissioning activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.
- » Dewater any trenches/excavations in a manner that does not cause erosion and does not result in silt-laden water flowing downslope. Water must be pumped out into a well-vegetated area to facilitate sediment trapping.
- » Run-off generated from hardened surfaces must be controlled using suitable erosion control measures (e.g. sand bags, earthen berms, etc.) whilst the facility is being decommissioned. Sediment barriers (e.g. silt fences, sandbags, hay bales, earthen filter berms or retaining walls) must be established to counter erosion and sedimentation where necessary.
- » Sediment barriers should be regularly maintained and cleared so as to ensure effective drainage.
- » All temporary soil berms, sandbags and silt fences must only be removed once the site has been closed and rehabilitated successfully.
- » Disturbed surfaces are to be re-vegetated as soon as practically possible to prevent erosion of bare/exposed soils. Rehabilitation and re-vegetation of natural areas disturbed outside of the development area is to be undertaken as soon as practically possible, as per the relevant *rehabilitation guidelines contained in Section 4.4.4 of the Ecological Impact Assessment.*

Residual:

Low/negligible: Without mitigation this impact can be considered relatively significant due to the sandy/erodible nature soils at the site. Although impacts would be highly localized, erosion is likely to persist or worsen over time if not addressed properly and regularly through an appropriate monitoring protocol for the site. Rapid and effective rehabilitation and re-vegetation of exposed soils will be important for reducing erosion risk and can essentially eliminate residual impacts related to erosion/sedimentation.

Nature: *Pollution of soils and habitat during decommissioning of the power plant facility*

During decommissioning, residual waste products generated or materials/substances involved in decommissioning could enter the adjacent environment, leading to pollution of habitats, soils and vegetation. Any products illegally disposed of into the environment will also likely cause harm to the natural environment and its components.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Site only (1)

Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (14)**
Status	Negative	Negative
Reversibility	Recoverable	Reversible
Irreplaceable loss of resources?	Possible	Unlikely
Can impacts be mitigated?	Potentially hazardous pollutant/waste streams can be effectively managed onsite through best practice pollution control measures that will be able to effectively mitigate potential impacts to natural resources.	

Mitigation:

If managed properly, the probability and extent of this impact can be reduced quite significantly. This impact can be best managed through practical on-site mitigation measures aimed at reducing the possibility of incidents through waste and pollution control measures as well as developing contingency measures to deal with any significant pollution events should these arise. These include:

- All employees handling fuels and any other hazardous materials are to be properly trained in their safe use, environmental restrictions and methods for proper disposal.
- Ensure that all workers on site are aware of the proper procedure in case of a fire occurring on site.
- Ensure adequate fire-fighting equipment is available and train workers on how to use it.
- Materials/liquids liable to spillage are to be stored in appropriate containment structures (e.g. drip-trays).
- An emergency spill response procedure must be formulated and staff is to be trained in spill response. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spillages of fuels, oils and other potentially harmful chemicals should be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil from the construction site must be removed and rehabilitated timeously and appropriately.
- Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site.
- Sanitation – portable toilets (1 toilet per 10 users is the norm) to be provided where construction is occurring and away from watercourses such as rivers and wetlands. Workers need to be encouraged to use these facilities and not the natural environment.
- Provide adequate rubbish bins and waste disposal facilities on-site and educate/encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal.
- Clear and completely remove from site all general waste, plant, equipment, surplus rock and other foreign materials.
- No litter, refuse, wastes, rubbish, rubble, debris and builders waste must be placed, dumped or deposited on adjacent/surrounding properties during or after the construction period.
- Recycling/re-use of waste is to be encouraged.
- Ensure that no refuse/waste is burnt or buried on the site or on surrounding premises.

Residual:

Low: Without mitigation this impact can be considered significant where activities are not managed properly at the site. Although impacts would be localized, pollution of soils and water by environmental contaminants such as wastes and hazardous products can persist in the environment for some time and can be difficult to rectify. With proper mitigation, the risk of incurring residual impacts can be lowered significantly.

6.2.5. Implications for Project Implementation

The key conclusions and recommendations from the ecological assessment include:

- Two (2) species of plant identified which are 'specially protected plant species' in terms of the Natal Conservation Ordinance No. 15 of 1974. These are *Crinum delagoense* (Candy striped Crinum, 'Declining' threat status) and the SA Endemic *Ledebouria ovatifolia*. These are protected under Schedule 12 (Specially Protected Indigenous Plants) of the Natal Conservation Ordinance No. 15 of 1974. A permit needs to be applied for with regards to relocating any of these species.
- Undertake plant rescue and translocation prior to any clearing/ disturbance of the site occurring, in line with the requirements and recommendations of the Plant Rescue Translocation and Protection Plan (refer to Appendix H and Appendix I).
- Where access is required to areas surrounding the development site, a 2m buffer may be used for access. Where possible, cut vegetation to ground-level rather than removing it completely, leaving root systems intact to ensure rapid re-colonization in areas that are not to be permanently hardened.
- Vegetation clearing should ideally proceed mainly during the dry, winter months where possible in order to minimise the risk of soil erosion linked to high stormwater runoff rates.
- Vegetation/soil clearing activities must only be undertaken during agreed working (negotiated between the contractor and ECO) times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.
- Schedule vegetation clearing such that this is completed immediately before construction in an area to avoid prolonged exposure of the soil to weather elements.
- All vehicles accessing the site should adhere to a low speed limit (30km/h is recommended) to avoid collisions with susceptible species such as reptiles (snakes and lizards).
- Limit construction activities, site camps and equipment lay-down areas to disturbed areas within the development footprint and alongside the existing Tata steel north perimeter fence firebreak to the south of the site. No construction camps, etc. to be located within natural grassland areas in areas adjacent to the development site.
- An appropriate SUDS (Sustainable Urban Drainage System) should be implemented, characterized by a combination of open, grass-lined channels/swales and stone-filled infiltration ditches that will encourage infiltration across the site, provide for the

filtration and removal of pollutants and provide for some degree of flow attenuation by reducing the energy and velocity of storm water flows.

» Semi-pervious materials must be used for roads that allow for some infiltration rather than using totally impermeable tarred road surfaces, as this will assist with reducing storm water runoff.

Based on the assessment undertaken, it is concluded that the project is considered to be acceptable from an ecological perspective provided that the recommended mitigation measures are implemented.

6.3. Assessment of Potential Air Quality Impacts

The expected impact on air quality as a result of the emissions form the proposed development will be associated with an increase of air pollution which may have direct or indirect impacts on local community and environment. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G** – Air Quality Assessment Report for more details).

6.3.1. Results of the Air Quality Study

Ambient air quality in Richards Bay is influenced by a number of sources of air pollution, including large and smaller industry, transportation, agricultural burning, mining and the long range transport of pollutants from the interior. The proposed gas to power plant is located in an area where there are many notable sources of SO_2, NO_2, PM_{10}, CO and benzene (to a lesser extent) in the immediate vicinity of the site.

Two operational scenarios are assessed for the proposed gas to power plant generating the maximum output of 400MW:

Scenario 1: Power generation using diesel, which includes stack emissions and fugitive emissions from the diesel storage tanks; and

Scenario 2: Power generation using LNG, which only includes stack emissions as LNG will be piped in.

The effects of emissions of SO_2, NO_X, PM_{10}, CO and benzene from these operational scenarios on the existing state of air quality are assessed by adding the predicted concentrations to the existing baseline, i.e. assessing the additive effect.

According to the model results, the 99th percentile of the predicted 1-hour and 24-hour and annual average SO_2, NO_2, PM_{10}, CO and benzene concentrations from the proposed gas to power plant are well below the respective NAAQS and WHO guidelines for Scenario 1 and Scenario 2. Predicted ambient concentrations are localised and very low for the modelled scenarios. The contribution to ambient concentrations beyond the immediate

vicinity of the proposed gas to power plant is therefore small. The additive effect of these concentrations to the ambient environment is therefore highly unlikely to make a significant contribution to the cumulative impacts of SO_2, NO_2, PM_{10}, CO and benzene in the ambient environment. Impacts in terms of predicted concentrations of SO_2, NO_2, PM_{10}, CO and benzene from the operational scenarios will however last for the full period of the proposed gas to power plant. The duration of direct, indirect and cumulative impacts from the operational scenarios are therefore expected to be long-term. The significance of all impacts for the two operational scenarios is low.

Construction and decommissioning activities will result in the emission of low quantities of terrestrial and construction dust, not expected to pose a health risk. Furthermore, dust emissions will not travel over vast distances, but will most likely settle within 100m to 1km of the proposed development site. A temporary nuisance impact may be experienced in parts of the RBIDZ Zone 1F, the property on which the site is to be constructed. Construction and decommissioning impacts will last for a relatively short period as these activities occur for the duration of these activities only. It is predicted that the significance of all impacts during the construction and decommissioning phase is low. No mitigation is necessary, however, measures are suggested to minimise the nuisance impacts arising from these activities.

In this assessment, two NO_X emission mitigation strategies have been tested for the proposed gas to power plant. These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed gas to power plant, this will result in significantly lower NO_2 concentrations during the operational phase for all scenarios. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the diesel and LNG. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 content levels are already low. Due to the low predicted impacts, no mitigation measures are suggested for operational activities, in other words, mitigation measures to control SO_2 and NO_X, or even PM_{10}, CO and benzene are not necessary for the normal operations of the proposed gas to power plant. The significance rating will remain low during the operational phase for all scenarios, with or without mitigation.

It is predicted with confidence, that the site operations will generate low emissions, low ambient concentrations, and low environmental impacts overall. Mitigation measures are recommended for construction and decommissioning activities only. It is a reasonable opinion that the project should be authorised considering the outcomes of this impact assessment.

6.3.2. Potential Direct Air Quality impacts during the Construction phase

Direct impacts will result from exposure to dust generated from the construction of the proposed Gas to Power Plant. Direct impacts associated with the construction phase are

expected to be of short duration and temporary in nature. Indirect impacts during the construction phase are very improbable.

Nature: *Dust generated during the construction phase has a nuisance impact and negatively affects quality of life by causing soiling, contamination, structural corrosion and damage to precision equipment, machinery and computers.*

Construction work will entail building of new infrastructure and heavy construction work with concrete, steel, piping, etc. Dust emissions during construction results mainly from earth moving activities (scraping, compacting, excavation, grading), movement of construction vehicles and back-fill operations. All aspects of the construction inherently generate dust, but the movement of construction vehicles on paved and unpaved surfaces at the construction site are generally the largest source of dust. Construction vehicles will be in operation for the duration of the construction. Dust is also easily entrained from exposed areas by wind. The impact of dust is considered to be limited to the site and its immediate surroundings, is more of a temporary nuisance nature and does not typically pose a health risk due to its typically coarse size. Dust emissions will not travel over vast distances, but will most likely settle within 100 m to 1 km of the proposed Gas to Power Plant site. Impacts may be experienced in parts of the IDZ Zone 1F, the property on which the site is to be constructed.

Relevant Listed activities:
GN 984, Activity 6 and Activity 28

	Without mitigation	**With mitigation**
Extent	Local-regional (1)	Local-regional (1)
Duration	Very short term (1)	Very short term (1)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	N/A

Mitigation measures:

» Implement traffic control measures to limit vehicle-entrained dust from unpaved roads by limiting vehicle speeds (i.e. 30km/h) and by restricting traffic volumes.
» Limit access to construction site to construction vehicles only.
» Loading and unloading bulk construction material should be in areas protected from the wind or carried out in calm conditions.
» Loads on vehicles carrying dusty construction materials should be covered.
» Vehicles carrying dusty materials should be cleaned before leaving the site.
» Unpaved road surfaces should be sprayed with a surfactant to ensure high moisture content which will bind the silt or maintain high moisture content on exposed surfaces and roads by spraying with water.
» Stabilise open areas with dust palliative, gravel or similar.

Residual Impacts:
No residual impacts are expected.

The impact is expected to be negative, local in extent, temporary in duration (limited to the duration of the construction), of low intensity, and improbable with mitigation measures implemented. The impact is therefore assessed to be of **low** significance to the decision making process with mitigation. This impact is expected to be direct with no residual impacts with mitigation. Indirect impacts during the construction phase are very improbable.

Although the significance of impacts during construction is low, a basic dust management plan is required to ensure the nuisance impacts are mitigated. This can be achieved by addressing dust management in the EMPr for the proposed gas to power plant.

6.3.3. Potential Direct Air Quality impacts during the Operation phase

Direct impacts will result from the inhalation of SO_2, NO_2, PM_{10}, CO and benzene emitted from the combustion of diesel fuel during Phase 1 (Scenario 1) and LNG during Phase 2 (Scenario 2) of the operational life of the proposed Gas to Power Plant. Direct impacts associated with the operational phase are expected to last for the duration of operation, which is ~25-40 years. The inhalation of these emissions at concentrations exceeding health-based air quality standards, and which are greater than the permitted number of exceedances per year, will result in negative health impacts. Emissions of SO_2, NO_2, PM_{10}, CO and benzene from the proposed gas to power plant increase the existing ambient concentrations of these pollutants in the immediate vicinity and the surrounding areas. The highest concentrations are located close to the proposed gas to power plant site. The predicted concentrations are very low (and in some cases orders of magnitude below) the NAAQS and WHO guidelines. No exceedance of the NAAQS is predicted within the proposed Gas to Power Plant site or in residential areas around the site. The predicted ambient concentrations for all pollutants therefore comply with the NAAQS in the ambient environment.

Nature: *Direct impacts from the combustion of diesel fuel (Scenario 1) at the proposed gas to power plant* Emissions, including SO_2, NO_2, PM_{10}, CO and benzene, are released from the combustion of diesel at the gas to power plant. The inhalation of these emissions at concentrations exceeding health-based air quality standards, and which are greater than the permitted number of exceedances per year, will result in negative health impacts.		
Relevant Listed activities: GN 984, Activity 6 and Activity 28		
	Without mitigation	**With mitigation**
Extent	Local-regional (1)	Local-regional (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)

Significance	**Low (27)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	N/A
Mitigation measures: In this assessment, two NO_X emission mitigation strategies have been tested for the proposed Gas to Power Plant using diesel fuel (Scenario 1) (refer to results section). These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed Gas to Power Plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the diesel fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.		
Residual Impacts: No residual impacts are expected. This is due to the fact that the project site is centrally located within the RBIDZ and serves as a buffer.		

The impact is expected to be negative, local in extent, to last for the duration of operation, of low intensity and probable, without mitigation or with mitigation measures implemented. The impact is therefore assessed to be of low significance to the decision making process without mitigation or with mitigation. This impact is expected to be direct with no residual impacts, without mitigation or with mitigation**.**

Nature: *Direct impacts from the combustion of <u>LNG fuel (Scenario 2)</u> at the proposed gas to power plant* Air quality impacts are caused by the inhalation of SO_2, NO_2, PM_{10}, CO and benzene, which are contained in emissions from the combustion of LNG fuel at the proposed Gas to Power Plant. The inhalation of the SO_2, NO_2, PM_{10}, CO and benzene at concentrations exceeding health-based air quality standards; and which are greater than the permitted number of exceedances per year, will result in negative health impacts.		
Relevant Listed activities: GN 984, Activity 6 and Activity28		
	Without mitigation	**With mitigation**
Extent	Local-regional (1)	Local-regional (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High

Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	N/A
Mitigation measures: In this assessment, two NO_X emission mitigation strategies have been tested for the proposed Gas to Power Plant using LNG fuel (Scenario 2) (refer to results section). These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed Gas to Power Plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the LNG fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.		
Residual Impacts: No residual impacts are expected. This is due to the fact that the project site is centrally located within the RBIDZ and serves as a buffer.		

The impact is expected to be negative, local in extent, to last for the duration of operation, of low intensity and probable, without mitigation or with mitigation measures implemented. The impact is therefore assessed to be of low significance to the decision making process without mitigation or with mitigation. This impact is expected to be direct with no residual impacts, without mitigation or with mitigation.

6.3.4. Potential Indirect Air Quality impacts during the Operation phase in terms of acid rain

Acid rain is a rain or any other form of precipitation that is unusually acidic, meaning that it has a low pH. It can have harmful effects on plants, aquatic animals and infrastructure. Acid rain is caused by emissions of SO_2 and NO_X, which react with the water molecules in the atmosphere to produce acids. The chemicals in acid rain can cause paint to peel, corrosion of steel structures such as bridges, and weathering of stone buildings and statues. Indirect impacts resulting from emissions of SO_2 and NO_X from the combustion of diesel fuel during Phase 1 and LNG during Phase 2 of the operational life of the proposed Gas to Power Plant include their contribution to acidification in both dry and wet (acid rain) deposition. Indirect impacts associated with the operational phase are expected to last for the duration of operation, which is ~25-40 years.

Nature: *Emissions of SO_2 and NO_X from the combustion of diesel fuel (Scenario 1) contributes to acid rain.*		
Relevant Listed activities: GN 984, Activity 6 and Activity 28		
	Without mitigation	**With mitigation**
Extent	Local-regional (2)	Local-regional (2)
Duration	Long term (4)	Long term (4)

Magnitude	Small impact (0)	Small Impact (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (12)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	N/A
Mitigation measures: In this assessment, two NO_X emission mitigation strategies have been tested for the proposed gas to power plant using diesel fuel (Scenario 1). These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed Gas to Power Plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the diesel fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.		
Residual Impacts: No residual impacts are expected.		

The impact is expected to be negative, local-regional in extent, to last for the duration of operation, of small impact and improbable, without mitigation or with mitigation measures implemented. The impact is therefore assessed to be of low significance to the decision making process without mitigation or with mitigation. This impact is expected to be indirect with no residual impacts, without mitigation or with mitigation**.**

Nature: *Emissions of SO_2 and NO_X from the combustion of LNG fuel (Scenario 2) contributes to acid rain.*		
Relevant Listed activities: GN 984, Activity 6 and Activity 28		
	Without mitigation	**With mitigation**
Extent	Local-regional (2)	Local-regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Small impact (0)	Small Impact (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (12)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	N/A
Mitigation measures:		

In this assessment, two NO_X emission mitigation strategies have been tested for the proposed gas to power plant using LNG fuel (Scenario 2). These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed gas to power plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the LNG fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.
Residual Impacts: No residual impacts are expected.

The impact is expected to be negative, local-regional in extent, to last for the duration of operation, of small impact and improbable, without mitigation or with mitigation measures implemented. The impact is therefore assessed to be of low significance to the decision making process without mitigation or with mitigation. This impact is expected to be indirect with no residual impacts, without mitigation or with mitigation**.**

6.3.5. Potential Indirect Air Quality impacts during the Operation phase in terms of South Africa's CO_2 / Greenhouse gas emissions and global warming

A greenhouse gas (GHG) is transparent to shortwave radiation emitted by the sun but has the ability to absorb the long wave radiation emitted by the surface of the earth, resulting in a warming of the atmosphere, producing what is known as the greenhouse effect. Examples of GHGs include water vapour, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (NO), ozone (O_3) and chlorofluorocarbons (CFCs). These pollutants have atmospheric lifetimes ranging from a few years to many decades. The individual effect of the wide range of GHGs is represented by a parameter known as the Global Warming Potential (GWP). The GWP is the ratio of the warming caused by a substance to the warming caused by a similar mass of CO_2 calculated over 100 years. Thus, the GWP of CO_2 is defined as 1. CO is not considered a GHG, but is a strong precursor in the formation of ozone in the troposphere. The global warming potential of tropospheric ozone is equivalent to between 918-1022 tons of CO_2.

In this impact assessment, indirect effects are assessed for emissions of CO_2 from the combustion of diesel fuel (Scenario 2) and LNG fuel (Scenario 2) at the proposed gas to power plant. CO_2 has not been modelled but is assessed qualitatively.

It is predicted that ~292 000 tons of CO_2 will be emitted from the combustion of diesel fuel (Scenario 1) at the proposed gas to power plant. This means that the proposed gas to power plant will add 0.07% more CO_2 to South Africa's current total CO_2 emissions.

It is predicted that ~210 000 tons of CO_2 will be emitted from the combustion of LNG fuel (Scenario 2) at the proposed gas to power plant. This means that the proposed Gas to Power Plant will add 0.05% more CO_2 to South Africa's current total CO_2 emissions.

Nature: *Emissions of CO_2 from the combustion of diesel fuel (Scenario 1) leads to an increase in the South African CO_2/GHG emissions and global warming.*		
Relevant Listed activities: GN 984, Activity 6 and Activity 28		
	Without mitigation	**With mitigation**
Extent	Local-regional (4)	Local-regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Small impact (0)	Small Impact (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	N/A

Mitigation measures: Mitigation measures are not feasible at this scale of operations due to the national climate change response still being developed.
Residual Impacts: No residual impacts are expected.

The impact is expected to be negative, local-regional in extent, to last for the duration of operation, of small impact and improbable, without mitigation or with mitigation measures implemented. The impact is therefore assessed to be of low significance to the decision making process without mitigation or with mitigation. This impact is expected to be indirect with no residual impacts, without mitigation or with mitigation**.**

Nature: *Emissions of CO_2 from the combustion of LNG fuel (Scenario 2) leads to an increase in the South African CO_2/GHG emissions and global warming.*		
Relevant Listed activities: GN 984, Activity 6 and Activity 28		
	Without mitigation	**With mitigation**
Extent	Local-regional (4)	Local-regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Small impact (0)	Small Impact (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	N/A
Mitigation measures: Mitigation measures are not feasible at this scale of operations due to the national climate change response still being developed.		
Residual Impacts: No residual impacts are expected.		

The impact is expected to be negative, local-regional in extent, to last for the duration of operation, of small impact and improbable, without mitigation or with mitigation measures implemented. The impact is therefore assessed to be of low significance to the decision making process without mitigation or with mitigation. This impact is expected to be indirect with no residual impacts, without mitigation or with mitigation**.**

6.3.6. Potential Direct Air Quality impacts during the Decommissioning phase

Direct impacts will result from exposure to dust generated from decommissioning activities of the proposed gas to power plant. Direct impacts associated with the decommissioning phase are expected to be of short duration and temporary in nature. Indirect impacts during the decommissioning phase are very improbable and therefore have not been assessed further.

Nature: Direct impacts from dust generation during the decommissioning phase

Dust emissions during decommissioning result from the demolition of structures, earth moving activities (scraping, compacting, excavation, grading), movement of construction vehicles and back-fill operations. All aspects of the decommissioning inherently generate dust, but the movement of construction vehicles on paved and unpaved surfaces at the site are generally the largest source of dust. Construction vehicles will be in operation for the duration of the decommissioning. Dust is also easily entrained from exposed areas by wind. The impact of dust is considered to be limited to the site and its immediate surroundings, is more of a temporary nuisance nature and does not typically pose a health risk due to its typically coarse size. Dust emissions will not travel over vast distances, but will most likely settle within 100m to 1km of the proposed gas to power plant site. Impacts may be experienced in parts of the IDZ Zone 1F, the property on which the site is to be constructed.

Relevant Listed activities:
GN 984, Activity 6 and Activity 28

	Without mitigation	**With mitigation**
Extent	Local-regional (1)	Local-regional (1)
Duration	Very short term (1)	Very short term (1)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	N/A

Mitigation measures:

» Implement traffic control measures to limit vehicle-entrained dust from unpaved roads by limiting vehicle speeds and by restricting traffic volumes.
» Limit access to site to construction vehicles only.
» Loading and unloading bulk material should be in areas protected from the wind or carried out in calm conditions.
» Loads on vehicles carrying dusty materials should be covered.
» Vehicles carrying dusty materials should be cleaned before leaving the site.
» Unpaved road surfaces should be sprayed with a surfactant to ensure high moisture content which will bind the silt or maintain high moisture content on exposed surfaces and roads by spraying with water.
» Stabilise open areas with dust palliative, gravel or similar.

Residual Impacts:
No residual impacts are expected.

The impact is expected to be negative, local in extent, temporary in duration (limited to the duration of the decommissioning), of low intensity, and highly probable without mitigation measures implemented. The impact is therefore assessed to be of low significance to the decision making process without mitigation. This impact is expected to be direct with no residual impacts, without mitigation. Indirect impacts during the decommissioning phase are very improbable.

The impact is expected to be negative, local in extent, temporary in duration (limited to the duration of the decommissioning), of low intensity, and improbable with mitigation measures implemented. The impact is therefore assessed to be of low significance to the decision making process with mitigation. This impact is expected to be direct with no residual impacts, with mitigation. Indirect impacts during the decommissioning phase are very improbable.

Although the significance of impacts during decommissioning is low, a basic dust management plan is required to ensure the nuisance impacts are mitigated. This can be achieved by addressing dust management in the Environmental Management Plan for the proposed Gas to Power Plant.

6.3.7. Implications for Project Implementation

- Implement traffic control measures to limit vehicle-entrained dust from unpaved roads by limiting vehicle speeds (i.e. 30km/h) and by restricting traffic volumes.
- Limit access to construction site to construction vehicles only.
- Loading and unloading bulk construction material should be in areas protected from the wind or carried out in calm conditions.
- Loads on vehicles carrying dusty construction materials should be covered.
- Vehicles carrying dusty materials should be cleaned before leaving the site.
- Unpaved road surfaces should be sprayed with a surfactant to ensure high moisture content which will bind the silt or maintain high moisture content on exposed surfaces and roads by spraying with water.
- Stabilise open areas with dust palliative, gravel or similar.
- If NO_X mitigation strategies are implemented at the proposed gas to power plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS.
- Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the diesel fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.

6.4. Assessment of Potential Social Impacts

A social impact assessment was conducted for the proposed gas to power plant. The assessment provided (a) a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed facility; (b) a description and assessment of the potential social issues associated with the proposed project; and (c) Identification of enhancement and mitigation aimed at maximising opportunities and avoiding and or reducing negative impacts. Potential social impacts and the relative significance of the impacts are summarised below (refer to **Appendix F**- Social Report for more details).

6.4.1. Results of the Social Assessment Study

From a social perspective it is concluded that the project is supported, but that mitigation measures should be implemented and adhered to. Positive and negative social impacts have been identified. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings have been made:

» The potential negative social impacts are primarily associated with the traffic impacts on daily living and movement patterns during the construction phase and operation phase; and can be reduced with the implementation of the mitigation measures proposed.
» Employment opportunities will be created in the construction and operation phase and the impact is rated as positive even if only a small number of individuals benefit in this regard.
» The proposed project could assist the local economy in creating entrepreneurial development, especially if local business could be involved in the provision of general material and services during the construction and operational phases.
» Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.
» The proposed development also represents an investment in infrastructure for the generation energy, which represents a positive social benefit for society as a whole.

6.4.2. Potential social impacts associated with the Construction phase of the gas to power plant

Impacts associated with the construction phase of the project are usually of a short duration (approximately 14-16 months) and temporary in nature, but could have long-term effects on the surrounding social environment if not managed appropriately.

Nature: *The creation of employment opportunities and skills development opportunities during the construction phase for the country and local economy.*

The construction of the proposed project will require a workforce and therefore direct employment will be generated. The proposed development will create employment opportunities for the local community. It is estimated that during the construction phase (for the period of approximately 14-16 months) approximately ~300-400 employment opportunities will be generated for the proposed Development. In terms of skills requirements, it is common that highly skilled or skilled labour such as engineers, technical staff and project managers will constitute about 40% of the work force; skilled staff would typically be required to operate machinery and will constitute about 35% of employees, while unskilled staff such as construction and security workers will constitute about 25% of the work force. Employment opportunities for the proposed development will peak during the construction phase and significantly decline during the operation phase. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area.

There will be significant job opportunities available for low skilled (construction, security, and maintenance workers) and semi-skilled workers, which can be sourced from the local area. The proponent has indicated that approximately 25% of the labour force are likely to be available to the local community. Construction workers could be sourced from the local area of Richards Bay. It could be expected that some of the workers from outside the local area would form part of the construction team. Local labour should be sourced from within Richards Bay first and if need be extend the search to the UDM or nationally. Adverse impacts could occur if a large in-migrant workforce, culturally different from the local communities within local area are employed and brought in during the construction phase. While the local labour pool may be qualified for less-skilled jobs, often local hiring will not meet the demands in professional and technical areas. A number of specialist contractors would most likely be brought in from other areas.

The developer will need to demonstrate a commitment to local employment targets in order to maximise the opportunities and benefits for members of the local community. It is likely that an Engineering, Procurement and Construction (EPC) contractor will be appointed by the developer who will hire the necessary employees. The applicant has indicated that training will also be provided to employees during the construction phase of the proposed development. Specific skills training for local communities have the opportunity to develop local employee potential. This is crucial to long-term development of skills and education in the area. This will accelerate the positive benefits and impacts of the proposed development on the economy.

	Without enhancement	**With enhancement**
Extent	Local- Regional (3)	Local- Regional (3)

Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (36)**	**Medium (44)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	

Enhancement measures:

» If possible, efforts should be made to employ local contractors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria.
» It is recommended that local employment policy is adopted to maximise the opportunities made available to the local labour force (sourced from Richards Bay).
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.
» Where feasible, training and skills development programmes should be initiated prior to the commencement of the construction phase.
» A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained by the Contractor and monitored by the ECO to record all complaints and queries relating to the project and the action taken to resolve the issue.

Residual impacts:

» Improved pool of skills and experience in the local area.
» Economic growth for small-scale entrepreneurs.
» Temporary employment during construction phase will result in jobs losses and struggles for local construction workers to find new employment opportunities post construction.

The impact is therefore assessed to be **positive,** local and regional in extent, temporary in duration, of moderate intensity, and highly probable with enhancement measures implemented. The impact is assessed to be of **medium significance** to the decision making process.

Nature: *Significance of the impact from the economic multiplier effects from the use of local goods and services*.

There are likely to be opportunities for local businesses to provide services and materials for the construction phase of the proposed development. The local service sector will also benefit from the proposed Development. The site is located within the RBIDZ Zone 1F. Given the relative proximity of the site to Richards Bay, the proponent has indicated that no on-site accommodation is envisaged for the construction phase. Employees will be sourced from the local areas (where possible). Off-site accommodation in Richards Bay would be required for contract workers and certain employees. The economic multiplier effects from the use of local goods and services opportunities will include, but is not limited to, construction materials and equipment and workforce essentials such as services, safety equipment, ablution, accommodation, transportation and other goods.

Some of the capital expenditure will be spent on local goods and services required for the proposed development of the power plant. In terms of business opportunities for local companies, expenditure during the construction phase will create business opportunities for the regional and local economy. The increase in demand for new materials and services in the nearby area may stimulate local business and local economic development (however locally sourced materials and services may be limited due to availability). There is likely to be a direct increase in industry and indirect increase in secondary businesses.

Also the injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area. Through the stimulation of employment and income is the creation of new demand within the local and regional economies. With increased income comes additional income for expenditure on goods and services supplied. The intention is to maximise local labour employment opportunities, this is likely to have a positive impact on local communities and have downstream impacts on household income, education and other social aspects. The implementation of the enhancement measures below can increase the opportunities for the local area.

	Without enhancement	**With enhancement**
Extent	Local- Regional (4)	Local- Regional (4)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Medium (30)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	

Enhancement

- It is recommended that a local procurement policy is adopted by the developer to maximise the benefit to the local economy.
- Where feasible, the developer should create a database of local companies, specifically Historically Disadvantaged (HD) which qualify as potential service providers (e.g. construction companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors; these companies should be notified of the tender process and invited to bid for project-related work where applicable.
- It is recommended that goods and services are sourced from the local area as much as possible; engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers, where feasible.

Residual impacts

Improved local service sector, growth in local business

The impact is assessed to be **positive**; local to regional in extent; temporary in duration; moderate intensity; and highly probable. The impact is assessed to be of a **low-medium significance** to the decision-making process.

Nature: *Influx of jobseekers. Added pressure on economic and social infrastructure and an increase in social conflicts during construction as a result of in-migration of jobseekers.*

The proposed development will create a range of employment possibilities and thus this will attract jobseekers. An influx of people looking for economic opportunities could result in pressure on economic and social infrastructure on the local population (rise in social conflicts and change in social dynamics). Influx of jobseekers into the area, could lead to a temporary increase in the level of crime, cause social disruption and put pressure on basic services. Influx of jobseekers could potentially create conflict between locals and outsiders mainly due to difference in racial, cultural and ethnic compositions. The high unemployment rates and expectations of job creation is already a potential source of competition among locals and could be exacerbated through outsiders coming into the area resulting in conflict. A further negative impact that could result due to an inflow of jobseekers is that local unemployment levels could rise due to an oversupply of an available workforce, particularly with respect to semi and unskilled workers.

Richards Bay is seen as a sensitive social receptor and jobseekers coming into the area could put pressure on social infrastructure; create social problems, tensions and conflicts. The impact associated with in-migration of jobseeker includes pressure on local services and infrastructure. This includes municipal services such as sanitation, electricity, water, waste management, health facilities, transportation and availability of housing. Informal settlements may develop near towns to accommodate jobseekers. It is very difficult to control the influx of people into an area, especially in a country where there's high levels of unemployment. Like any other development, this project would require employees during the construction phase. An influx of jobseekers to an area often results in an increase in prostitution activities, destructive behaviour (e.g. alcohol abuse, damaging the environment) and temporary sexual relations with locals; this could result in the spreading of HIV/Aids and STDs and unwanted pregnancies. The proposed development disrupting societies largely depends on the level of local employment achievable and clearly stipulating a local employment regime to limit outsiders coming into the area. Employment opportunities can be sourced from the local area first, i.e. Richards Bay, if availability of labour is limited then extend the search to the ULM and UDM. The ULM population (334 459 people) could fulfil the majority of the lower and semi-skilled employment opportunities that emerge from the proposed development.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation

- It is recommended that local employment policy is adopted to maximise the opportunities made available to the local labour force.
- A skills audit should be undertaken for construction employment opportunities, especially for semi and low-skilled job categories. Enhance employment opportunities for the immediate local area; (i.e. Richards Bay), and if this is not possible, then the broader focus areas should be considered for sourcing workers such as ULM and UDM.

- » Tender document should stipulate the use of local labour as far as possible.
- » Prior to construction commencing representatives from the local community (e.g. ward councillor, surrounding landowners) should be informed of details of the construction schedule and exact size of the workforce.
- » Recruitment of temporary workers at the gates of the proposed development should not be allowed. A recruitment office should be established by the contractor in a nearby town to deal with jobseekers.
- » A security company is to be appointed and appropriate security procedures to be implemented.
- » Establish procedures for the control and removal of loiterers at the construction site.
- » A comprehensive employee induction programme should address issues such as HIV/ AIDS and sexually transmitted diseases. The induction should also address a code of conduct for employees that would align with community values.
- » Developer is to have an HIV/AIDs policy, as well as Grievance Policy for workers.
- » A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained by the Contractor and monitored by the ECO to record all complaints and queries relating to the project and the action taken to resolve the issue.

Residual impacts

Possibility of outside workers remaining in the area after construction is completed and subsequent pressures on local infrastructure and services.

The impact is assessed to be **negative**; local in extent; temporary in duration; moderate intensity; and improbable with mitigation measures. The impact is assessed to be of **low significance** to the decision-making process.

Nature: *Impacts on daily living and increase in traffic disruptions, congestion and impacts movement patterns during the construction phase.*

An increase in traffic due to construction vehicles and heavy vehicles could create short-term disruptions and safety hazards for current road users. Transportation of project components and equipment to the proposed site will be transported using vehicular / trucking transport. The developer has indicated that the number of heavy vehicle trips per day would be in the region of ~30-50 trips in the beginning phase and thereafter approximately only ~15-20 trips. Access to the proposed development site will be via existing roads within the IDZ Phase 1F (already approved through an EIA undertaken for the Phase 1F infrastructure). The IDZ Phase 1F can be accessed via:

- » The N2 via the R619 (located north of the IDZ 1F) onto Heliumhoogte Road and then onto Alumina Alley Road; or
- » The IDZ 1F can be accessed via the N2 on the R34 (also known as John Ross PKWY) and then onto Alumina Alley road.

Increased traffic due to construction vehicles and heavy vehicles could cause disruptions to road users and increase safety hazards. The use of local roads and transport systems may cause road deterioration and congestion. During the stakeholder consultations that took place it was noted that the R619 route is currently a congested route with high volumes of vehicles and trucks passing through each day. Increased vehicular movement during the construction phase may influence daily living and movement patterns of community members in the surrounding communities. Mitigation measures are aimed at optimising vehicular movement during the construction phase to minimize traffic congestion problems in the area, which in turn influences daily living and movement patterns of community members in the surrounding communities who make use of these roads. It is suggested that construction vehicles and trucks utilise the R34 route to access the IDZ phase 1F area, to prevent further congestion on the R619 route.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation

» The R34 (John Ross Pkwy) access route to the IDZ 1F area should be utilised as much as possible
» All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and made aware of the potential safety issues.
» Heavy vehicles should be inspected regularly to ensure their road safety worthiness.
» Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules.
» A comprehensive employee induction programme must be implemented to cover land access protocols and road safety.
» A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained by the Contractor and monitored by the ECO to record all complaints and queries relating to the project and the action taken to resolve the issue.

Residual impacts

None anticipated

The impact is assessed to be **negative**; local in extent; temporary in duration; low intensity and improbable with mitigation measures. The impact is assessed to be of **low significance** to the decision making process.

Nature: *Temporary increase in safety and security concerns associated with the influx of people during the construction phase.*

The perceived decline of security during the construction phase of the proposed project due to the influx of workers and/ or outsiders to the area (as influx of newcomers or jobseekers are usually associated with an increase in crime) may have indirect effects, such as increased safety and security risk for neighbouring properties and damage to property, increased risk of veld fire, crime and so forth. The perception exists that construction related activities (influx of jobseekers, and construction workers and so forth) is a contributor to increased criminal activities in an area. Safety and security impacts are a reality in South Africa which needs to be addressed through appropriate mitigation and management measures. The proposed site is located within an industrial area where general industrial activities are taking place or are proposed to take place in the future.

The portion of land (i.e. development area) identified by the developer for the construction and operation of the power plant and associated infrastructure will be leased from the RBIDZ. The area has been earmarked for general industrial development. The proposed power plant development area will be appropriately secured all the time with access control and a security company will be appointed. Therefore the proposed safety and security impacts is anticipated to be of low significance.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Very improbable (1)
Significance	**Low (14)**	**Low (7)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation

- Working hours should be kept within daylight hours during the construction phase, and/or as any deviation that is approved by the surrounding landowners.
- The perimeter of the construction site should be appropriately secured. The fencing of the site should be maintained throughout the construction periods.
- The appointed EPC contractor must appoint a security company and appropriate security procedures and measures are to be implemented.
- Access in and out of the site should be strictly controlled by a security company.
- Provide workers with identity tags and prohibit the access of unauthorized people to the construction site.
- The contractor must ensure that open fires on the site for heating, smoking or cooking are not allowed except in designated areas.
- Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff.
- Provision of adequate and strategically placed traffic warning signs and control measures along the access road to warn road users of the construction activities taking place and displaying road safety messages and speed limits. Warning signs must be visible at all times.
- A comprehensive employee induction programme, covering land access protocols, fire management and road safety. This must be addressed in the construction EMPr as the best practice.

» All vehicles must be road worthy and drivers must be qualified and made aware of the potential road safety issues and follow the speed limits. » The contractor should have personnel trained in first aid on site to deal with smaller incidents that require medical attention. » A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedure and address issues and complaints.
Residual impacts None anticipated.

The impact is assessed to be **negative**; local in extent; temporary in duration; low intensity and improbable with mitigation measures. The impact is assessed to be of **low significance** to the decision making process.

Nature: *Nuisance impacts in terms of a temporary increase in noise and dust.*

Impacts associated with construction related activities include noise, dust and disruption or damage to adjacent properties and is considered as a potential issue. Site clearing and construction vehicles traveling on gravel roads does increase the risk of dust and noise being generated, which can in turn impact on the surrounding area. The primary sources of noise during construction would be from the construction equipment and other sources of noise including vehicle/truck traffic, and general construction activities. Noises levels can be audible over a large distance however are generally short in duration. The generation of dust would come from construction activities as well as trucks/ vehicles driving on the gravel access road. With the in-migration of people and construction workers into the area, this will also increase noise impacts. Enviro Acoustic Research (Pty) Ltd have indicated that a noise impact study would not be required. This is because the facility would be further than 1 000m from the closest potential noise-sensitive receptors (the closest residential developments) and the potential of a noise impact would be low. Therefore the activity is unlikely to have any acoustical implications. The proposed site is also located within a Richards Bay general industrial area IDZ 1F. Therefore the nuisance impacts from the construction activities are expected to have a low significance.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Small (1)	Small (1)
Probability	Probable (3)	Improbable (2)
Significance	**Low (12)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation

» Vehicles used to transport sand and building materials must be fitted with tarpaulins or covers when travelling on roads.

» Ensure all vehicles are roadworthy, drivers are qualified and are made aware of the potential noise and dust issues. » A method of communication should be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. The EPC contractor should appoint a designated staff member to implement grievance procedures and address issues and complaints. A Public Complaints register must be maintained by the Contractor and monitored by the ECO to record all complaints and queries relating to the project and the action taken to resolve the issue.
Residual impacts None anticipated

The impact is assessed to be **negative**; local in extent; temporary in duration; low intensity; and improbable. The impact is assessed to be of **low significance** to the decision-making process.

6.4.3. Potential social impacts associated with the Operation phase of the gas to power plant

The power plant is designed to be operational for at least ~25-40 years. The potential positive and negative social impacts which could arise as a result of the operation of the proposed project include the following:

Nature: *The creation of employment opportunities and skills development opportunities during the operation phase for the country and local economy at mid-merit.*

For mid-merit, it is estimated that approximately ~25-30 jobs will be generated.

	Without enhancement	**With enhancement**
Extent	Local- Regional (2)	Local- Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (32)**	**Medium (40)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	

Enhancement:

» It is recommended that a local employment policy is adopted to maximise the opportunities made available to the local community.
» The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.
» Vocational training programs for employees should be established to promote the proposed development of skills.

Residual impacts:
Improved pool of skills and experience in the local area.

The impact is assessed to be **positive**; local to regional in extent; long-term; low intensity and is highly probable. The impact is assessed to be of **medium significance** to the decision-making process.

Nature: The creation of employment opportunities and skills development opportunities during the operation phase for the country and local economy at baseload. For baseload approximately ~25-30 for the lifetime of the project (over a period of ~20-25 years)		
	Without enhancement	**With enhancement**
Extent	Local- Regional (2)	Local- Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (48)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	
Enhancement » It is recommended that a local employment policy is adopted to maximise the opportunities made available to the local community. » The recruitment selection process should seek to promote gender equality and the employment of women wherever possible. » Vocational training programs for employees should be established to promote the proposed development of skills.		
Residual impacts Improved pool of skills and experience in the local area		

The impact is assessed to be **positive**; local to regional in extent; long-term; moderate intensity and is highly probable. The impact is assessed to be of **medium significance** to the decision-making process.

Nature: *Significance of the impact from the economic multiplier effects from the use of local goods and services.* There are likely to be opportunities for local businesses to provide services and materials for the operation phase of the development. The local service sector will also benefit from the proposed development. In terms of business opportunities for local companies, expenditure during the operation phase will create business opportunities for the regional and local economy. Also the injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area. Through the stimulation of employment and income is the creation of new demand within the local and regional economies. With increased income comes additional income for expenditure on goods and services supplied. The intention is to maximise local labour employment opportunities, this is likely to have a positive impact on local

communities and have downstream impacts on household income, education and other social aspects. The implementation of the enhancement measures below can increase the opportunities for the local area.		
	Without enhancement	**With enhancement**
Extent	Local- Regional (4)	Local- Regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Medium (30)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	

Enhancement

- It is recommended that a local procurement policy is adopted by the developer to maximise the benefits to the local economy.
- Where feasible, the developer should create a database of local companies, specifically Historically Disadvantaged (HD) which qualify as potential service providers (e.g. construction companies, waste collection companies, security companies etc.); these companies should be notified of the tender process and invited to bid for project-related work where applicable.
- It is recommended that goods and services are sourced from the local area as much as possible; engage with local authorities and business organisations to investigate the possibility of procurement of materials, goods and products from local suppliers, where feasible.

Residual impacts

Improved local service sector, growth in local business

The impact is assessed to be **positive**; local to regional in extent; temporary in duration; moderate intensity; and highly probable. The impact is assessed to be of a **low-medium significance** to the decision-making process.

Nature: *Development of energy infrastructure*

Approximately 90% of South African electricity comes from coal-fired power stations, with Eskom being the dominant electricity producing company generating 95% of all electricity in South Africa (as detailed in the SA Yearbook 2009/2010). The demand for electricity in South Africa has grown, on average, at more than 4% over the past few years, with a simultaneous reduction in the surplus generating capacity due to limited commissioning of new generation facilities. The Integrated Resource Plan (IRP) 2010 developed by the Department of Energy projected that an additional capacity of up to 56 539MW of generation capacity will be required to support the country's economic development and ensure adequate reserves over the next twenty years. In order to meet this required generation capacity, the IRP includes a mix of generation technologies, including a nuclear fleet of 9.6 GW; 6.3 GW of coal; 17.8 GW of renewables; and 8.9 GW of other generation sources, including gas. The generation of power is also needed to ensure the sustainability of existing industry, as well as attracting new industry to the area. The proposed development of a

power plant could therefore add to the stability of the economy and contribute to the local economy.		
	Without enhancement	**With enhancement**
Extent	Local- Regional- National (4)	Local- Regional- National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (40)**	**Medium (40)**
Status (positive or negative)	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources	Yes (impact of climate change)	
Can impacts be enhanced	No	
Enhancement None anticipated		
Residual impacts » Contribution towards security of electricity supply.		

The impact is assessed to be **positive**; local to national in extent; long term; minor intensity; and highly probable. The impact is assessed to be of **medium positive significance** to the decision-making process.

Nature: *Impacts from an increase in traffic disruptions, congestion and impacts movement patterns during the operation phase (mid-merit).*

During phase 1 of the power plant, fuels will need to be transported to site each day, including diesel and Liquified Petrolium Gas (LPG) (phase 1 of the proposed development). The project involves the construction of a gas-fired power station which will provide either baseload or mid-merit power supply to the electricity grid. Tankers will be delivering fuel per day during phase 1 of the operation phase. Each tanker delivering fuel to site will bring 40-44 m^3 of diesel or LPG. Depending on the technology design required the number of tankers delivering fuel per day will be as follows:

» For baseload operation – 52 tankers a day
» For mid-merit operation – 18 tankers a day

Access to the proposed development site will be via existing roads within the RBIDZ Phase 1F (already approved through an EIA undertaken for the Phase 1F infrastructure). The RBIDZ Phase 1F can be accessed via:

» The N2 via the R619 (located north of the IDZ 1F) onto Heliumhoogte Road and then onto Alumina Alley Road; or
» The IDZ 1F can be accessed via the N2 on the R34 (also known as John Ross PKWY) and then onto Alumina Alley road.

Increased traffic due to heavy vehicles (tankers) could cause disruptions to road users and increase safety hazards. The use of local roads and transport systems may cause road deterioration and increase congestion. During the stakeholder consultations that took place it was noted that the R619 route is currently a congested road with high volumes of vehicles and trucks passing through each day. Increased vehicular movement during the operation phase may influence daily living and movement patterns of community members in the surrounding communities through increased congestion. Mitigation measures are aimed at optimising vehicular movement during the operation phase to minimize traffic congestion problems in the area, which in turn influences daily living and movement patterns of community members in the surrounding communities who make use of these roads. It is suggested that construction vehicles and trucks utilise the R34 route to prevent further congestion along the R619 route.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation

» The R34 access route should rather be utilised by tankers delivering fuel as much as possible during phase 1 of the operation phase.
» All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and made aware of the potential safety issues.
» Heavy vehicles should be inspected regularly to ensure their road safety worthiness.
» Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules.
» A comprehensive employee induction programme must be implemented to cover land access protocols and road safety.

Residual impacts

None anticipated

The impact is assessed to be **negative**; local in extent; long-term; low intensity and improbable with mitigation measures. The impact is assessed to be of **low significance** to the decision making process.

Nature of impact: *Impacts from an increase in traffic disruptions, congestion and impacts movement patterns during the operation phase (baseload).*

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (42)**	**Low (24)**

Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Mitigation: » The R34 access route should rather be utilised by tankers delivering fuel as much as possible during phase 1 of the operation phase. » All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and made aware of the potential safety issues. » Heavy vehicles should be inspected regularly to ensure their road safety worthiness. » Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules. » A comprehensive employee induction programme must be implemented to cover land access protocols and road safety.		
Residual impacts None anticipated		

The impact is assessed to be **negative**; local in extent; long-term; moderate intensity and improbable with mitigation measures. The impact is assessed to be of **low significance** to the decision making process.

Nature: *Visual impacts and sense of place impacts associated with the operation phase of the power plant and associated infrastructure.*

The sense of place is developed over time as the community embraces the surrounding environment, becomes familiar with its physical properties, and creates its own history. The sense of place is created through the interaction of various characteristics of the environment, including atmosphere, visual resources, aesthetics, climate, lifestyle, culture and heritage. Importantly though it is a subjective matter and is dependent on the demographics of the population that resides in the area and their perceptions regarding trade-offs. An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. The social impacts associated with the impact on sense of place relate to the change in the landscape character and visual impact from the proposed gas to power facility. The landscape in the area has already been altered due to the industrial activities nearby. The site is also located within the RBIDZ Phase 1F which is planned to have general industrial activities surrounding the proposed development. Therefore the aesthetics from the gas to power plant is expected to have a low intensity impact and a low impact on the areas sense of place.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (14)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	

Mitigation

» Non anticipated

Residual impacts

None anticipated if the visual impact will be removed after decommissioning, provided the site is rehabilitated to its original (current) status.

The impact is assessed to be **negative**; local in extent; long term; minor intensity; and improbable. The impact is assessed to be of **low significance** to the decision-making process.

6.4.4. Implications for Project Implementation

The proposed Gas to power plant and associated infrastructure is unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the

project could be developed subject to the implementation of the following recommended mitigation measures and management actions:

» The EPC contractor should appoint a designated staff member to assist with the management of social impacts and to deal with any community issues.
» In terms of employment related impacts, it is important to consider that job opportunities for the unskilled and semi-skilled in the study area could create competition among the local unemployed. Introducing an outside workforce will therefore most likely worsen local endeavours to obtain jobs and provoke discontent as well as put pressure on the local services available. It is imperative that local labour be sourced, wherever possible, to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the construction activities where possible. Local procurement of labour and services/products would greatly benefit the community during the construction and operational phases of the project.
» Local procurement of services and equipment where possible in order to enhance the multiplier effect. This would serve to mitigate other subsequent negative impacts such as those associated with the inflow of outsiders to the area, the increased pressure on the infrastructure and services in the area, as well as the safety and security concerns.
» Involve the community in the process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).
» Implement mitigation measures to reduce and avoid negative impacts.
» It is important that the mitigation measures relating to traffic impacts (daily living and movement patterns) are implemented to reduce the negative impacts.

6.5. The No-Go Alternative

The no go alternative would result in no impacts on the social and biophysical environment.

The Integrated Resource Plan (IRP) 2010-2030 developed by the Department of Energy (DoE) projected that an additional capacity of up to 56 539MW of generation capacity will be required to support the country's economic development and ensure adequate reserves over the next twenty years. The required expansion is more than two times the size of the existing capacity of the system. In order to meet this required generation capacity, the IRP includes a mix of generation technologies, including a nuclear fleet of 9.6 GW; 6.3 GW of coal; 17.8 GW of renewables; and 8.9 GW of other generation sources, including gas. Although liquefied natural gas (LNG)-fuelled combined cycle gas turbines is considered to be one of the alternative baseload power generation options in the least-cost Base Case presented in the IRP, the potential to develop these plants has been constrained by the availability of fuel and the capacity to build. The Department of Energy's Independent Power Producer (IPP) office, together with Transnet, is working together to help expedite the 3126 MW Ministerial determination for Gas IPPs. It is in response to this initiative that this project is being proposed.

South Africa is a country with an economy dependent on coal for the majority of its electricity, an energy-intensive industrial sector and an energy sector responsible for 82% of total GHG emissions, making it the 12th highest world emitter of GHG[27]. Adding to the challenge is the need to address energy poverty, which manifests in the lack of access to affordable, adequate, reliable, safe and environmentally benign energy services. At the same time, economic growth is needed for development, in order to create employment. Traditionally economic growth has implied the increased use of finite resources and increased energy use. However, energy also has the potential to act as an engine of inclusive and sustainable growth. This is why moving towards a sustainable and low-carbon approach is a priority, and tracking energy consumption is essential to map the transition to a lower carbon future. In this regard, the Intergovernmental Panel on Climate Change (IPCC) fifth assessment report identified cities as being major players in reducing global emissions.

The South African Government recognises the need to diversify the mix of energy generation technologies within the country and to reduce the country's reliance on fossil fuels which contribute towards climate change and are therefore not environmentally friendly. This is in accordance with the prescriptions of the United Nations Convention on Climate Change 1994 (UNFCCC) and its associated Kyoto protocol of 1997. South Africa has put in place a long term mitigation scenario (LTMS) by which the country aims to develop a plan of action which is economically viable and internationally aligned to the world effort on climate change. During this period (2003-2050) South Africa will aim to take action to mitigate greenhouse gas emissions by 30% - 40% by the year 2050. This is a reduction of between 9 000 and 17 500 tons of CO_2 by 2050. Consequently, the South African Government has recognised the need to move towards cleaner energy and has therefore set targets for cleaner energy technologies (including renewable energy and gas) by 2030 (IRP, 2011).

In December 2015, the Paris Agreement was launched, with a long-term objective of the agreement to make sure global warming stays "well below" 2 degrees Celsius (3.6 degrees Fahrenheit) and to "pursue efforts" to limit the temperature rise to 1.5 degrees Celsius (2.7 degrees Fahrenheit). To achieve that goal, governments pledged to stop the rise in heat-trapping greenhouse gas emissions "as soon as possible". By some point after 2050, the agreement says, man-made emissions should be reduced to a level that forests and oceans can absorb. In order to reach the long-term goal, countries, including South Africa, agreed to set national targets for reducing greenhouse gas emissions every five (5) years. More than 180 countries have already submitted targets for the first cycle beginning in 2020. Only developed countries are expected to slash their emissions in absolute terms; developing nations (such as South Africa) are encouraged to do so as their capabilities evolve over time. Until then, they are expected only to rein in the growth of emissions as their economies develop.

[27] Greenhouse Gas Inventory for South Africa: 2000-2010

The proposed gas to power plant will assist in reducing the country's CO_2 emissions associated with energy supply relative to other fossil fuels (e.g. coal). From a climate change perspective, the benefits arising from the use of natural gas as a source of energy instead of coal include:

» Reduced carbon dioxide emissions relative to equivalent energy from other fossil fuels;
» Lower particulate emissions relative to coal;
» High energy efficiency in combined-cycle applications;
» Negligible sulphur content in regional deposits; and
» Gas-fired generation plants require less space than conventional coal-fired plants of the same capacity[28].

When considering the desirability of the no go option for the specific project, the costs and benefits of the proposed project must be considered. The implementation of the project is expected to result in a number of environmental costs, as detailed within this report. This could include:

» Direct loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the gas to power plant (which is limited to the development footprint of 7.3ha). The cost of loss of biodiversity is expected to be limited as a result of the extent of the area and the limited presence of species of conservation concern within the development area.
» Visual impacts associated with the gas to power plant. The cost of loss of visual quality to the area is expected to be very low as a result of the location of the facility within the RBIDZ.
» Change in land-use and loss of land available for agriculture on the development footprint. The cost in this regard is expected to be insignificant due to the fact that the proposed development is located within the RBDIZ, zoned as IDZ Industry.
» Impacts to ambient air quality. The cost in this regard is expected to be low as the modelling results reveal that the predicted emissions from both, diesel fuel (Scenario 1) and LNG fuel (Scenario 2) is below WHO guidelines.

These costs are expected to occur at a local and site level and are considered acceptable provided the mitigation measures as outlined in this EIA and the EMPr are implemented. No fatal flaws associated with the proposed project have been identified.

The positive implications of establishing the gas to power plant on the demarcated site include:

» The project will result in important socio-economic benefits at the local and regional scale through job creation, procurement of materials and provision of services and

[28] White Paper on Energy Policy, 1998

other associated downstream economic development. These will persist during the preconstruction, construction and operational phases of the project.

» The project contributes towards the Provincial and Local goals to accelerate economic growth, create jobs, uplift communities and alleviate poverty. The proposed development is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.
» The proposed development is to be located within the identified RBIDZ area most suitable for the rollout of the development of industrial activities within the KZN Province. This implies that projects of the same nature will be consolidated in one area creating a node, and ultimately aiming to reduce the potential for cumulative impacts associated with such developments when spatially fragmented. The location is therefore considered desirable
» The project serves to diversify the economy and electricity generation mix of South Africa by addition of gas-generated energy to the mix. Depending on the final design (baseload or mid-merit), the gas power plant has the ability to run 24 hours a day or during peak times. This will assist in stabilising the power supply during the periods of the day when this is required most.

The benefits of the project are expected to occur at a national, regional and local level. As the costs to the environment at a site specific level have been largely limited through the implementation of mitigation measures, the expected benefits of the project are expected to partially offset the localised environmental costs of the project.

The No-Go Alternative would represent a lost opportunity for South Africa to establish and grow a new industry within the economy which has the potential for further gas to power plant projects. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, as well as its commitments to reduction in greenhouse gas emissions, this would represent a negative social cost. In addition, the implementation of the no go option would result in a lost opportunity at a local and regional level from a socio-economic perspective as a result of no opportunities for employment or socio-economic upliftment.

The no go alternative is therefore not considered desirable at a local, regional and national scale.

ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS CHAPTER 7

As discussed in the previous chapter, gas to power plant developments may have effects (both, positive and negative) on natural resources, the social environment and on the people living in and within a close proximity to the project area. The preceding impact assessment chapter has reported on the assessment of the impacts associated with the gas to power plant largely in isolation (from other similar developments).

Concerns are often raised in the environmental impact assessment process regarding long term environmental changes, not only as result of a single action, activity or development project, but the combined effects of many actions over time. 'Cumulative impacts' or 'Cumulative effects' are commonly understood as the impacts operating over different temporal and spatial scales which combine from different projects or activities which result in significant change, which often exceeds the simple sum of all the individual impacts (DEAT, 2004). Cumulative effects generally occur under three typical scenarios:

» When impacts on the environment take place so frequently that the effects of individual impacts cannot be assimilated by the environment;
» When impacts occur so densely spatially that the effects of individual impacts cannot be assimilated by the environment; and
» When the impacts of one activity/project combine synergistically with those of another.

Each individual development, when assessed in isolation, may produce impacts that are socially acceptable or insignificant, however, when the effects of the numerous single developments are considered in combination, these impacts may become 'cumulatively significant'. In recent years there has been a growing realisation that the process of evaluating the positive and negative environmental impacts of individual developments, which may be unobjectionable in themselves, do not adequately take into account the cumulative nature of individual impacts. The complicating factor is that the projects then need to be considered from the perspective of past, present and reasonably foreseeable future development. Put another way then, cumulative effects are "…*changes to the environment that are caused by an action in combination with other past, present and future human actions*" (DEAT, 2004).

7.1. Approach Taken to Assess Cumulative Impacts

The assessment of cumulative impacts requires a holistic view, interpretation and analysis of the biophysical, social and economic systems and is limited and constrained by the current methods used for identifying and analysing cumulative effects.

The following principles were used in describing and assessing cumulative impacts of the proposed development (after DEAT, 2004):

- Cumulative effects/impacts are caused by the aggregate of past, present, and reasonably foreseeable future actions;
- Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who has taken the action;
- It is not practical to analyse the cumulative effects of an action on every environmental receptor, and therefore the list of environmental effects must focus on those that are truly meaningful;
- Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries;
- Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects (repeated actions may cause effects to build up);
- Cumulative effects may last for years beyond the life of the action that caused the effects;
- Cumulative impacts can be characterised according to impact pathways (one pathway could be the persistent additions from one process and yet another pathway could be the compounding effect from one or more processes);
- Cumulative impacts can also occur when thresholds are passed or when interaction is antagonistic; and
- Each affected resource, ecosystem, and human community must be analysed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.

The cumulative impacts that have the potential to be compounded through the development of the gas to power plant and its associated infrastructure in proximity to other developments include impacts such as those listed in Sections 7.2, 73 and 7.4. The role of the cumulative assessment is to test if such impacts are relevant to the gas to power project in the proposed location, that is, in the Richards Bay Industrial Development Zone (RBIDZ): Phase 1F, resulting in:

» Unacceptable loss of threatened or protected vegetation types or species through clearing, resulting in an impact on the conservation status of such flora or ecological functioning;
» Positive and negative contribution from a socio-economic perspective;
» Contribution to climate change mitigation; and
» Unacceptable increase in ambient air quality levels, resulting in an impact on the health of the occupants within the area and an increase in pollutants in the area.

Figure 7.1 indicates the location of the gas to power plant in relation to all other known developments in the RBIDZ: Phase 1F.

Figure 7.1: RBIDZ: Phase 1F Land Allocation, indicating planned developments within this phase

As can be seen from Figure 7.1, the RBIDZ: Phase 1F is planned to include the following developments:

» Tata Steel (already established and operational);
» Elegant Afro Lime;
» Nyanza Light Metals;
» Tyre Recycling and Value Cement; and
» Byromate (i.e. the proposed gas to power plant).

The potential for cumulative impacts are summarised in the sections which follow and have been considered within the detailed specialist studies, where applicable (refer to **Appendices F – H**).

As there is uncertainty as to whether all the identified developments (i.e. Elegant Afro Lime, Nyanza Light Metals, Tyre Recycling and Value Cement) will be implemented, it is also difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known developments in the broader area and the gas to power plant are therefore qualitatively assessed in this Chapter.

As these cumulative impacts are explored in more detail, the trade-offs between promoting fuel diversification (i.e. the gas industry) in the South African energy mix (and the associated benefits in terms of reduction in CO_2 emissions[29] – a national interest) versus the local and regional environmental and social impacts and benefits (i.e. impacts on ecology, the local economy, employment, ambient air quality, etc.) will become evident. It is only when these trade-offs are fully understood, that the true benefits of gas-produced energy can be assessed.

7.2. Cumulative Ecological Impacts

In assessing cumulative impacts of the development, an attempt has been made to account for past, present and future impacts and pressures on the terrestrial ecosystems and biodiversity occurring at the site and immediate surrounding intact habitats as follows:

» **Past ecological impacts and effects**
According to the Biodiversity Study of Alton North Richards Bay undertaken in 2005 by O'Connor and Associates, the site has experienced past environmental perturbations that are judged to have had 'an enormous influence on its biodiversity and ecological functioning'.

[29] Relative to equivalent energy from other fossil fuels and lower particulate emissions relative to coal during its operation.

- The first is associated with the planting of historic *Pinus and Eucalyptus sp*. tree plantations (Google Earth™ imagery shows the area under plantation forestry between 2004–2012). In addition to the direct loss of indigenous vegetation through land transformation, the introduction of evergreen species into seasonal vegetation results in a concomitant increase in transpirational losses and leaves the area susceptible to alien and weed invasion.
- A second impact has been the canalisation of water flow in the area, with a consequent effect being the lowering of the water table within the pre-existing dryland component of the environment.
- Based on the history of ecological disturbance at the site (O'Connor and Associates, 2005) remaining open grassland habitat is largely degraded and secondary in nature, with signs of earthworks, vehicle/human tracks, tarred roads (former airfield) and general soil disturbance associated with historic plantation forestry.

» **Present ecological impacts and pressures**

The proposed development site is currently located in the Alton North area, south of the North Central Arterial and bordering on the Tata Steel factory to the south, with the eastern edge being industry linked with Alumina Alley. The site is comprised of vacant municipal owned land bordered by mixed-use of industrial developments as well as residential areas and open space areas. The broader area is characterised by intense past land-use modifications from agriculture, mining, tourism, residential, recreational and industrial development activities. Impacts associated with current land use and activities at the site and surrounds include:

- Grassland habitat degradation as a result of over-grazing by livestock;
- Habitat fragmentation as a result of industrial development (i.e. Tata steel factory and other industrial activities and warehousing);
- The effect of the artificial canal in the west on the local water table level (draw-down effects);
- Noise and visual disturbance due to industrial activities and the effect of this on local wildlife; and
- Alien invasive plant and weed proliferation and increased source of regenerative/seed material for undesirable plant species as a consequence of disturbance.

» **Future ecological impacts/development pressures**

Future ecological impacts beyond the individual impacts likely to be associated with the proposed development will be centred around the large-scale and complete development of the RBIDZ Phase 1F project area for various industrial developments. This is shown spatially in Figure 7.1 which shows the RBIDZ: Phase 1F area and planned industrial development (factories, warehouses and access road infrastructure) in relation to the existing factories and warehouses to the south and east. Ecological impacts associated with these development/activities will probably be similar to those of the proposed development, involving:

- The destruction of natural habitat (grasslands, woodland and wetlands);
- Loss of habitat and species of flora/fauna (including protected/threatened species);
- Habitat fragmentation;
- Proliferation of alien plants post-disturbance for areas to be conserved/retained;
- Soil erosion related to increased runoff from hardened surfaces;
- Increase in noise and light pollution; and
- Potential for soil, water and vegetation pollution.

Only very minimal areas within the RBIDZ Phase 1F area will be set aside to be conserved (shaded 'dark green' in Figure 7.1) to the north-west and south-east of Tata steel.

7.2.1. Cumulative impact on ecosystem conservation targets

The Maputaland Wooded Grassland (CB2) is provincially listed as ***Endangered*** in terms of its threat status and is currently moderately protected. A 25% conservation target has been set for this vegetation type that is not currently met by existing statutory protected areas in the Province (17% protected) and statistics suggests that only 36% of this vegetation type remains in KZN (based on KZN Vegetation Targets and Statistics, December 2014, obtained from Ezemvelo KZN Wildlife/EKZNW). This suggests that further loss of this grassland type could contribute in a reduction in the ability to meet conservation targets set provincially for this vegetation type.

Given the small extent of the development site (<8ha) and the degraded/ secondary nature of much of the grassland vegetation community within the proposed development footprint, with only small portions of fairly intact and moderately sensitive/ importance natural grassland, the site in itself is unlikely to contribute significantly to meeting ecosystem conservation targets for the region.

Nature: Cumulative impact on ecosystem conservation targets		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site only (1)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**Medium (55)**	**High (65)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	
Loss of resources?	Yes	
Can impacts be mitigated?	The impact of irreplaceable loss of an Endangered vegetation type and associated habitat will be difficult	

	to mitigate onsite and the need and desirability for a biodiversity offset to compensate for the loss of vegetation/habitat should be investigated further by the Richards Bay IDZ.
Confidence in findings	Moderate
Mitigation: Mitigating the cumulative impact involving the loss of portions of an endangered grassland vegetation type will be inherently difficult to achieve. It is recommended that the need and desirability for a biodiversity offset be investigated further by RBIDZ SoC Ltd as a means of compensating for the cumulative and irreplaceable loss of Maputaland Wooded Grassland vegetation and habitat associated with the broader RBIDZ Phase 1F development. This is discussed further in **Appendix H**: Terrestrial Ecological Assessment.	

7.2.2. Cumulative impact on ecological functioning and ecosystem services supply

Grassland ecosystems provide a range of important ecosystem goods and services to society. They typically support a rich diversity of grasses, wild flowers, invertebrates, reptiles, birds and other animals. Other services provided by these ecosystems include their role in reducing runoff and attenuating downstream flooding, assisting with binding topsoil and controlling erosion as well as their role in storing carbon, especially in the topsoil. Benefits to local communities may include medicinal plants, grazing material for livestock and thatching grass.

Disturbance can affect processes and structure within an ecosystem or the outside forcing functions driving the ecosystem. Whether a disturbance causes a loss of ecosystem function depends on the degree of redundancy in the ecosystem to buffer ecosystem function from disturbance (US EPA, 1992). Potential loss of ecological goods and services currently supplied by the grassland (in terms of habitat, harvestable goods and grazing land mainly) are likely to be limited due to the degraded/ secondary nature of much of the site and the degree of habitat fragmentation. The functioning and services supplied by the broader wooded grassland community on the RBIDZ Phase 1F site will be permanently lost as a result of the broader industrial development at the site, of which the proposed power plant will make a somewhat meaningful contribution when considered cumulatively. Whilst some remaining area within the Phase 1F area will be set aside for conservation (refer to Figure 7.1), these areas are likely to be small and insignificant in terms of their potential functioning within a future highly developed and fragmented landscape (isolated patches that are unlikely to function well ecologically). The overall net loss of ecosystem goods and services is likely to be somewhat significant and will only be able to be mitigated through a compensatory mechanism such as a biodiversity offset (refer to Appendix H: Terrestrial Ecological Assessment for further details on offsets). This should be investigated further by the RBIDZ SoC Ltd as a means of compensating for the cumulative and irreplaceable loss of Maputaland Wooded Grassland vegetation and habitat associated with the broader RBIDZ Phase 1F development.

Nature: Cumulative impact on ecological functioning and ecosystem services supply		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (48)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	
Loss of resources?	Yes	
Can impacts be mitigated?	The impact of irreplaceable loss of vegetation and associated habitat and the ecosystem goods and services provided will be difficult to mitigate onsite and the need and desirability for a biodiversity offset to compensate for the loss of ecosystem functioning should be investigated in this respect by the RBIDZ.	
Confidence in findings	Moderate	
Mitigation: Mitigating the cumulative impact involving the loss of an endangered grassland habitat and associated ecosystem functioning and services will be inherently difficult to achieve. It is recommended that the need and desirability for a biodiversity offset be investigated further by RBIDZ SoC Ltd as a means of compensating for the cumulative loss of grassland habitat, ecosystem functioning and goods/ services provision associated with the broader RBIDZ Phase 1F development by the RBIDZ. This is discussed further in Appendix H: Terrestrial Ecological Assessment		

7.2.3. Cumulative impact to species of conservation concern

Activities involving the clearing/ harvesting of natural vegetation could result in the destruction or loss of flora (plants) and fauna (animal) species of conservation concern. This of course depends on whether these species are present at a site or not and on the threat status of individual species. If a subpopulation of a species of conservation concern (SCC) is found to occur on a proposed development site, it would be one indicator that development activities are likely to result in the loss of biodiversity, bearing in mind that loss of subpopulations of these species will either increase their extinction risk or may in fact contribute to their complete extinction.

The loss of numerous individual *Crinum delagoense* plants within the grassland ecosystem as a result of the development site is likely to negatively affect the local population of this provincially-protected species which is classified as "Declining". Despite the widespread distribution of this species, some population decline is likely due to harvesting of plants for medicinal purposes and loss of available grassland habitat (SANBI, 2010). However,

it can still be seen in a number of localities, and current levels of decline are unlikely to exceed 10% of the population (SANBI, 2010). Other KZN specially protected plants include *Ledebouria ovatifolia,* a South African Endemic, which occurs within the grasslands at the site. Within the broader RBIDZ Phase 1F area, there are likely to be these and potentially other threatened/protected /endemic species that could be lost to development. Additional protected plants species/plants of conservation concern that have been previously recorded at the RBIDZ Phase 1F area (NEMAI Consulting, 2015) include: *Boophone disticha, Hypoxis hemerocallidea* and *Eulophia speciosa* (all three plants listed by SANBI, 2010, as 'Declining' in terms of threat status).

Nature: Cumulative impact to species of conservation concern		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site only (1)	Regional (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (56)**	**High (64)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	
Loss of resources?	Yes	
Can impacts be mitigated?	Loss of protected/threatened plant species can be mitigated by translocating these plants to suitable adjacent grassland habitat, reducing the impact on the local population of this species to a low significance level.	
Confidence in findings	Moderate	
Mitigation: Mitigating this impact will be possible and if managed properly, the extent and probability of this impact occurring can be reduced. This impact can be best mitigated by translocating affected plants to suitable adjacent grassland habitat outside of development zones, reducing the impact on the local population of this species to a low significance level. Through education of workers/ employees onsite to not to disturb/ harvest plant species (apart from rescue and relocation activities), the likelihood of this impact occurring could also be reduced.		

7.3. Cumulative Ambient Air Quality Impacts

7.3.1. Cumulative impacts from dust generation during the construction phase

Cumulative impacts will result from exposure to dust generated from the construction of the proposed gas to power plant together with other existing sources of dust in the area.

Cumulative impacts associated with the construction phase are expected to be of short duration and temporary in nature.

Ambient air quality in Richards Bay is influenced by a number of sources of air pollution. Large and small scale industrial facilities, transportation, agricultural activities, agricultural burning, domestic fuel burning, mining and open stockpiles in the area are identified as existing sources of dust. Emissions from operations at the Port of Richards Bay which include the ore export terminal, the coal terminal and handling of break bulk cargo is a potentially large source of dust. Another important source of dust is the long range transport of pollutants from the interior. There will thus be a cumulative impact with dust generated during the construction phase of the proposed gas to power plant and existing/future sources of dust in the area. The impact of dust is considered to be limited to the site and its immediate surroundings, is more of a temporary nuisance nature and does not typically pose a health risk due to its typically coarse size. Dust emissions will not travel over vast distances, but will most likely settle within 100 m to 1 km of the proposed gas to power plant site. Impacts may be experienced in parts of the IDZ Zone 1F, the property on which the site is to be constructed.

Nature: Dust generated during the construction phase has a nuisance impact and negatively affects quality of life by causing soiling, contamination, structural corrosion and damage to precision equipment, machinery and computers.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local-regional (1)	Local-regional (1)
Duration	Very short term (1)	Very short term (1)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Confidence in findings	High	
Mitigation measures: » Implement traffic control measures to limit vehicle-entrained dust from unpaved roads by limiting vehicle speeds and by restricting traffic volumes. » Limit access to construction site to construction vehicles only. » Loading and unloading bulk construction material should be in areas protected from the wind or carried out in calm conditions. » Loads on vehicles carrying dusty construction materials should be covered. » Vehicles carrying dusty materials should be cleaned before leaving the site.		

» Unpaved road surfaces should be sprayed with a surfactant to ensure high moisture content which will bind the silt or maintain high moisture content on exposed surfaces and roads by spraying with water. » Stabilise open areas with dust palliative, gravel or similar.
Residual Impacts: No residual impacts are expected.

The impact is expected to be negative, local in extent, temporary in duration (limited to the duration of the construction), of low intensity, and highly probable if the proposed project is considered in isolation. The impact is therefore assessed to be of low significance to the decision making process if considered in isolation. This impact is expected to have no residual impacts.

The impact is expected to be negative, local in extent, temporary in duration (limited to the duration of the construction), of low intensity, and improbable if the proposed project is considered cumulatively with other projects in the area. The impact is therefore assessed to be of low significance to the decision making process if the proposed project is considered cumulatively with other projects in the area. This impact is expected to have no residual impacts.

Although the significance of impacts during construction is low (whether the proposed project is considered in isolation or cumulatively with other projects in the area), a basic dust management plan is required to ensure the nuisance impacts are mitigated. This can be achieved by addressing dust management in the Environmental Management Plan for the proposed gas to power plant.

7.3.2. Cumulative impacts from the combustion of diesel fuel (Scenario 1) and LNG (Scenario 2) at the proposed Gas to Power Plant

The proposed gas to power plant is located in an area where there are many notable sources of SO_2, NO_2, PM_{10}, CO and benzene (to a lesser extent) in the immediate vicinity of the site, i.e. within a 5 km radius, and beyond. Motor vehicle traffic on the surrounding and nearby roads will have some influence on ambient air quality as will domestic fuel burning. Heavy industrial activities, particularly to the south of the proposed site and at the port is an important source of SO_2, NO_2, PM_{10}, CO and benzene at that locality. Emissions of SO_2, NO_2, PM_{10}, CO and benzene from the combustion of diesel fuel during Phase 1 and LNG during Phase 2 at the proposed gas to power plant will increase the existing ambient concentrations of these pollutants in the immediate vicinity and the surrounding areas. It is therefore expected that there will be compounding of effects and hence cumulative impacts during operation of the proposed Gas to Power Plant.

Predicted ambient concentrations of SO_2, NO_2, PM_{10}, CO and benzene resulting from emissions from the proposed gas to power plant are relatively localised and are indicated as very low at the monitoring sites (See model results). The contribution to ambient concentrations beyond the immediate vicinity of the proposed gas to power plant will be

small and is highly unlikely to make a significant contribution to the cumulative impacts of these pollutants in the area. It is highly unlikely that they will result in exceedances of the NAAQS at the monitoring sites, or elsewhere in the area.

Cumulative impacts will result from the inhalation of SO_2, NO_2, PM_{10}, CO and benzene emitted from the combustion of diesel fuel (Scenario 1) in Phase 1 and LNG (Scenario 2) in Phase 2 during the operational life of the proposed gas to power plant and existing/future sources of pollutants in the area.

Nature: Air quality impacts are caused by the inhalation of SO_2, NO_2, PM_{10}, CO and benzene, which are contained in emissions from the combustion of diesel fuel at the proposed Gas to Power Plant. The inhalation of the SO_2, NO_2, PM_{10}, CO and benzene at concentrations exceeding health-based air quality standards; and which are greater than the permitted number of exceedances per year, will result in negative health impacts.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local-regional (1)	Local-regional (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Confidence in findings	High	
Mitigation measures: In this assessment, two NO_X emission mitigation strategies have been tested for the proposed Gas to Power Plant using diesel fuel (Scenario 1) (refer to results section). These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed Gas to Power Plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the diesel fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.		
Residual Impacts: No residual impacts are expected. This is due to the fact that the project site is centrally located within the RBIDZ and serves as a buffer.		

The impact is expected to be negative, local in extent, to last for the duration of operation, of low intensity and probable, whether the proposed project is considered in isolation or

cumulatively with other projects in the area. The impact is therefore assessed to be of low significance to the decision making process whether the proposed project is considered in isolation or cumulatively with other projects in the area, and is expected to have no residual impacts.

Nature: Air quality impacts are caused by the inhalation of SO_2, NO_2, PM_{10}, CO and benzene, which are contained in emissions from the combustion of LNG fuel at the proposed Gas to Power Plant. The inhalation of the SO_2, NO_2, PM_{10}, CO and benzene at concentrations exceeding health-based air quality standards; and which are greater than the permitted number of exceedances per year, will result in negative health impacts.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local-regional (1)	Local-regional (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Confidence in findings	High	
Mitigation measures: In this assessment, two NO_X emission mitigation strategies have been tested for the proposed Gas to Power Plant using LNG fuel (Scenario 2) (refer to results section). These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed Gas to Power Plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the LNG fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.		
Residual Impacts: No residual impacts are expected. This is due to the fact that the project site is centrally located within the RBIDZ and serves as a buffer.		

The impact is expected to be negative, local in extent, to last for the duration of operation, of low intensity and probable, whether the proposed project is considered in isolation or cumulatively with other projects in the area. The impact is therefore assessed to be of low significance to the decision making process whether the proposed project is considered in isolation or cumulatively with other projects in the area, and is expected to have no residual impacts.

7.3.3. Cumulative impacts from the combustion of diesel fuel (Scenario 1) during Phase 1 and LNG fuel (Scenario 2) during Phase 2 at the proposed Gas to Power Plant (Scenario 1) in terms of acid rain

Cumulative impacts resulting from emissions of SO_2 and NO_X from the combustion of diesel fuel during Phase 1 and LNG fuel during Phase 2 of the operational life of the proposed Gas to Power Plant include their contribution as well as other sources of SO_2 and NO_X in the area that lead to acidification in both dry and wet (acid rain) deposition. Quantification of the relative contribution of proposed Gas to Power Plant to acidification is difficult, but it is considered to be relatively small in the national and global context.

Cumulative impacts associated with the operational phase are expected to last for the duration of operation, which is ~25-40 years. Impacts which could arise as a result of the operation of the proposed project include the following:

Nature: Emissions of SO_2 and NO_X from the combustion of diesel fuel contributes to acid rain		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local-regional (2)	Local-regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Small impact (0)	Small Impact (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (12)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Confidence in findings	High	
Mitigation measures: In this assessment, two NO_X emission mitigation strategies have been tested for the proposed Gas to Power Plant using diesel fuel (Scenario 1) (refer to results section). These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed Gas to Power Plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the diesel fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.		
Residual Impacts:		

No residual impacts are expected.

The impact is expected to be negative, local-regional in extent, to last for the duration of operation, of small impact and improbable, whether the proposed project is considered in isolation or cumulatively with other projects in the area. The impact is therefore assessed to be of low significance to the decision making process whether the proposed project is considered in isolation or cumulatively with other projects in the area, and is expected to have no residual impacts.

Nature: Emissions of SO_2 and NO_X from the combustion of LNG fuel contributes to acid rain		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local-regional (2)	Local-regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Small impact (0)	Small Impact (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (12)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Confidence in findings	High	
Mitigation measures: In this assessment, two NO_X emission mitigation strategies have been tested for the proposed Gas to Power Plant using LNG fuel (Scenario 2) (refer to results section). These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed Gas to Power Plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the LNG fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.		
Residual Impacts: No residual impacts are expected.		

The impact is expected to be negative, local-regional in extent, to last for the duration of operation, of small impact and improbable, whether the proposed project is considered in isolation or cumulatively with other projects in the area. The impact is therefore assessed to be of low significance to the decision making process whether the proposed project is considered in isolation or cumulatively with other projects in the area, and is expected to have no residual impacts.

7.3.4. Cumulative impacts from the combustion of diesel fuel (Scenario 1) during Phase 1 and LNG fuel (Scenario 2) during Phase 2 at the proposed Gas to Power Plant in terms of South Africa's CO_2/greenhouse gas emissions and global warming

Cumulative impacts resulting from emissions of CO_2 from the combustion of diesel fuel during Phase 1 and LNG fuel during Phase 2 of the operational life of the proposed Gas to Power Plant include its contribution as well as other sources of CO_2 in the area that lead to the overall CO_2/GHG emission levels in South Africa, and global warming. The relative contribution of the proposed Gas to Power Plant to the total national CO_2 emission is considered to be relatively small in the national and global context, since it may account for less than 1% of South Africa's current total CO_2 emissions.

Nature: Emissions of CO_2 from the combustion of diesel fuel leads to an increase in the South African CO_2/GHG emissions and global warming		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local-regional (4)	Local-regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Small impact (0)	Small Impact (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	
Confidence in findings	High	
Mitigation measures: Mitigation measures are not feasible at this scale of operations due to the national climate change response still being developed.		
Residual Impacts: No residual impacts are expected.		

The impact is expected to be negative, local-regional in extent, to last for the duration of operation, of small impact and improbable, whether the proposed project is considered in isolation or cumulatively with other projects in the area. The impact is therefore assessed to be of low significance to the decision making process whether the proposed project is considered in isolation or cumulatively with other projects in the area, and is expected to have no residual impacts.

Nature: Emissions of CO_2 from the combustion of LNG fuel leads to an increase in the South African CO_2/GHG emissions and global warming

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local-regional (4)	Local-regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Small impact (0)	Small Impact (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (16)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No	
Confidence in findings	High	
Mitigation measures: The implementation of this project is seen as a mitigation measure considering the lower GHG emissions when considered relative to other fossil fuels (e.g. coal).		
Residual Impacts: No residual impacts are expected.		

The impact is expected to be negative, local-regional in extent, to last for the duration of operation, of small impact and improbable, whether the proposed project is considered in isolation or cumulatively with other projects in the area. The impact is therefore assessed to be of low significance to the decision making process whether the proposed project is considered in isolation or cumulatively with other projects in the area, and is expected to have no residual impacts.

7.3.5. Cumulative impacts from dust generation during the decommissioning phase

Cumulative impacts will result from exposure to dust generated from decommissioning activities of the proposed Gas to Power Plant together with other existing sources of dust in the area. Cumulative impacts associated with the decommissioning phase are expected to be of short duration and temporary in nature.

Ambient air quality in Richards Bay is influenced by a number of sources of air pollution. Large and small scale industrial facilities, transportation, agricultural activities, agricultural burning, domestic fuel burning, mining and open stockpiles in the area are identified as existing sources of dust. Emissions from operations at the Port of Richards Bay which include the ore export terminal, the coal terminal and handling of break bulk cargo is a potentially large source of dust. Another important source of dust is the long range transport of pollutants from the interior. There will thus be a cumulative impact with dust

generated during the decommissioning phase of the proposed Gas to Power Plant and existing/future sources of dust in the area. The impact of dust is considered to be limited to the site and its immediate surroundings, is more of a temporary nuisance nature and does not typically pose a health risk due to its typically coarse size. Dust emissions will not travel over vast distances, but will most likely settle within 100 m to 1 km of the proposed Gas to Power Plant site. Impacts may be experienced in parts of the IDZ Zone 1F, the property on which the site is to be constructed.

Nature: Dust generated during the decommissioning phase has a nuisance impact and negatively affects quality of life by causing soiling, contamination, structural corrosion and damage to precision equipment, machinery and computers.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local-regional (1)	Local-regional (1)
Duration	Very short term (1)	Very short term (1)
Magnitude	Low (4)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Low (24)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Confidence in findings	High	
Mitigation measures: » Implement traffic control measures to limit vehicle-entrained dust from unpaved roads by limiting vehicle speeds and by restricting traffic volumes. » Limit access to site to construction vehicles only. » Loading and unloading bulk material should be in areas protected from the wind or carried out in calm conditions. » Loads on vehicles carrying dusty materials should be covered. » Vehicles carrying dusty materials should be cleaned before leaving the site. » Unpaved road surfaces should be sprayed with a surfactant to ensure high moisture content which will bind the silt or maintain high moisture content on exposed surfaces and roads by spraying with water. » Stabilise open areas with dust palliative, gravel or similar.		
Residual Impacts: No residual impacts are expected.		

The impact is expected to be negative, local in extent, temporary in duration (limited to the duration of the decommissioning), of low intensity, and highly probable if the proposed project is considered in isolation. The impact is therefore assessed to be of low significance to the decision making process if considered in isolation. This impact is expected to have no residual impacts, with mitigation.

The impact is expected to be negative, local in extent, temporary in duration (limited to the duration of the decommissioning), of low intensity, and improbable if the proposed project is considered cumulatively with other projects in the area. The impact is therefore assessed to be of low significance to the decision making process if the proposed project is considered cumulatively with other projects in the area. This impact is expected to have no residual impacts, with mitigation.

Although the significance of impacts during decommissioning is low (whether the proposed project is considered in isolation or cumulatively with other projects in the area), a basic dust management plan is required to ensure the nuisance impacts are mitigated. This can be achieved by addressing dust management in the Environmental Management Plan for the proposed Gas to Power Plant.

7.4. Cumulative Socio-Economic Impacts

The site for the proposed development is located in the RBIDZ Phase 1F within the KZN Province, in close proximity to Tata Steel, in an area planned for further industrial development (refer to Figure 7.1). This implies that projects of the same nature will be consolidated in one area creating a node, and ultimately aiming to reduce the potential for cumulative impacts associated with such developments when spatially fragmented. Possible cumulative impacts as a result of other industrial projects in the area could have cumulative negative and positive impacts for the local community. Cumulative impacts have been considered as part of the Social Impact Assessment (SIA) and identified where relevant.

7.4.1. Cumulative impacts from employment, skills and business opportunities

The proposed development and the establishment of other general industrial plants (refer to Figure 7.1) in the RBIDZ Phase 1F has the potential to result in significant positive cumulative impacts; specifically with the creation of a number of socio-economic opportunities for the Province, which in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. Furthermore at municipal level, the cumulative impact could be positive and could incentivise operation and maintenance companies to centralise and expand their activities towards education and training more closely to the projects. Cumulative impacts on local entrepreneurs will be positive and assist in developing their businesses further.

Nature: An increase in employment opportunities, skills development and business opportunities with the establishment other general industrial developments in the RBIDZ Phase 1F.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local- Regional (3)	Local- regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (39)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	
Confidence in findings	High	
Enhancement: The establishment of other general industrial developments in the RBIDZ phase 1F has the potential to have a positive cumulative impact on the area in the form of employment opportunities, skills development and business opportunities. The positive benefits will be enhanced if local employment policies are adopted and local services providers are utilised by the developers to maximise the developments opportunities available to the local community.		

The cumulative impact is assessed to be positive; local to regional in extent; long-term; moderate intensity and probable. The overall impact is likely to have a **medium positive significance** to the local area.

7.4.2. Cumulative impacts on daily living and movement patterns (traffic impacts)

Possible cumulative impacts as a result of other industrial projects in the area could have cumulative negative impacts for the local community. Increased traffic due to construction vehicles and heavy vehicles could cause disruptions to road users and increase safety hazards. The use of local roads and transport systems may cause road deterioration and congestion. During the stakeholder consultations that took place it was noted that the R619 route is currently a congested route with high volumes of vehicles and trucks passing through each day. Increased vehicular movement from other industrial developments in the IDZ Phase 1F may influence daily living and movement patterns of community members in the surrounding communities. If more than one development is under construction or operation at any one time, then the impacts from increased traffic is likely to have more of a negative impact on the local area. Mitigation measures are aimed at optimising vehicular movement to minimize traffic congestion problems in the area, which in turn influences daily living and movement patterns of community members in the surrounding communities who make use of these roads. It is suggested that heavy vehicles and trucks utilise the R34 route to access the RBIDZ Phase 1F area to prevent further congestion on the R619 route.

Nature: Impacts from an increase in traffic disruptions, congestion and impacts on movement patterns during the operation phase		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Highly probable (4)
Significance	**Low (24)**	**Medium (48)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Confidence in findings	High	
Mitigation » The R34 access route should rather be utilised by tankers delivering fuel as much as possible during phase 1 of the operation phase of the gas to power station. This road should also be used by other developments in the Phase 1F area. » All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and made aware of the potential safety issues. » Heavy vehicles should be inspected regularly to ensure their road safety worthiness. » Implement penalties for reckless driving for the drivers of heavy vehicles as a way to enforce compliance to traffic rules. » A comprehensive employee induction programme must be implemented to cover land access protocols and road safety.		

The cumulative impact is assessed to be negative; local in extent; long-term; low intensity and improbable with mitigation measures. The impact is assessed to be of **medium significance** to the decision making process.

7.4.3. Cumulative impacts with large scale in-migration of people

Large-scale industrial development in the RBIDZ Phase 1F area will likely draw a large number of labour, businesses and jobseekers to the area. If the labour force cannot be sourced locally or the local labour pool is inadequate for the industrial developments, outside labour will likely move to the area to fill the gap. The area may experience an influx of new residents who may move to the area looking for job opportunities; which will have effects on the existing population during the construction periods that could entail problems of housing, sanitation, water usage and solid waste disposal. Employment for a power plant peaks during construction and significantly declines during operation. Though there may be an influx of workers during construction, these workers are largely temporary. Towns with larger populations (greater than 1 000 individuals) and with developed services will likely experience greater rates of population growth than areas without developed services. In relation to the area, the town that will be mostly affected

is Richards Bay (population of 57 387 people) and the smaller settlements nearby. With the influx of new individuals, secondary industries in the town may also begin to grow, more individuals will move to the area to fill these secondary positions. The impact of this on services and resources is likely to impact the current communities and increase the pressure on the local municipality to meet the basic needs of these potential new communities. The poor communities are likely to be the most vulnerable to loss of service provision and suffer the negative impact of large scale in-migration. There is potential for the influx of migrants to significantly change the local receiving environment and this is likely to have a permanent impact in the region. If more than one industrial development is under construction at any one time, then the impacts from in-migration of people is likely to have more of a negative impact on the local area. It is very difficult to control an influx of people into an area, especially in a country where unemployment rates are high.

Nature: Negative impacts and change to the local economy with an in-migration of labourers, businesses and jobseekers to the area.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (3)	Local (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Confidence in findings	Medium	
Mitigation » Develop a recruitment policy/ process (to be implemented by contractors), which will source labour locally, where feasible. » Working together with government agencies to ensure service provision is in line with the proposed development needs of the local area. » Forming joint ventures with community organisations, through Trusts, which can provide local communities with benefits, such as employment opportunities and services.		

The cumulative impact is assessed to be negative; local to regional in extent; long-term; moderate intensity and probable. The overall impact is likely to have a **low negative significance** to the local area.

7.4.4. Cumulative impacts on the sense of place and landscape

The aesthetics from the industrial developments in the area is expected to have a low intensity impact and a low impact on the area's sense of place since it is an IDZ with projects of a similar nature being consolidated into one area.

Nature: Visual impacts and change in the sense of place impacts associated with the establishment of more than one industrial development in the area		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Probable (3)
Significance	**Low (16)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	No	
Confidence in findings	High	
Mitigation » None required		

The cumulative impact is assessed to be negative; local to regional in extent; long-term; moderate intensity and probable. The overall impact is likely to have a **low negative significance** to the local area.

7.5. Conclusion regarding Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of the gas to power plant as well as other planned developments in the RBIDZ Phase 1F. The confidence in the degree of significance of these cumulative impacts is moderate as a result of uncertainties regarding other developments proceeding in the area. The current study assesses the cumulative impacts on the basis of current and best available information, with precautionary assumptions taken into account.

The cumulative impacts that have the potential to be compounded through the development of the gas to power plant and its associated infrastructure in proximity to other developments include impacts related to ecology, the local economy and employment and ambient air quality. The role of the cumulative assessment is to test if such impacts are relevant to the gas to power project in the proposed location, that is, in the Richards Bay Industrial Development Zone (RBIDZ): Phase 1F, resulting in:

- Unacceptable loss of threatened or protected vegetation types or species through clearing, resulting in an impact on the conservation status of such flora or ecological functioning;
- Complete or whole-scale change in sense of place and character of an area; and
- Unacceptable increase in ambient air quality levels, resulting in an impact on the health of the occupants within the area and an increase in pollutants in the area.

Considering the findings of the specialist assessments undertaken for the project, the cumulative impacts for the proposed Gas to Power Plant will be acceptable and the majority are rated as being of **medium to low significance** with the implementation of appropriate mitigation were feasible. On this basis, the following can be concluded considering the Gas to Power Plant:

- The construction of the project will not result in the unacceptable loss of threatened or protected plant species. The proposed development is acceptable from an ecological perspective.
- The construction of the project will not result in the complete or whole-scale change in sense of place and character of the area nor will the project result in unacceptable visual intrusion.
- The project will not significantly increase the negative impact on the social environment. However, an increase in positive impacts, specifically as a result of job creation and socio-economic benefits, can be expected.
- The project will contribute towards a reduction in greenhouse gas emissions from energy generation and will aid the country in meeting the commitments made under the COP 21 Agreement, to which the Government has committed to become a signatory.

Based on a detailed evaluation, the cumulative impacts associated with the construction and operation of the proposed Gas to Power Plant and other development within the RBIDZ: Phase 1F are considered to be acceptable. The limited potential for cumulative impacts and risks makes the location of this project within the RBIDZ: Phase 1F a desirable location for further consideration provided that environmental impacts are mitigated to suitable standards as recommended within this EIA Report.

CONCLUSIONS AND RECOMMENDATIONS CHAPTER 8

Richards Bay Gas Power 2 (Pty) Ltd, an Independent Power Producer (IPP), is proposing the establishment of a gas to power plant and associated infrastructure on a site located within the Richards Bay Industrial Development Zone (IDZ) 1F, located within the uMthlathuze Local Municipality in Kwazulu-Natal, South Africa. The gas to power plant will have a capacity of up to 400MW. This project is to be developed in response to the Department of Energy's (DoE) request for projects to be developed by IPPs in order to provide alternative power generation technologies to meet the energy requirements of 10 000MW of additional electrical capacity by 2025, as identified in the National Development Plan (NDP).

The gas to power plant and associated infrastructure is proposed to be located on erven 17455, 17443 and 17442 within the Richards Bay Industrial Development Zone (RBIDZ): Phase 1F. The EIA undertaken by Nemai Consulting (2015) which considers the installation of infrastructural services (roads, sewer infrastructure, internal electrical infrastructure, water mains, storm water infrastructure and infill of wetlands), notes that under its application for environmental authorisation, the site will be cleared for the placement of infrastructure services and servitudes and each tenant will develop their respective stands for industrial purposes. This is aligned with the intentions of the RBIDZ to develop and establish a world-class built industrial park incorporating a delimited Customs Controlled Area and linked to the Richards Bay International Port, with the provision of quality infrastructure including ICT and transport infrastructure, business and utility services.

The proposed plant net output, at International Standards Organisation (ISO) Reference Conditions, is expected to be up to 400 MW, to be developed in two (2) phases to operate with liquid fuel such as diesel and/ or Liquefied Petroleum Gas (LPG) in Phase 1 and ultimately Liquid Natural Gas (LNG) or Natural Gas in Phase 2 of the development. It is anticipated that 300MW will be fuel/ gas generated energy and 100MW will be heat/ steam generated energy (i.e. a combine-cycle system).

The main infrastructure associated with the facility includes the following:

» Up to six (6) Gas Turbines (this is dependent on the DoE's Gas IPP Programme and the requirements of gas to power stations to operate at either base-load or mid-merit)
» 1-2 steam turbines utilising the heat from all the engines for power production in a steam cycle.
» The power plant will comprise multiple engine halls, each of ~60MW. Each engine hall will typically comprise one engine. Stacks associated with engine halls will be up to 20m in height.
» Access roads within project locality boundaries.

- Three (3) fuel tanks with a capacity of 2000m^3 each which will be used as an interim fuel storage facility until the gas infrastructure is constructed by the DoE and Transnet. Two (2) fuel unloading stations will be associated with these tanks.
- Water storage facilities for process water and fire-fighting purposes.
- An HV-Yard and Substation, adjacent to the power plant.
- A new 132kV power line to connect into the Municipal grid, connecting directly to the Indus Substation bordering the site.
- Guard house, admin building, workshops and a warehouse.

Water volumes of between 50 000m^3 and 270 000m^3 [30]per annum are expected to be required for the project. The volume of water required will be supplied via the Richards Bay IDZ water supply network that has an allotment from the local water authority. Every effort is being made to reduce these volumes further, including the potential for recycling condensation from air cooled condensers if such equipment will form part of the final plant design. The Richards Bay IDZ has undertaken to provide the water to the site under its long-term lease agreement with Richards Bay Gas Power 2 (Pty) Ltd. The Richards Bay IDZ have provided Richards Bay Gas Power 2 (Pty) Ltd with a letter of confirmation that the volumes required would be supplied (refer to Appendix C9).

A summary of the details and dimensions of the planned infrastructure associated with the gas to power plant is provided in Table 8.1.

Table 8.1: Technical Details of the proposed project

Component	Description/ Dimensions
Location of the site	Erven 17455, 17443 and 17442 within the Richards Bay IDZ Phase 1F, KwaZulu-Natal
SG Codes	NOGVO4210000881800000 NOGVO4210000881900000 NOGVO4210000882000000
Four coordinate points for the proposed development site	32°1'31.137''E; 28°44'19.238''S 32°1'27.87''E; 28°44'24.814''S 32°1'41.779''E; 28°44'31.585''S 32°1'45.057'E; 28°44'26.176''S
Extent of the proposed development footprint (including all associated infrastructure)	7.3 ha (Refer to Appendix B for site maps).
Extent of broader site	7.46 ha
Municipal Jurisdiction	uMhlathuze Local Municipality which falls under the jurisdiction of the uThungulu District Municipality.
Proposed technology	» Up to six (6) Gas Turbines (GT) » Engines fuelled by diesel and LPG (Phase 1) and ultimately by LNG (Phase 2)

[30] Exact water requirements are unconfirmed at this stage and are therefore best estimates. Once the final technology has been selected, water volumes will be confirmed.

Component	Description/ Dimensions
	» 1-2 steam turbines utilising the heat from all the engines for power production in a steam cycle. » Air cooler condensers » Dry cooling » Dry low emissions (DLE)
Power output capacity	300MW generated through the use of diesel /LPG (phase 1) and LNG / NG (phase 2). This is dependent on the final equipment and configuration choices. An additional 100MW can be generated through combined cycle waste heat and steam turbines should the developer consider the CCGTs. The combined maximum power output is up to 400MW (this is dependent on the final equipment and configuration choices). There is no difference in the power output levels between phases 1 and 2.
Sources of the preferred fuels for Phase 1 and volumes required	» Liquid fuel (Diesel /LPG) can be purchased from Durban Refinery and/ or imported internationally. The volumes required are: * 1 000 000m^3 per annum at base load * 410 000m^3 per annum at mid-merit » Gas (LNG /NG) can be purchased from international and/ or local LNG suppliers. The volumes required are: * 30 million GJ (800 000 000m^3) at base load per annum * 12.3 million GJ (326 000 000 m^3) at mid-merit per annum
Stack height	» Stacks associated with engine halls will be up to 15m in height.
Fuel storage	» Three (3) fuel tanks with a capacity of 2000m^3 each will be used as an interim fuel storage facility until the gas infrastructure is constructed by the DoE. These fuel tanks will be located within an appropriately bunded area on the site, » Two (2) fuel unloading stations will be associated with these tanks.
Site access	» The site will be accessed via existing roads within the IDZ Phase 1F (already approved through an EIA undertaken for the Phase 1F infrastructure) and internal access roads (width of up to 6m) which will be constructed.
Grid connection	» On-site substation (HV Yard) associated with the power station. » A new 132kV power line to connect to the Indus Substation bordering the site. Refer to Appendix B for site maps and coordinate points for power line and on-site substation.
Associated buildings	» Guard house, admin building, workshops and a warehouse
Services required	The proposed project will be located within the Richards Bay IDZ 1F under a long-term lease. The Zone Operator / Landlord (RBIDZ) is responsible for all services required by Richards Bay Gas Power 2 (Pty) Ltd (the tenant) under the long-term lease agreement. The RBIDZ lease agreement states: *"Undeveloped land which is to be serviced by the Landlord to include bulk water, sewer, and electrical connections and a road external to the leased premises but within the RBIDZ. The Landlord will be responsible*

Component	Description/ Dimensions
	for the development of the Property as vacant developed land with services in place to the supply points installed by the Landlord near the boundary of the Property." In this regard, the following engineering services will be provided by the Landlord: » Water; » Sewage; » Roads; » Storm water; » Electricity; and » Refuse removal on a weekly basis by the uMhlathuze Municipality. Refer to Appendix C for a letter of confirmation for services from the Landlord.
Water Storage	» Water storage facilities will be located on site. This will include a raw water and fire water tank, demineralisation water tank and a tank for partially treated water.

The EIA process for the proposed gas to power plant has been undertaken in accordance with the EIA Regulations published in Government Notice GN38282 of December 2014, in terms of Section 24(5) of NEMA (Act No. 107 of 1998), and includes an assessment of the activities associated with the construction and operation of the gas to power plant.

The EIA Phase aimed to achieve the following:

» Provide an overall assessment of the social and biophysical environments affected by the proposed development footprint as part of the project;
» Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed gas to power plant;
» Identify and recommend appropriate mitigation measures for potentially significant environmental impacts; and
» Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

8.1. Alternatives Considered for the Gas to Power Plant

In accordance with the requirements outlined in Appendix 3 of the EIA Regulations 2014, the consideration of alternatives including site, activity, technology, as well as the "do-nothing" alternative should be undertaken. Thus, the identification of alternatives is a key aspect of the success of the EIA process. In relation to a proposed activity "Alternatives"

means different ways of meeting the general purposes and requirements of the proposed activity. The following sections address this requirement.

8.1.1. Site Alternatives

The proposed gas to power plant is to be located on a site within the Richards Bay IDZ Phase 1F within the uMhlathuze Local Municipality, which falls under the jurisdiction of the uThungulu District Municipality in Kwazulu-Natal. The site has been zoned for IDZ industrial development as part of the planning for this IDZ area.

The erven on which the proposed facility is planned have been allocated to the developer for this purpose. Therefore, the siting of the facility has been predetermined and no feasible siting alternatives within an appropriately zoned area exist. Richards Bay Gas Power 2 (Pty) Ltd considers this area, and specifically the demarcated site, to be highly preferred for the development of a gas to power project from a technical perspective as detailed in Section 3.1.4 of this EIA Report.

8.1.2. Cooling Technology Alternatives

Combined cycle gas to power plants require cooling at the back-end of the thermal cycle. The purpose of the cooling is to condense steam back to water at the end of the steam cycle. There are different types of cooling technologies available (discussed below for comparative purposes) but typically water is used for cooling in power plants.

Due to water availability considerations in the area, dry cooling technology will be used for the project. This is also consistent with the Department of Water and Sanitation requirements. Therefore no alternative technology is considered.

Dry Cooling

Dry-cooling systems use air instead of water to cool the steam exiting a turbine. Dry-cooled systems use no water and can decrease total power plant water consumption by more than 90 percent[31]. The tradeoffs to these water savings are higher operating costs and lower plant efficiencies[32].

Wet cooling system

Wet-recirculating or closed-loop systems use cooling water in a second cycle to cool the steam. Most commonly, wet-recirculating systems use cooling towers to expose water to

[31] Though no water is required for dry-cooling systems, power plants using dry-cooling systems also require water for system maintenance and cleaning

[32] Source: http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/water-energy-electricity-cooling-power-plant.html#sources

ambient air. Some of the water evaporates; the rest is then sent back to the condenser in the power plant. Because wet-recirculating systems withdraw water to replace any water that is lost through evaporation in the cooling tower, these systems tend to have appreciably high water consumption[33].

8.1.3. Fuel type Alternatives

The fuel types that were originally under consideration for Phase 1 of the proposed gas to power plant were diesel; Liquefied Petroleum Gas (LPG), Heavy Fuel Oil (HFO) and Light Fuel Oil (LFO). HFO and LFO were subsequently excluded, in response to comments received on the draft scoping report, due to their high emissions.

It is important to note that the impacts identified and assessed in this EIA Report have considered diesel and LPG as the only fuel sources for Phase 1. Should sustainable supplies of cleaner fuel (e.g. biofuel) become commercially viable in the future then Richards Bay Gas Power 2 (Pty) Ltd should investigate the conversion of the plant to be able to utilise such fuels if technically and financially feasible.

8.1.4. Operational Alternatives

As previously indicated in this chapter, the power plant could operate at base load or mid-merit energy. This will be dependent on the DoE IPP Programme requirements, as well as those of Eskom.

Base load is defined as the minimum level of demand on an electrical supply system over 24 hours. Base load power sources are those plants which can generate dependable power to consistently meet demand.

Mid-merit is defined as the power supply that fills the gap between peak load and base load where peak load is the maximum level of power demand. This generally translates to an operational period of 8 hours per day.

The development footprint for both scenarios is 7.3ha. Table 8.2 below provides details of the main differences associated with operating the power plant at base load versus mid-merit as proposed by Richards Bay Gas Power 2 (Pty) Ltd.

Table 8.2: Base load versus Mid-merit

	Base load	**Mid-merit**
Number of gas turbines	2	6
Number of steam turbines	1-2	1-2
Number of engines	2	6

[33] Source: http://www.ucsusa.org/clean_energy/our-energy-choices/energy-and-water-use/water-energy-electricity-cooling-power-plant.html#sources

Number of operational hours per year	8 000	3 000
Volume of diesel /LPG required	1 000 000m^3	410 000m^3
Number of trucks delivering fuel daily	52	18
Volume of LNG/ NG required	800 000 000m^3	326 000 000m^3
Volume of water required	270 000m^3	50 000m^3

This impact assessment has considered the operation of the facility at base load as a worst-case scenario.

8.2. Evaluation of the Proposed Project

The preceding chapters of this report together with the specialist studies contained within **Appendices F - H** provide a detailed assessment of the environmental impacts on the social and biophysical environment as a result of the proposed project. This chapter concludes the EIA Report by providing a summary of the conclusions of the assessment of the proposed site for the gas to power plant and the associated infrastructure. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental team during the course of the EIA and presents an informed opinion of the environmental impacts associated with the proposed project.

8.2.1. Impacts on Ecology

The development of the project will require the clearance of the entire development footprint (i.e. an area of 7.3ha). The significance of potential pre-construction and construction related ecological impacts are estimated to range from **Low to Medium** ecological significance with mitigation; with the direct disturbance/degradation and loss of vegetation/habitat as a result of stripping and clearing of vegetation being the most significant. The spread of Invasive Alien Plants (IAPs), weeds and other undesirable plants post-construction (due to disturbance created) is likely to be of a **Medium** ecological significance and will affect areas adjacent to the facility over the operational life-span of the project. During the decommissioning phase of the project, impacts are unlikely to be of much significance, with the potential of the project to have a net positive ecological impact on the habitat and biodiversity when the artificial infrastructure is removed and the grassland vegetation/habitat is properly reinstated at the site.

Cumulative impacts associated with the development were identified and assessed, in the context of past historic disturbance at the site and future industrial expansion within the broader Phase 1F site. Cumulative impacts on ecosystem conservation targets, loss of ecological functioning and ecosystem services supply, and impacts to species of conservation concern are expected to range from **Medium to High** significance in light of the threat status and irreplaceability value of the Maputaland Wooded Grassland vegetation type and the presence of protected/threatened plant species at the site. Cumulative impacts are likely to remain Moderately-High to High even when considering

these impacts without the planned gas to power plant development (due to the extensive industrial development planned for the Phase 1 F area).

With adequate mitigation and impact management, most direct and indirect impacts can be effectively managed and reduced to estimated low significance levels. The cumulative loss of threatened/protected plant species can be effectively managed by rescuing and translocating species to suitable conservation sites outside of the developable area, reducing the impact on the local population of these species to a low significance level. Other on-site impacts can be relatively easily mitigated through appropriate practical on-site impact mitigation and best practice management measures which have been outlined in this report. These include the implementation of an alien plant management programme and revegetation/rehabilitation plan for areas disturbed during construction. The cumulative, permanent and irreversible loss of vegetation and habitat will be difficult to mitigate, and the consequences in terms of meeting targets set for Maputaland Wooded Grassland (Endangered vegetation type) as well as the resultant loss of ecosystem functioning, goods and services will be unavoidable. The contribution of the project itself to this impact is expected to be limited as a result of the limited footprint (i.e. 7.3ha).

From an ecological perspective, it is concluded that the project is acceptable and can be implemented provided that recommended mitigation measures are implemented.

8.2.2. Impacts on Air Quality

Negative air quality impacts associated with the generation of dust and emissions have been identified. However, the assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws and which are of such significance that they cannot be successfully mitigated.

In this study, direct impacts will result from exposure to dust generated from the construction and decommissioning phases of the proposed gas to power plant. Direct impacts will also result from the inhalation of SO_2, NO_2, PM_{10}, CO and benzene emitted during the operational phase of the proposed gas to power plant.

Indirect impacts resulting from emissions of SO_2 and NO_2 from power plants include their contribution to acidification in both dry and wet (acid rain) deposition, during the operational phase. Further indirect effects during the operational phase are associated emissions of CO and CO_2. CO_2 is a GHG, adding to the global concentrations. CO is not considered a GHG, but is a strong precursor in the formation of ozone in the troposphere.

Ambient air quality in Richards Bay is influenced by a number of sources of air pollution, including large and smaller industry, transportation, agricultural burning, mining and the long range transport of pollutants from the interior. The proposed gas to power plant is

located in an area where there are many notable sources of SO_2, NO_2, PM_{10}, CO and benzene (to a lesser extent) in the immediate vicinity of the site.

According to the model results, the 99th percentile of the predicted 1-hour and 24-hour and annual average SO_2, NO_2, PM_{10}, CO and benzene concentrations from the proposed gas to power plant are well below the respective National Ambient Air Quality Standards (NAAQS) and World Health Organisation (WHO) guidelines for Scenario 1 and Scenario 2. Predicted ambient concentrations are localised and very low for the modelled scenarios. The contribution to ambient concentrations beyond the immediate vicinity of the proposed gas to power plant is therefore small. The additive effect of these concentrations to the ambient environment is therefore highly unlikely to make a significant contribution to the cumulative impacts of SO_2, NO_2, PM_{10}, CO and benzene in the ambient environment. Impacts in terms of predicted concentrations of SO_2, NO_2, PM_{10}, CO and benzene from the operational scenarios will however last for the full period of the proposed gas to power plant. The duration of direct, indirect and cumulative impacts from the operational scenarios are therefore expected to be long-term. The significance of all impacts for the two operational scenarios is **low**.

Construction and decommissioning activities will result in the emission of low quantities of terrestrial and construction dust, not expected to pose a health risk. Furthermore, dust emissions will not travel over vast distances, but will most likely settle within 100m to 1km of the proposed development site. A temporary nuisance impact may be experienced in parts of the RBIDZ Zone 1F, the property on which the site is to be constructed. Construction and decommissioning impacts will last for a relatively short period as these activities occur for the duration of these activities only. It is predicted that the significance of all impacts during the construction and decommissioning phase is **low**. No mitigation is necessary, however, measures are suggested to minimise the nuisance impacts arising from these activities.

In this assessment, two NO_X emission mitigation strategies have been tested for the proposed gas to power plant. These include the water-steam injection and lean-premix mechanism. If NO_X mitigation strategies are implemented at the proposed gas to power plant, this will result in significantly lower NO_2 concentrations during the operational phase for all scenarios. Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the diesel and LNG. However, it has been concluded that this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 content levels are already low. Due to the low predicted impacts, no mitigation measures are suggested for operational activities, in other words, mitigation measures to control SO_2 and NO_X, or even PM_{10}, CO and benzene are not necessary for the normal operations of the proposed gas to power plant. The significance rating will remain **low** during the operational phase for all scenarios, with or without mitigation.

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

iii. Annual emission measurements to assess compliance with the Minimum Emission Standards for Listed Activities (Government Gazette 37054, Notice No. 893 of 22 November 2013);
iv. The maintenance of an emission inventory with registration on the National Atmospheric Emission Inventory System (NAEIS) and annual reporting of emissions to the NAEIS (Government Gazette 38633, Notice No. R 283 of 2 April 2015).

Further environmental management requirements should address the control of emissions during operations through routine maintenance and operation according to specification.

According to the dispersion modelling results and air quality impact assessment, the site operations is expected to generate low emissions, low ambient concentrations, and low environmental impacts for both Scenario 1 and Scenario 2. It is therefore recommended that the proposed mitigation measures for the construction, operation and decommissioning phases are implemented to limit the negative impacts.

From an air quality perspective it is concluded that the project is supported, provided that mitigation measures are implemented and adhered to.

8.2.3. Impacts on the Social Environment

Positive and negative social impacts have been identified to be associated with the construction and operation of the project. The assessment of the key issues indicated that there are no negative impacts that can be classified as fatal flaws and which are of such significance that they cannot be successfully mitigated. Positive impacts could be enhanced by implementing appropriate enhancement measures and through careful planning. Based on the social assessment, the following general conclusions and findings have been made:

» The potential negative social impacts are primarily associated with the traffic impacts on daily living and movement patterns during the construction phase and operation phase. These impacts can be reduced to acceptable levels with the implementation of the mitigation measures proposed.
» Employment opportunities will be created in the construction and operation phases. The impact is rated as positive even if only a small number of individuals benefit in this regard as a result of high levels of unemployment in the region.

» The proposed project could assist the local economy in creating entrepreneurial development, especially if local business could be involved in the provision of general material and services during the construction and operational phases.
» Capacity building and skills training among employees are critical and would be highly beneficial to those involved, especially if they receive portable skills to enable them to also find work elsewhere and in other sectors.
» The proposed development also represents an investment in infrastructure for the generation energy, which represents a positive social benefit for society as a whole.

From a social perspective it is concluded that the project is supported, but that mitigation measures should be implemented and adhered to.

8.3. Overall Conclusion (Impact Statement)

The Integrated Resource Plan (IRP) 2010-2030 developed by the Department of Energy (DoE) projected that an additional capacity of up to 56 539MW of generation capacity will be required to support the country's economic development and ensure adequate reserves over the next twenty years. The required expansion is more than two times the size of the existing capacity of the system. In order to meet this required generation capacity, the IRP includes a mix of generation technologies, including a nuclear fleet of 9.6 GW; 6.3 GW of coal; 17.8 GW of renewables; and 8.9 GW of other generation sources, including gas. Although liquefied natural gas (LNG)-fuelled combined cycle gas turbines is considered to be one of the alternative baseload power generation options in the least-cost Base Case presented in the IRP, the potential to develop these plants has been constrained by the availability of fuel and the capacity to build. The Department of Energy's Independent Power Producer (IPP) office, together with Transnet, is working together to help expedite the 3126 MW Ministerial determination for Gas IPPs. It is in response to this initiative that this project is being proposed.

South Africa is a country with an economy dependent on coal for the majority of its electricity, an energy-intensive industrial sector and an energy sector responsible for 82% of total GHG emissions, making it the 12th highest world emitter of GHG[34]. Adding to the challenge is the need to address energy poverty, which manifests in the lack of access to affordable, adequate, reliable, safe and environmentally benign energy services. At the same time, economic growth is needed for development, in order to create employment. Traditionally economic growth has implied the increased use of finite resources and increased energy use. However, energy also has the potential to act as an engine of inclusive and sustainable growth. This is why moving towards a sustainable and low-carbon approach is a priority, and tracking energy consumption is essential to map the transition to a lower carbon future. In this regard, the Intergovernmental Panel on Climate

[34] Greenhouse Gas Inventory for South Africa: 2000-2010

Change (IPCC) fifth assessment report identified cities as being major players in reducing global emissions.

The South African Government recognises the need to diversify the mix of energy generation technologies within the country and to reduce the country's reliance on fossil fuels which contribute towards climate change and are therefore not environmentally friendly. This is in accordance with the prescriptions of the United Nations Convention on Climate Change 1994 (UNFCCC) and its associated Kyoto protocol of 1997. South Africa has put in place a long term mitigation scenario (LTMS) by which the country aims to develop a plan of action which is economically viable and internationally aligned to the world effort on climate change. During this period (2003-2050) South Africa will aim to take action to mitigate greenhouse gas emissions by 30% - 40% by the year 2050. This is a reduction of between 9 000 and 17 500 tons of CO_2 by 2050. Consequently, the South African Government has recognised the need to move towards cleaner energy and has therefore set targets for cleaner energy technologies (including gas-generated energy) by 2030 (IRP, 2011).

In December 2015, the Paris Agreement was launched, with a long-term objective of the agreement to make sure global warming stays "well below" 2 degrees Celsius (3.6 degrees Fahrenheit) and to "pursue efforts" to limit the temperature rise to 1.5 degrees Celsius (2.7 degrees Fahrenheit). In order to reach the long-term goal, countries, including South Africa, agreed to set national targets for reducing greenhouse gas emissions every five (5) years. Only developed countries are expected to cut their emissions in absolute terms; developing nations (such as South Africa) are encouraged to do so as their capabilities evolve over time. Until then, they are expected only to rein in the growth of emissions as their economies develop. The proposed gas to power plant will assist in reducing the country's CO_2 emissions associated with energy supply relative to other fossil fuels (e.g. coal). From a climate change perspective, the benefits arising from the use of natural gas as a source of energy instead of coal include:

» Reduced carbon dioxide emissions relative to equivalent energy from other fossil fuels;
» Lower particulate emissions relative to coal;
» High energy efficiency in combined-cycle applications;
» Negligible sulphur content in regional deposits; and
» Gas-fired generation plants require less space than conventional coal-fired plants of the same capacity[35].

8.4. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the facility and associated

[35] White Paper on Energy Policy, 1998

infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the impacts associated with the development of the Ilanga CSP 5 facility can be managed and mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

The following mitigation measures provided in the EIA Report and associated specialist reports are recommended:

» Following the final design of the facility, a revised layout must be submitted to DEA for review and approval prior to commencing with construction.
» An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMPr for the duration of the construction period.
» All mitigation measures detailed within this report and the specialist reports contained within Appendices **F - I** to be implemented.
» The draft Environmental Management Programme (EMPr) as contained within **Appendix I** of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed solar energy facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project.
» Undertake plant rescue and translocation prior to any clearing/ disturbance of the site occurring, in line with the requirements and recommendations of the Plant Rescue Translocation and Protection Plan.
» Where access is required to areas surrounding the development site, a 2m buffer may be used for access. Where possible, cut vegetation to ground-level rather than removing it completely, leaving root systems intact to ensure rapid re-colonization in areas that are not to be permanently hardened.
» Vegetation clearing should ideally proceed mainly during the dry, winter months where possible in order to minimise the risk of soil erosion linked to high stormwater runoff rates.
» Vegetation/soil clearing activities must only be undertaken during agreed working (negotiated between the contractor and landowner) times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.
» Schedule vegetation clearing such that this is completed immediately before construction in an area to avoid prolonged exposure of the soil to weather elements.
» All vehicles accessing the site should adhere to a low speed limit (30km/h is recommended) to avoid collisions with susceptible species such as reptiles (snakes and lizards).

- Limit construction activities, site camps and equipment lay-down areas to disturbed areas within the development footprint and alongside the existing Tata steel north perimeter fence firebreak to the south of the site. No construction camps, etc. to be located within natural grassland areas in areas adjacent to the development site.
- An appropriate SUDS (Sustainable Urban Drainage System) should be implemented, characterized by a combination of open, grass-lined channels/swales and stone-filled infiltration ditches that will encourage infiltration across the site, provide for the filtration and removal of pollutants and provide for some degree of flow attenuation by reducing the energy and velocity of storm water flows.
- Semi-pervious materials must be used for roads that allow for some infiltration rather than using totally impermeable tarred road surfaces, as this will assist with reducing storm water runoff.
- Implement traffic control measures to limit vehicle-entrained dust from unpaved roads by limiting vehicle speeds (i.e. 30km/h) and by restricting traffic volumes.
- Limit access to construction site to construction vehicles only.
- Loading and unloading bulk construction material should be in areas protected from the wind or carried out in calm conditions.
- Loads on vehicles carrying dusty construction materials should be covered.
- Vehicles carrying dusty materials should be cleaned before leaving the site.
- Unpaved road surfaces should be sprayed with a surfactant to ensure high moisture content which will bind the silt or maintain high moisture content on exposed surfaces and roads by spraying with water.
- Stabilise open areas with dust palliative, gravel or similar.
- If NO_X mitigation strategies are implemented at the proposed gas to power plant, this will result in significantly lower NO_2 concentrations during the operational phase. However, this is not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current NO_2 levels are already low and compliant with the NAAQS.
- Impacts from SO_2 emissions can be further reduced by decreasing the sulphur content of the diesel fuel. However, this is also not necessary since the modelling results have demonstrated that the resultant ambient concentrations at the current SO_2 levels are already low and compliant with the NAAQS.
- The EPC contractor should appoint a designated staff member to assist with the management of social impacts and to deal with any community issues.
- In terms of employment related impacts, it is important to consider that job opportunities for the unskilled and semi-skilled in the study area could create competition among the local unemployed. Introducing an outside workforce will therefore most likely worsen local endeavours to obtain jobs and provoke discontent as well as put pressure on the local services available. It is imperative that local labour be sourced, wherever possible, to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the construction activities where possible. Local procurement of labour and services/products would greatly benefit the community during the construction and operational phases of the project.

- Local procurement of services and equipment where possible in order to enhance the multiplier effect. This would serve to mitigate other subsequent negative impacts such as those associated with the inflow of outsiders to the area, the increased pressure on the infrastructure and services in the area, as well as the safety and security concerns.
- Involve the community in the process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).
- Implement mitigation measures to reduce and avoid negative impacts.
- It is important that the mitigation measures relating to traffic impacts (daily living and movement patterns) as detailed within the SIA (**Appendix F**) are implemented to reduce the negative impacts.
- Obtain all other required environmental permits for the project.

REFERENCES CHAPTER 9

Armstrong, A.J., 2001. Conservation status of herpetofauna endemic to KwaZulu-Natal. African Journal of Herpetology 50(2): 79-96.

ATSDR, 2007. Toxicological profile for benzene. US Department of Health and Human Services, Agency for Toxic Substances and Disease Registry, USA.

Aucamp, I.C., Woodbourne, S., Perold, J.J., Bron, A. and Aucamp, S.-M. 2011. Looking beyond social impact assessment to social sustainability. In Vanclay, F. and Esteves, A.-M. New Directions for Social Impact Assessments, Cheltenham, UK: Edward Elgar.

Bromilow, C., 2010. Problem Plants and Alien Weeds of South Africa. Third Edition. Briza Publications, Pretoria, South Africa.

Business and Biodiversity Offsets Programme (BBOP), 2012. Biodiversity Offset Design Handbook-Updated. BBOP, Washington, D.C

CCINFO, 1998. The Canadian Centre for Occupational Health and Safety database. http://ccinfoweb.ccohs.ca visited on 21 July 2003.

Census 2011 Community Profiles Database. Statistics South Africa.

Chittenden, H. 2009. Robert's Bird Guide: A comprehensive field guide to over 950 bird species in southern Africa.

CSIE, DME and Eskom. 2001. South African Renewable Energy Resource Database. Available from: www.csir.co.za/environmentek/sarerd/contact.html

CSIR (Council for Scientific and Industrial Research). 2010. National Freshwater Ecosystem Priority Areas (NFEPA). Council for Scientific and Industrial Research, Pretoria, South Africa.

DEA, 2009. National Ambient Air Quality Standards, Government Gazette, 32861, Vol. 1210, 24 December 2009.

DEA, 2012a. National Ambient Air Quality Standard for Particulate Matter of Aerodynamic Diameter less than 2.5 micometers, Notice 486, 29 June 2012, Government Gazette, 35463.

DEA, 2014. Regulations regarding air dispersion modelling, Notice 533, Government Gazette, 37804, 11 July 2014.

DEA, 2016. Regulation prescribing the Atmospheric Emission Licensing processing fee, Notice 250, Government Gazette, 39805, 11 March 2016.

DEAT, 2004. Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Department of Environmental Affairs and Tourism (DEAT), Pretoria.

DEAT (Department of Environmental Affairs and Tourism), 1998. Guideline Document on EIA Regulations of Environmental Affairs and Tourism.

EAE, 2006. Encyclopaedia of the Atmospheric Environment, 2006, Nitrogen [Online], http://www.ace.mmu.ac.uk/eae/Air_Quality/Older/Nitrogen_Dioxide.html

EKZNW (Ezemvelo KwaZulu-Natal Wildlife), (2009). Norms and Standards for Biodiversity Offsets: KwaZulu-Natal Province, South Africa.

EKZNW (Ezemvelo KwaZulu-Natal Wildlife), (2009). Norms and standards for Biodiversity Offsets: KwaZulu-Natal Province, South Africa.

EKZNW (Ezemvelo KwaZulu-Natal Wildlife), (2011). Biodiversity Impact Assessment Handbook for KwaZulu-Natal. Version 1.0, Final Draft, June 2011. EKZNW IEM Section.

EKZNW (2010) Terrestrial Systematic Conservation Plan: Minimum Selection Surface (MINSET). Unpublished GIS Coverage [tscp_minset_dist_2010_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.

Elliott, F.A. & Escott, B.J., (2013). uThungulu Biodiversity Sector Plan, V1.0. Unpublished Report by Ezemvelo KZN Wildlife, Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg.

Endangered Wildlife Trust (EWT). Red Data Book of the Mammals of South Africa: A Conservation Assessment.

eThekwini Municipality, (2009). Generic EMP for Construction Activities.

Environmental Management Framework (EMF) Report for Richards Bay Port Expansion Area and Industrial Development Zone (IDZ) (2011)

Environmental Resources Management (ERM) (2015). Independent Power Producers Programme: EIA for a Floating Power Plant, Port of Richards Bay. Draft Scoping Report. November 2015.

Franke. V. & Guidero. A., 2012: Engaging local stakeholder: A Conceptual Model for Effective Donor- Community Collaboration. Institute for Homeland Security Solutions.

Frith, A. 2011. Mapping South Africa with dot distribution: Census 2011. Available from: http://dotmap.adrianfrith.com/

FutureWorks, 2007. Umhlatuze Ecosystem Services Management Plan. Draft 2 for external Review. December, 2007.

Green Economy Strategy for KwaZulu Natal Province, 2012.

Hurley, P. 2000. Verification of TAPM meteorological predictions in the Melbourne region for a winter and summer month. Australian Meteorological Magazine, 49, 97-107.

Hurley, P.J., Blockley, A. and Rayner, K. 2001. Verification of a prognostic meteorological and air pollution model for year-long predictions in the Kwinana industrial region of Western Australia. Atmospheric Environment, 35(10), 1871-1880.

Hurley, P.J., Physick, W.L. and Ashok, K.L. 2002. The Air Pollution Model (TAPM) Version 2, Part 21: summary of some verification studies, CSIRO Atmospheric Research Technical Paper No. 57, 46 p.

IFC, 2007. Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets. International Finance Corporation: Washington.

Interorganizational Committee on Principles and Guidelines for Social Impact Assessment. US Principles and Guidelines – Principals and guidelines for social impact assessment in the USA. Impact Assessment and Project Appraisal, 21(3): 231-250.

IUCN 2012. IUCN Red List of Threatened Species. Version 2012.1. <www.iucnredlist.org>. Downloaded on 12 December 2015.

IUCN, 2012. IUCN Guidelines for Reintroductions and other Conservation Translocations. IUCN Species Survival Commission (SOC). August 2012. Obtained online: http://www.issg.org/pdf/publications/translocation-guidelines-2012.pdf

Jewitt, D. 2011. Conservation Targets and Status for Vegetation Types in KZN. Ezemvelo KwaZulu-Natal Wildlife: Biodiversity Conservation Planning Division, Pietermaritzburg,

South Africa. October 2011.

Kleynhans, C.J., Thirion, C. and Moolman, J., (2005). A Level I River Ecoregion classification System for South Africa, Lesotho and Swaziland. Report No. N/0000/00/REQ0104. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria, South Africa.

KZN Department of Economic Development and Tourism Strategic Plan 2013/14- 2017/18

KZN Provincial Growth and Development Strategy (PGDS), 2011

KZN Provincial Growth and Development Strategy (PGDS) 2011-2030 (Version 29.2-September 2013)

KwaZulu Natal Provincial Spatial Development Framework (PSDF)

Lawrence, D.P., 2007. Impact significance determination - Designing an approach. Environmental Impact Assessment Review 27 (2007) 730 - 754.

Le Roux, SD, (1993). Bioclimatic groups of Natal, in Parsons, MJ (ed), Maize in Natal: Agricultural production guidelines for Natal, Cedara Agricultural Development Institute, Pietermaritzburg, South Africa.

Marais, J., 2004. A complete guide to the snakes of Southern Africa. Second edition. Struik Publishers, Cape Town, South Africa.

Mucina, L. and Rutherford, M.C. (eds) (2006) The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19, South African National Biodiversity Institute, Pretoria.

National Climate Change Response Green Paper (DEA, 2010)

National Development Agency (NDA). (2014). Beyond 10 years of unlocking potential. Available from: http://www.nda.org.za/?option=3&id=1&com_id=198 &parent_id=186&com_task=1

National Energy Act (2008)

National Environmental Management Act 107 of 1998 (NEMA)

National Development Plan (2030)

National Integrated Resource Plan South Africa (2010-2030)

NEMAI Consulting, September 2014. Richards Bay Industrial Development Zone Phase 1F – Installation of Bulk Infrastructure Services, Richards Bay, KwaZulu Natal: Draft Scoping Report.

NEMAI Consulting, September 2015. Richards Bay Industrial Development Zone Phase 1F - Environmental Impact Assessment Report.

O' Connor and Associates, (2005). Biodiversity Study of Alton North, Richards Bay. Unpublished specialist report prepared for SRK Consulting. 22 April 2005.

Passmore, N.I. and Carruthers, V.C., (1995). South African Frogs: A complete guide. Southern Book Publishers & Witwatersrand University Press.

Pooley, E., (2005). A field guide to Wildflowers of KZN and the Eastern Region. First Edition, second impression. Natal Flora Publications Trust.

Raghunandan, A., Scott, G., Zunckel, M. and Carter, W. 2007. TAPM verification in South Africa: modelling surface meteorology at Alexander Bay and Richards Bay. South African Journal of Science.

Richards Bay Industrial Development Zone (RBIDZ), 2015. Available from: http://www.rbidz.co.za/pages/home.aspx

Robertson, M.P *et al.,* (2003). A proposed prioritization system for the management of invasive alien plants in South Africa. South African Journal of Science 99: 1-7, January/February 2003.

SANBI (South African Biodiversity Institute), (2010). Threatened Species: A guide to Red Lists and their use in conservation. Threatened Species Programme, Pretoria, South Africa. 28 pp.

Scott-Shaw, C.R and Escott, B.J. (Eds), (2011). KwaZulu-Natal Provincial Pre-Transformation Vegetation Type Map – 2011. Unpublished GIS Coverage [kznveg05v2_1_11_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.

SIVEST, 2010. Environmental Risk Assessment of Richards Bay IDZ 1A, 1B, 1C, 1D & 1F.

Southern African Bird Atlas Project. Online database: http://sabap2.adu.org.za/ Accessed 10 April 2016.

South African Weather Bureau (SAWB), 1998. Climate of South Africa, Climate Statistics up to 1990, WB40.

South African Weather Bureau (SAWB), 1992. Climate tables of South Africa, Climate Statistics, WB42.

South African LED Network (SA LED Network). (2010). Networking Practioners Developing Local Economies. Available from: http://led.co.za/

State of the Environment Report (SOER). 2005. Northern Cape Province. Department of Tourism, Environment and Conservation. CSIR Environmental.

Statistics South Africa. (2014). Education: A Roadmap out of poverty? Available from: http://beta2.statssa.gov.za/?p=2566

Strategic Infrastructure Projects (SIPs)

Stuart, C. and Stuart, T., (2007). Field guide to mammals of Southern Africa. Fourth Edition. Struik Publishers.

The Constitution Act 108 of 1996

THORN-EX, September 2010. Environmental Risk Evaluation and Guidelines for the Richards Bay Industrial Development Zone.

THORN-EX, February 2011. Richards Bay Industrial Development Zone - Water Use Licence Application: Phase 1A.

UMHLATHUZE MUNICIPALITY (2012 – 2017). uMhlathuze Municipal Integrated Development Plan.

uMhlathuze Local Municipality (ULM) Integrated Development Plan (IDP) (2012-2017)

uMhlathuze Spatial Development Framework (SDF) (2007)

uMoya-NILU, 2014. Air Quality Management Plan for the uThungulu District Municipality: Output H: Air Quality Management Plan, Report No. uMN030-2013, June 2014.

uMoya-NILU, 2015. eThekwini Municipality AQMP Review and Update: Baseline Assessment, Report Number uMN032-15, 10 December 2015, Final.

UNEP, 2002. EIA Training Resource Manual. 2nd Ed. UNEP.

US EPA, 2006: Technology Transfer Network Clearinghouse for Inventories & Emissions Factors, TANKS Emissions Estimation Software, Version 4.09D, https://www3.epa.gov/ttnchie1/software/tanks/tank4man.pd

United States Environmental Protection Agency (US EPA), 2016. Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. Chapter 3: Stationary Internal Combustion Sources. http://www.epa.gov/ttn/chief/ap42/ch03/index.html. Visited 1 December 2015.

United Nations Economic and Social Commission for Asia and the Pacific (UN). (2001). Guidelines for Stakeholders: Participation in Strategic Environmental Management. New York, NY: United Nations.

uThungulu District Municipality (UDM) Integrated Development Plan (IDP) (2012/2013-2014/2015)

uThungulu District Municipality (UDM) Spatial Development Framework (SDF) (2012)

Vanclay, F. 2003. Conceptual and methodological advances in Social Impact Assessment. In Vanclay, F. & Becker, H.A. 2003. The International Handbook for Social Impact Assessment. Cheltenham: Edward Elgar Publishing Limited.

Van Oudtshoorn, F., (2006). Guide to grasses of Southern Africa. Pretoria, South Africa.

Van Wyk, B. and Van Wyk, P. (2007). Field Guide to Trees of Southern Africa.

Van Wilgen, B.W., Forsyth, G., Le Maitre, D.C., Wannenburgh, A., Kotze, J.D.F., Van den Berg, E. and Henderson, L. 2012. An assessment of the effectiveness of a large, national-scale invasive alien plant control strategy in South Africa. Biological Conservation 148: 28–38.

WESSA KZN. (2008). Invasive Alien Plants in KwaZulu-Natal: Management and Control. Wildlife and Environment Society of South Africa, KwaZulu-Natal Region.

White Paper on Energy Policy of the Republic of South Africa (1998)

White Paper on Renewable Energy of the Republic of South Africa (2003)

WHO, 1999. Guidelines for Air Quality, World Health Organisation, http://www.who.int/peh/air/Airqualitygd.htm

WHO, 2003. Health aspects of air pollution with particulate matter, ozone and nitrogen dioxide. Report on a WHO Working Group Bonn, Germany 13-15 January 2003, WHO Geneva.

WHO, 2005. Air Quaity Guidelines, Global Update 2005 for particulate matter, ozone, nitrogen dioxide and sulfur dioxide, http://www.euro.who.int/__data/assets/pdf_file/0005/78638/E90038.pdf