Scoping and Environmental Impact Report (S&EIR)

Proposed Nseleni Independent Floating Power Plant (NIFPP) and associated infrastructure for the evacuation of power from the NIFPP to the National Grid, Port of Richards Bay, KwaZulu-Natal.

AND

Proposed Liquid Natural Gas (LNG) receiving and storage facility and associated physical infrastructure to support the Nseleni Independent Floating Power Plant, Port of Richards Bay, KwaZulu-Natal.

FINAL SCOPING REPORT

Prepared by:

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Applicants:

Nseleni Power Corporation (Pty) Ltd

AND

Anchor Energy (Pty) Ltd

Competent Authority:

Department of Environment, Forestry & Fisheries (DEFF)

Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032

Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033

DATE: 11 December 2020

SE Solutions Ref: NIFPP SEIR

Report Rev No: 02

PURPOSE OF THE DOCUMENT

The main aim of the **Scoping Process** of a Scoping and Environmental Impact Reporting (S&EIR) application process for Environmental Authorisation (EA) in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and associated 2014 Environmental Impact Assessment (EIA) Regulations, as amended, is to, through a consultative process:

- Identify the relevant policies and legislation relevant to the activity;
- Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- Identify and confirm the preferred activity and technology alternative through an identification of impacts and risks and ranking process of such impacts and risks;
- Identify and confirm the preferred site, through a detailed site selection process, which includes an identification of impacts and risks inclusive of identification of cumulative impacts and ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
- Identify the key issues to be addressed in the assessment phase;
- Agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and,
- Identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

The purpose of this **Final Scoping Report** is for submission to the Competent Authority, in this case, the Department of Environment, Forestry & Fisheries (DEFF) for consideration and approval of the Plan of Study for Environmental Impact Assessment (EIA) in order for the Scoping and Environmental Impact Report (S&EIR) application to then progress into the EIA phase. The Final Scoping Report is an updated version of the Draft Scoping Report that was subjected to a 30 calendar day commenting period from 06 November to 07 December 2020. The Final Scoping Report includes the **Comment and Response Report (CRR)** generated from all comments received by Interested and Affected Parties (I&APs) as well as Organs of State on the Draft Scoping Report. The Final Scoping Report, as submitted, is available on the SE Solutions (www.sesolutions.co.za) website. The Report can be accessed via the 'Reports' tab and is entitled '*NIFPP Final Scoping Report*'.

Should I&APs and/or State Departments wish to comment on the Final Scoping Report, all comments are to be submitted directly to the DEFF Case Officer (remember to always quote the DEFF Ref Numbers, which are: Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033 and Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032) and copied to SE Solutions.

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DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)	
COMPANY NAME	Sustainable Environmental Solutions (Pty) Ltd – trading as SE Solutions
BRIEF COMPANY PROFILE	The establishment of SE Solutions was premised on both an interest and belief in the concept of environmental sustainability and making this a reality in South Africa, and other countries where the company works. The company strives to live up to its name of developing solutions for sustainability problems and challenges and most importantly prides itself in tailoring solutions rather than trying to implement standard approaches, regardless of the problem. To give a brief background to some of the larger projects SE Solutions has been involved in, the following examples are listed. SE Solutions was appointed by Bombela to recover a failing EIA process on the Gautrain Rapid Rail Link Project. SE Solutions was appointed by Sasol to coordinate and manage the Mafutha Environmental Assessment Programme in the Lephalale area, a programme consisting of four large scale EIAs (for a Coal-to-Liquids plant, a mine, a services corridor and a proposed town), all required for the possible establishment of a new industrial complex akin to Sasol's operations in Secunda. SE Solutions has a long history of developing environmental management programmes and systems mostly for large scale construction projects, such as the Hillside smelter in Richards Bay, the Mozal smelter Project, the Gautrain Rapid Rail Link Project and various projects for TCTA. SE Solutions has also played a leadership role on the Acid Mine Drainage Project on the Western, Central and Eastern Witwatersrand Basins. This combined experience has been used to develop a sustainable environmental management system model, which has been further developed into an electronic web based system called 'SustEMS' (Sustainable Environmental Management Systems). The company continues to work in Eastern Europe on large scale environmental assessment projects to satisfy international lender requirements.
EAP's RESPONSIBLE FOR THIS REPORT & THEIR EXPERTISE	**Sean O'Beirne:** Highest Qualification: Master's in Radar rainfall measurement - Wits University, South Africa. Years' Experience as an EAP: 27 years Summary of expertise (refer to detailed Curriculum Vitae in Appendix 1): • Certified Environmental Assessment Practitioner in South Africa • Experienced in the design and implementation of Environmental Management Systems for ISO 14001 Certification and post EIA Environmental Management Programmes • Experienced in Equator Principles and International Lender Requirements • Experienced in managing large multi-disciplinary project teams for various types of environmental assessments • Undertaken numerous EIAs and Strategic Environmental Assessments • Experienced in training and skills transfer within the Environmental Management field **Vici Napier:** Highest Qualification: Master's in Conservation Biology - University of Cape Town, South Africa. Years' Experience as an EAP: 16 years Summary of expertise (refer to detailed Curriculum Vitae in Appendix 1): • Registered Professional Natural Scientist with SACNASP (Reg No. 400215/09). • Experienced in managing large multi-disciplinary project teams for various types of environmental assessments • Undertaken numerous EIAs and Strategic Environmental Assessments (SEAs) • Undertaken numerous Water Use License Applications (WULAs) and other environmental authorisation application processes • Experienced in training and skills transfer within the Environmental Management field

EXECUTIVE SUMMARY

Nseleni Power Corporation (Pty) Ltd (DEFF Ref No. 14/12/16/3/3/2/2032) is proposing to establish a floating gas powered power station made up of floating Combined Cycle Gas Turbine (CCGT) power plants (known as the Nseleni Independent Floating Power Plant (NFIPP)) and associated infrastructure for the evacuation of power from the NIFPP to the National Grid, in the Port of Richards Bay. The project is being proposed within the context of continued power shortages in South Africa which has seen the country's reserve margin under severe pressure and continued load shedding as a result of constrained generation potential. Richards Bay offers a deep water harbor and relatively easy access to high voltage power transmission infrastructure that can be used to transmit the power to where it is needed as a function of the transmission grid.

It is planned to initially ship in four (4) Floating Power Barges generating a nominal 700 MW per barge resulting in 2 800 MW generation capacity. Thereafter, additional barges would be shipped in to take the combined power generation potential to as much as 8 400 MW. The power plants themselves would be CCGT providing high generation efficiencies. The gas turbines have low NOx burners and selective catalytic reduction (SCR) to control NOx emissions and three stage filtration to remove respirable Particulate Matter (PM). At the same time LNG is a clean burning fuel with relatively low PM loads. Power would be evacuated to a newly constructed land-based substation and switching yard and from there into the National Grid.

Anchor Energy (Pty) Ltd (DEFF Ref No. 14/12/16/3/3/2/2033) will construct all physical infrastructure within the Port of Richards Bay associated with the receiving and storage of gas, delivered to the NIFPP as Liquid Natural Gas (LNG) and likely sourced from Angola, as well as associated infrastructure to support the NIFPP. The physical infrastructure would consist of a series of jetties with concrete platforms on marine piles and would be made up of offloading berths, LNG Floating Storage Units (FSUs), LNG storage tanks, regasification facilities and a series of berths for the NIFPP. Some dredging would be required to create sufficient draft for the LNG supply vessels and the NIFPP floating power barges.

Some 220 000 tonne of LNG would need to be delivered monthly to the NIFPP and would be offloaded from supply vessels into FSUs connected to the LNG terminal. LNG must be regasified (converted from a liquid to a gas) before it can be combusted and it is planned to optimize the heat balance using waste heat from the NIFPP CCGT power plants for the regasification. Safety is paramount and there would be multiple features to ensure the safe transfer, regasification storage and ultimately combustion of the LNG. All the facilities would be protected from fire using CO_2 as an extinguisher, automatic cutoff valves should a transfer line fail and multiple sensors to provide early indications of fire risk.

The project (as a whole) would invoke a range of listed activities from Listing Notices 1, 2 and 3 of the Environmental Impact Assessment (EIA) Regulations requiring a Scoping and Environmental Impact Reporting (S&EIR) application process for Environmental Authorisation (EA). As there are two entities responsibility for different project components (as described above), two separate EIA Applications have been submitted in order to obtain separate EAs, however a single S&EIR application process is being conducted. In addition, the following additional EAs are applicable:

- **Nseleni Power Corporation (Pty) Ltd (DEFF Ref No. 14/12/16/3/3/2/2032)**
    - Atmospheric Emissions License (AEL) in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004); and,
    - Water Use License (WUL) in terms of the National Water Act, 1996 (Act No. 36 of 1996).
- **Anchor Energy (Pty) Ltd (DEFF Ref No. 14/12/16/3/3/2/2033)**
    - Dumping at Sea Permit in terms of the National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008).

The project would also need to comply with a range of other national, provincial and municipal legislation as well as development polices, plans and programmes including the District Municipality (King Cetshwayo) and Local Municipality

(City of uMhlathuze) Integrated Development Plans (IDPs) and the Environmental Management Framework (EMF) for the Richards Bay Port Expansion and Industrial Development Zone, and others. Country commitments through various international convention ratifications would also apply. Finally, but importantly the project would also need to comply with lender requirements, namely the Equator Principles and the International Finance Corporation (IFC) Performance Standards on which the Equator Principles are based.

Key elements of the receiving environment include the predominant northeasterly-southwesterly wind directions, threatened ecosystems, and the uMhlathuze Estuary which is ranked one of the ten most conservation important estuaries in South Africa. There are multiple mangrove clusters, large sub and intertidal areas to the south of the sand spit (the Kabeljou Flats), mudflats in the Bhizolo and Manzamnyama Canals and multiple wetlands. Ground and surface water forms key elements of the local ecology. Air quality is categorized as 'poor'. The area experiences many of the socio-economic development challenges faced across the Country with above national average unemployment rates. The City of uMhlathuze is an industrial city, but has seen poor growth in the manufacturing sector which has limited overall economic growth. Water supply has been problematic over the last several years in the region and must be viewed as a severe constrain to development.

As required by the EIA Regulations and good practice requirements, public participation (PP) will be a key component of the S&EIR process. The PP process will include identification of interested and affected parties from existing databases, advertising of the process and an invitation to participate, disclosure of important project information and opportunity to comment on the proposed project. Direct public engagement will occur, within the limits of current COVID-19 restrictions. All comments received and responses issued are captured within the Comment and Response Report (CRR) attached to this Final Scoping Report.

Potential environmental and social impacts have been identified using the nomenclature of activities and aspects and how these will potentially change the receiving environment. In addition, a systems depiction of the receiving environment has been developed to identify how project activities (both construction and operational) would result in potential impacts. Various project alternatives are presented for further assessment and with a view to reducing potential impacts. These alternatives include cooling, siting of marine piles and quays, disposal of dredged material, routing and type of transmission line, siting of substation and, the No-Development (no-go) option.

The following specialist appointments will be required to meet the scope of the assessment required for the impact assessment phase of the process:

Specialist Assessment	Appointed Specialist Company	Aspect to be Assessed
Air Quality Impact Assessment	Airshed Planning Professionals	Atmospheric emissions: Dust, PM, SO_2 and NO_x
Qualitative Noise Impact Statement	Airshed Planning Professionals	Noise
Terrestrial Biodiversity Assessment	GroundTruth: Water, Wetlands and Environmental Engineering	Land transformation: terrestrial fauna & flora
Wetland Delineation, Functional Assessment and Impact Assessment		Land transformation: wetlands
Heritage Impact Assessment	Heritage Contracts and Archaeological Consulting cc	Heritage & cultural resources
Quantitative Risk Assessment for Major Hazard Installations	Riscom	Waste & pollution: spillage of LNG
Socio-economic Impact Assessment	ACER Africa and Urban Econ	Social: employment; skills transfer; spending; impact on the local and regional economy
Estuarine Ecological Assessment	CRUZ Environmental & Associates	Seabed transformation
Hydrodynamic Modelling	WSP Africa	Seabed transformation/ disturbance Waste & pollutions: effluent discharge
Climate Change Impact Assessment	Climate Neutral Group	Atmospheric emissions: GHG emissions

This Final Scoping Report is an updated version of the Draft Report and addresses all comments received during the review period and/or public meetings hosted. This Final Report has been submitted to DEFF for a decision within the S&EIR application process.

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ABBREVIATIONS AND SYMBOLS

AEL	Atmospheric Emissions License
BOG	Boil-Off Gas
CCGT	Combined Cycle Gas Turbine
CD	Chart Datum
CO_2	Carbon dioxide
CO	Carbon monoxide
CO_x	Carbon oxides
CRR	Comment and Response Report
CWDP	Coastal Water Discharge Permit
DEDTEA	KZN Department of Economic Development, Tourism and Environmental Affairs
DEA	Department of Environmental Affairs (now DEFF)
DEAT	Department of Environmental Affairs and Tourism (Now DEFF)
DEFF	Department of Environment, Forestry and Fisheries (previously DEA and DEAT)
DM	District Municipality
DWA	Department of Water Affairs (now DWS)
DWS	Department of Water & Sanitation (previously DWA and DWAF)
DWAF	Department of Water Affairs and Forestry (now, DWS)
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EDS	Emergency Disconnection Systems
EFZ	Estuarine Functional Zone
EG	Embedded Generator
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Importance Sensitivity
EMF	Environmental Management Framework
EMS	Environmental Management System
EP	Equator Principles
EPFI	Equator Principles Financing Institutions
ERM	Environmental Resource Management
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
ESMP	Environmental and Social Management Plan

ESS	Emergency Shutdown Systems
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GIL	Gas-Insulated Transmission Line
GM	Grievance Mechanism
HGM	Hydrogeomorphic
HV	High Voltage
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
HRSG	Heat Recovery Steam Generator
I&AP	Interested and Affected Party
IDZ	Industrial Development Zone
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IMO	International Maritime Organization
IRP	Integrated Resource Plan
ISPS	International Ship and Port Facility Security Code
KCDM	King Cetshwayo District Municipality
kV	KiloVolt
KZN	KwaZulu-Natal
LM	Local Municipality
LNG	Liquid Natural Gas
MDGs	Millennium Development Goals
MES	Minimum Emissions Standards
MMscfd	million standard cubic feet per day
MV	Medium Voltage
MW	Mega Watt
NAAQS	National Ambient Air Quality Standard
NDP	National Development Plan
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)

NEMAQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEMWA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NFA	National Forest Act, 1998 (Act No. 84 of 1998)
NGO	Non-Governmental Association
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NEMICMA	National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008)
NFEPA	National Freshwater Ecosystem Priority Area
NO_x	Nitrogen oxides
NIFPP	Nseleni Independent Floating Power Plant
NWA	National Water Act, 1998 (Act No. 36 of 1998)
OCGT	Open Cycle Gas Turbine
PERC	Powered Emergency Release Coupler
PES	Present Ecological State
PGDS	Provincial Growth and Development Strategy
PM	Particulate Matter
PPP	Public Participation Process
PS	Performance Standard
RBCAA	Richards Bay Clean Air Association
REIPP	Renewable Energy Independent Power Producer
RSA	Republic of South Africa
SANS	South African National Standard
SCR	Selective Catalytic Reduction
SDF	Spatial Development Framework
SDGs	Sustainable Development Goals
SEA	Strategic Environmental Assessment
S&EIR	Scoping and Environmental Impact Reporting
SEMA	Specific Environmental Management Act
SO_2	Sulphur dioxide
SO_x	Sulphur oxides
SOP	Standard Operating Procedure
TNPA	Transnet National Ports Authority
ToR	Terms of Reference
tpm	tonnes per month

tph	tonnes per hour
UNFCCC	United National Framework Convention on Climate Change
V	volts
WESSA	Wildlife and Environmental Society of South Africa
WIS	Waste Information System
WMA	Water Management Area
WML	Waste Management License
WUL	Water Use License
WULA	Water Use License Application

1 INTRODUCTION

Since 2008, when demand for electricity in South Africa began to outstrip supply, requiring the introduction of load shedding, the South African economy has laboured. Multiple interventions to address the supply shortfall have not yet yielded a cessation of load-shedding and electricity supply in the country remains 'severely constrained'. At the same time the high dependence on coal as an energy source has attracted growing criticism due to greenhouse gas emissions principally but also due to other coal combustion emissions such as Particulate Matter (PM) Nitrous Oxides (NO_x) and Sulphur Oxides (SO_x). Greenhouse gas emissions contribute significantly to climate change while the other emissions have a strongly negative impact on air quality in the areas in which the coal-fired power stations operate. Apart from Kusile Power station, which is currently under construction, none of the power stations are able to comply with published Minimum Emissions Standards (MES) and have been forced to apply for postponement of the compliance time frames to enable continued legal operation. On top of all of this the generation fleet is aging and will see the decommissioning of power stations towards the end of the 2020s.

Given all of the above and without getting into the detail of the negative environmental consequences of coal mines, there is an urgent need to diversify electricity generation in making up the existing and future shortfall in supply. To some extent the shortfall and diversification has been made up through the Independent Power Producers (IPP) programme and especially the renewable energy projects but there remains a need for much more non-coal supply capacity. In 2016 the CSIR[1] published a study that showed that South Africa's entire electricity demand could be met through renewables provided that there was some baseload, which they argued could come from natural gas fired power plants. The proposed project as a whole, consisting of the Nseleni Independent Floating Power Plant (NIFPP) and associated infrastructure (Nseleni Power Corporation (Pty) Ltd (DEFF Ref No. 14/12/16/3/3/2/2032)) AND the Liquid Natural Gas (LNG) receiving and storage facility and associated physical infrastructure to support the NIFPP (Anchor Energy (Pty) Ltd (DEFF Ref No. 14/12/16/3/3/2/2033)), is a project aimed at supplying natural gas based electricity generation. It is proposed that Liquid Natural Gas (LNG) be shipped from source to the NIFPP located within the Port of Richards Bay.

The LNG vessels will dock/ moor at an LNG Terminal and off-load LNG for storage into cryogenic floating storage units "FSUs". The power generation facility will be made up of "modular" stand-alone Floating Power Barges with Combined Cycle Gas Turbines (CCGT) for the generation electricity from LNG as the fuel source. The Floating Power Barges will be docked/ moored to the Power Barge Terminal, which in turn is linked to the LNG Terminal. Each Floating Power Barge will have an associated demineralisation/ desalination plant (to provide the required process water) as well as a regasification plant to convert the LNG to gas suitable for use in the CCGT.

The project will involve a range of activities that in terms of the country's National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA) and other Specific Environmental Management Acts (SEMAs) require Environmental Authorisation (EA) before they can proceed. Sustainable Environmental Solutions (Pty) Ltd (SE Solutions), was appointed by Anchor Energy (Pty) Ltd (hereinafter referred to as the 'Applicant') as the independent Environmental Assessment Practitioner (EAP), to undertake the required application for Environmental Authorisations (EAs) for the proposed Nseleni Power Corporation (Pty) Ltd: Nseleni Independent Floating Power Plant (NIFPP) and associated infrastructure as well as the Anchor Energy (Pty) Ltd: Liquid Natural Gas (LNG) receiving and storage facility and associated physical infrastructure to support the NIFPP, Port of Richards Bay, KwaZulu-Natal, and to conduct the requisite Environmental Impact Assessment (EIA) required for that decision-making.

[1] Formal comments on the South African Integrated Resource Plan (IRP) Update Assumptions, Base Case and Observations 2016 CSIR Energy Centre Pretoria, 31 March 2017 (with small editorial updates on 6 April 2017)

2 DETAILED PROJECT OVERVIEW

2.1 LOCALITY

The study area within which the proposed project will be located is depicted in Figure 1 (refer also to Appendix 2) while the relevant property information is provide in Table 1. The project falls largely within the Port of Richards Bay, within the City of uMhlathuze Local Municipality and King Cetshwayo District Municipality.

Table 1: Cadastral properties/ farm portions per Applicant

Applicant	Cadastral Information	Surveyor General 21 digit code	Property Owner/ Custodian
Nseleni Power Corporation (Pty) Ltd	Remainder Farm 16230	N0GV00000001623000000	Transnet National Ports Authority (TNPA)
	Portion 1 of Farm 6230	N0GV00000001623000001	
	Portion 45 of Erf 5333	N0GV04210000533300045	
	Remainder Erf 5333	N0GV04210000533300000	City of uMhlathuze Local Municipality
Anchor Energy (Pty) Ltd	Remainder Farm 16230 (over water area)	N0GV00000001623000000	TNPA

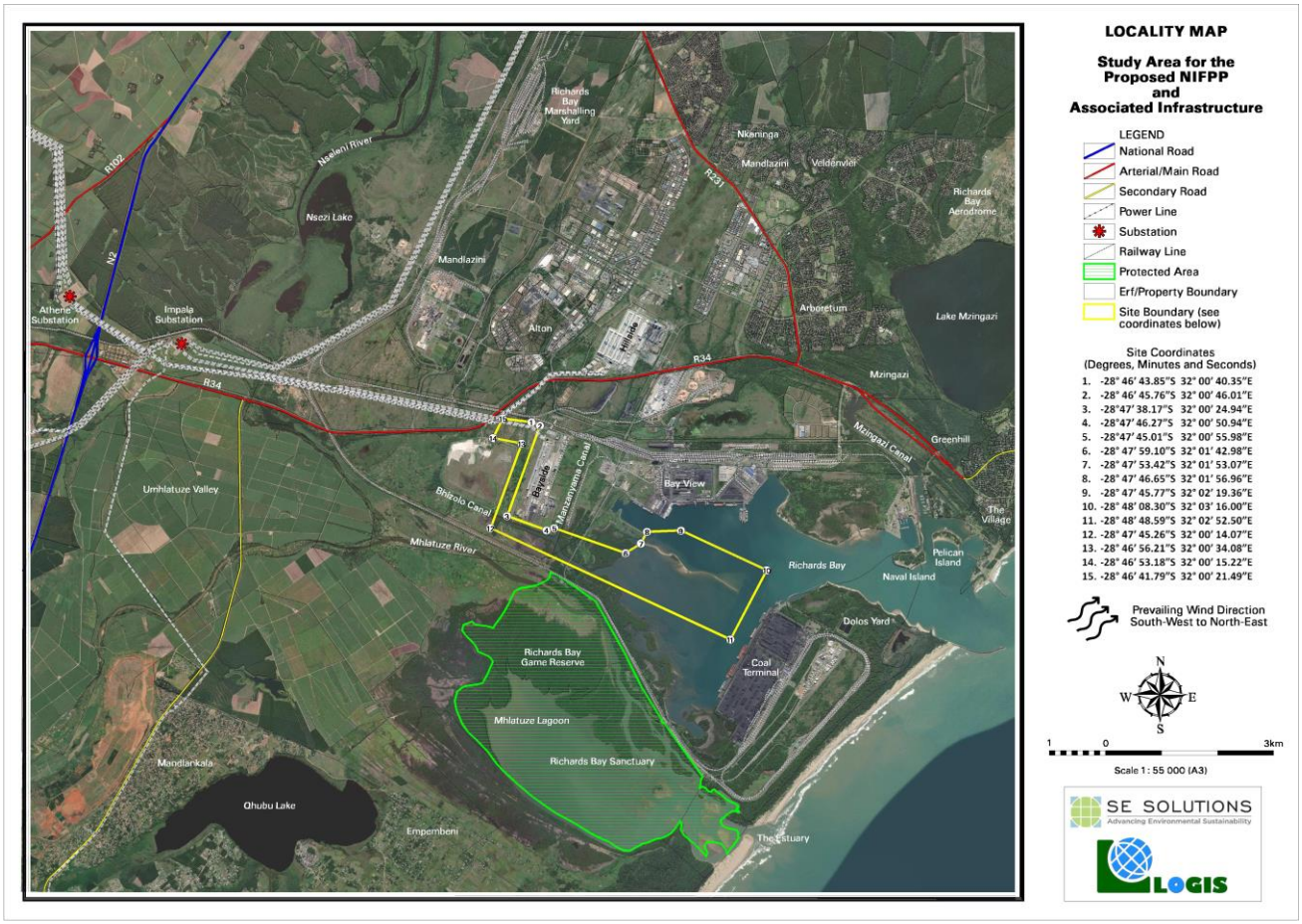


Figure 1: Locality Map for the study area within which the proposed NIFPP and associated infrastructure will be located.

2.2 SURROUNDING LAND USE

The Port of Richards Bay is managed by the Transnet National Ports Authority (TNPA); however, the "sea/estuarine" environment and bed/substrate is owned by the Minister of Environment, Forestry & Fisheries (DEFF). On land,

Remainder Erf 5333 is largely vacant and owned by the City of uMhlathuze Local Municipality, while Portion 45 of Erf 5333 and Portions 1 and Remainder of Farm 16230 are owned by the TNPA. The adjacent land parcel (Lot 6363, Alton) to the east of the proposed powerline corridor is the Bayside Aluminium smelter, owned by South32 and to the west is the Gypsum Dump, owned by Foskor (Figure 1).

Two canals that were established to drain the area used for the Bayside Aluminium Smelter exist on the eastern and southern boundaries of Bayside, the Manzamnyama and Bhizolo Canals respectively. The area to the south of the Port of Richards Bay (or Richards Bay Estuary) is known as the Richards Bay Sanctuary or uMhlathuze Estuary and includes the Richards Bay Game Reserve, a protected area.

The Port of Richards Bay, itself, contains a dry bulk terminal, a multi-purpose terminal and the privately-operated coal terminal. Other private operators within the Port include several wood chip export terminals and a bulk liquid terminal. The Port has extensive rail and conveyor belt systems servicing the berths from nearby factories and plants.

2.3 PROJECT DETAILS

The project assessed in this S&EIR process is the proposed Nseleni Independent Floating Power Plant (NIFPP) and associated infrastructure (Nseleni Power Corporation (Pty) Ltd (DEFF Ref No. 14/12/16/3/3/2/2032)) AND the Liquid Natural Gas (LNG) receiving and storage facility and associated physical infrastructure to support the NIFPP (Anchor Energy (Pty) Ltd (DEFF Ref No. 14/12/16/3/3/2/2033)) to be located (predominantly) within the Port of Richards Bay. The NIFPP will make use of Combined Cycle Gas Turbine (CCGT) technology fuelled by Liquid Natural Gas (LNG) (Box 1) supplied by Anchor Energy (Pty) Ltd. The NIFPP would be made up of a series of individual floating power plants each of which would be capable of generating nominal 700 MW. It is proposed to phase the NIFPP, gradually bringing in the power plants to create a combined generation capacity of 2 800 MW. Subsequent phases may take the combined power generation to 8 400 MW.

Box 1: What is Liquid Natural Gas (LNG)?

Natural gas is the cleanest fossil fuel and a highly efficient form of energy. Natural gas consists almost entirely of methane (CH_4), the simplest hydrocarbon compound, and differs from synthetic gas, which tends to be hydrogen rich. When methane is burned completely, the principal products of combustion are carbon dioxide and water vapour. Typically, LNG is 85 to 95-plus percent methane, along with a few percent ethane, even less propane and butane, and trace amounts of nitrogen. The exact composition of natural gas varies according to its source and processing history. Like methane, natural gas is odourless, colourless, noncorrosive, and nontoxic.

In order to transport natural gas, techniques have been developed to cool natural gas to minus 160° C at atmospheric pressure which serves to condense the gas into a liquid that is 1/600th of the original gas volume. The Liquid Natural Gas (LNG) can then be transported in purpose built cryogenic (very low temperature) containers that retain the natural gas in liquid form. For the gas to be useable as a fuel, it must be heated to return it to a gaseous form.

2.3.1 LNG SUPPLY AND TRANSPORTATION TO THE NIFPP

LNG supply and transportation to the NIFPP is the responsibility of Anchor Energy (Pty) Ltd [14/12/16/3/3/2/2033]. Bulk LNG will be transported from source, possibly AngolaLNG's plant at Soyo, by means of dedicated LNG vessels that are sized for the NIFPP's requirements and capable of entering the Port of Richards Bay. It is envisaged that the off-take demand for the NIFPP 700 MW floating power barge modules will be in the order of 7000 tonne per day per power barge. Based upon an initial 4 power barges, the monthly supply will be of the order of 220 000 tonne of LNG, which will necessitate a 100 000 tonne supply vessel every other week. The LNG delivery vessels would "dock/ moor" to the LNG Floating Storage Units (FSUs – i.e. permanently moored LNG vessels acting as LNG storage units).

A typical operating procedure for an LNG vessel, upon arrival at a Port, is as follows:

- Tugboats usually accompany the LNG vessel after embarkation of the pilot;
- An additional tugboat may be in attendance to provide assistance, as necessary, and remain for the rest of the transit;
- During the turning manoeuvres, the tugboats will normally control the vessel. When the manoeuvre is complete, tugboats provide assistance in aligning the vessel for a parallel approach and controlled speed for landing on the LNG Terminal docking fenders or FSU;
- The tugboats will normally hold the LNG vessel alongside until secured to the LNG FSU (Figure 2); and,
- Once docked, the LNG vessel will be connected with the receiving terminal via purpose designed Cryogenic articulated unloading arms or flexible cryogenic hoses in the case of an FSU.

The LNG in the vessel will be unloaded to the FSU (via flexible cryogenic hoses - Figure 2), which in turn supplies the on-quay LNG bulk storage tanks at the design rate for the system using the LNG vessels' own pumps. The discharge of LNG from the vessel to the FSU will be a continuous process until all cargo has been off-loaded. During the discharge operation, ballast water will be taken on-board (in accordance with standard maritime practice) from the surrounding water into the double hull compartments to compensate for cargo discharge.

Figure 2: LNG transfer between LNG carrier and FSU via flexible cryogenic hoses.

Each LNG vessel will be compared against predetermined acceptance criteria, before being approved for LNG transfer from ship to tankship (FSUs). In addition, the requirements of the vessels security plan shall be implemented consistent with the "International Ship and Port Facility Security Code". Once moored, staff will complete various safety checks and unloading operations will not commence until the Ship to Quay (shore) or the Ship to Ship Safety Checklist included in the "International Guide for Oil Tankers and Terminals" and "Ship to Shore Transfer" has been completed satisfactorily.

2.3.2 LNG TERMINAL

The interface between the LNG FSU and the NIFPP is known as the LNG Terminal (Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033). The LNG terminal consists of a series of mooring and berthing dolphins with a central offloading (docking/mooring station) platform (Figure 3). Access to the various dolphins is provided by lightweight steel walkways. A typical LNG docking/ mooring station consists of four berthing dolphins and between four and six mooring dolphins. The offloading platform supports the LNG cryogenic offloading arms, which connects the vessel/ FSU manifolds to the onshore piping (Figure 4). The offloading platform is connected to the other infrastructure via an elevated access road

(i.e. on marine piles). This road is to provide maintenance access to the offloading platforms (i.e. docking/ mooring stations). A separate pipe support bridge runs alongside the roadway to support the LNG pipeline distribution network. The cryogenic unloading arms compensate for vessel movement during the LNG unloading process. They are also fitted with break-away couplings that seals both sides of the connection, in case of failure of the mooring lines. The maximum anticipated LNG vessel calling at the terminal has a draft of approximately 12m. The berthing area (at the docking/ mooring station) will therefore be dredged to provide a minimum depth of -13.5m at extreme low tides.

The docking/ mooring station or platform also houses the fire protection equipment (i.e. foam, dry powder and firewater monitors/ systems that provide adequate safety coverage). The fire-fighting systems include high expansion foam monitors over a defined spill basin, which are actuated automatically in the event of a fire. A control room overlooks the docking and transfer station and all monitoring of the LNG vessel berthing and operation of the gangway and loading arms is performed from this control room (Figure 6). All vessel-quay interface electronic equipment is located in this room, including a meteorological monitoring system.

Figure 3: Left: Typical multiple piled concrete and steel quay; Right: Schematic design of the LNG Terminal capable of accommodating two LNG FSUs and/or vessels at the same time.

Figure 4: LNG vessel docking/ mooring station complete with LNG cryogenic unloading arms located on the LNG Terminal.

Figure 5: LNG FSU permanently moored/ berthed to the LNG Terminal's docking/ mooring station (offloading platform).

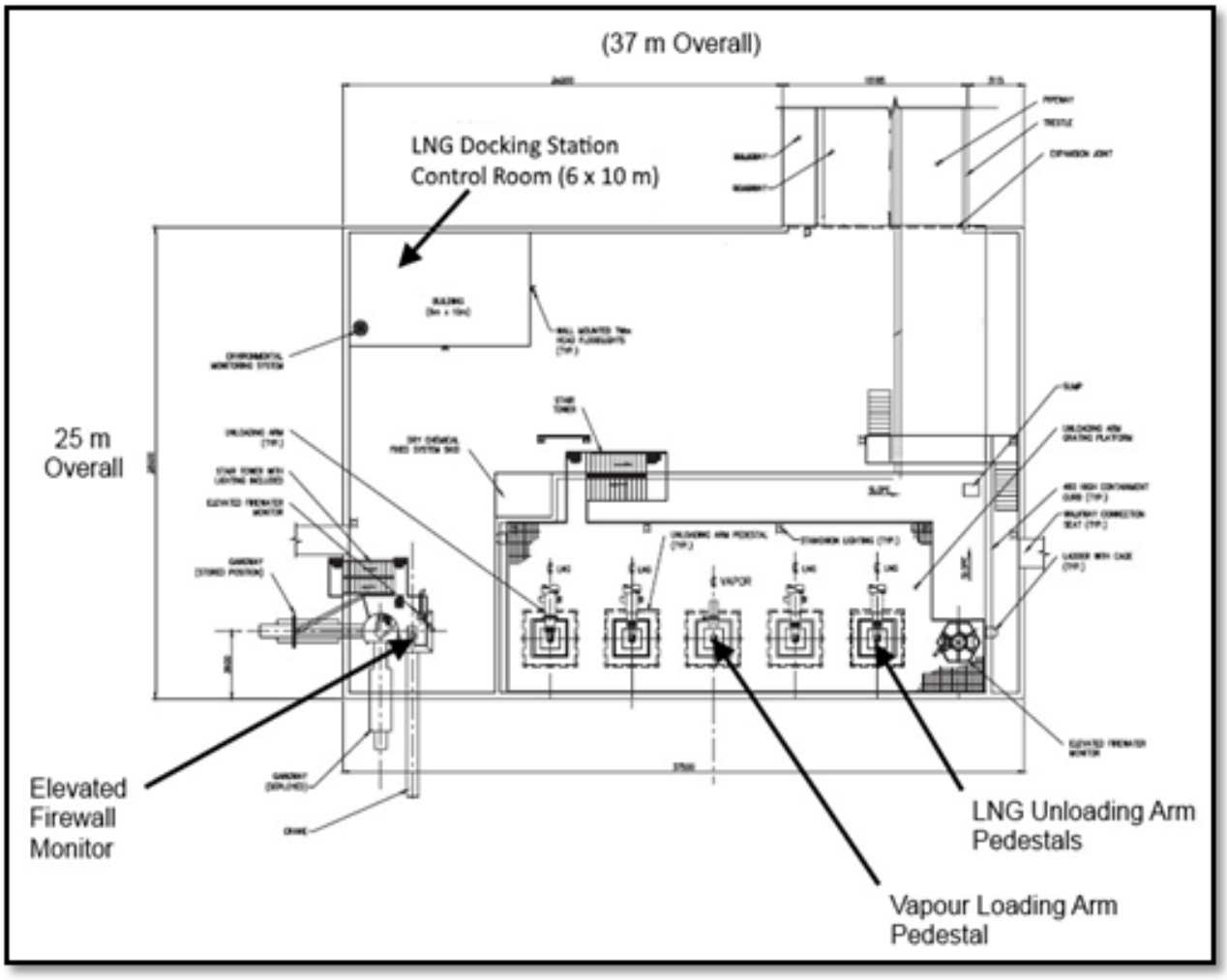


Figure 6: Top view of a typical docking/ mooring station.

The LNG terminal will normally have two main modes of operation:

1. Ship to ship Transfer – This mode of operation is the period during which the ocean going LNG vessel is moored alongside the FSU at the LG terminal, is connected to the FSU by means of flexible cryogenic hoses and transfer of LNG takes place from the LNG vessel to the FSU until such time that the entire cargo of LNG has been transferred across into the FSU. During this process, the pumps on the LNG vessel are used to effect the transfer

of LNG. At the end of unloading, pressurised nitrogen gas will be used to purge the transfer system of LNG and any residual gas prior to disconnecting.

During cargo discharge the vapour pressure in the LNG vessel tanks will be maintained by returning vapour from the FSUs to the LNG tanker. By operating a balanced system, under normal circumstances, hydrocarbons will not be released to the atmosphere, nor will a flammable gas situation arise on-board the LNG vessel or the FSU.

2. Ship to jetty discharge. This mode of operation refers to the period when transfer of LNG from the FSU to the on jetty vertical bulk cryogenic tanks associated with the regasification system connected to each power barge occurs. LNG is transferred from the FSU using the FSUs main pumps by means of specially designed articulating cryogenic arms into vacuum insulated piping connected to the on jetty storage. During this period, cryogenic conditions are maintained in the unloading and circulation system. In order to maintain these conditions, LNG will be circulated via the unloading line to the docking/ mooring station and back to the on-quay LNG bulk storage tanks via the re-circulation line.

The following activities would be carried out on the LNG Terminal

- Receiving and mooring of the LNG Tanker;
- Operation of the LNG unloading and storage;
- Operation of waste and wastewater management systems;
- Management of security;
- Management of traffic to and from the LNG facilities site;
- Dealing with unplanned events, for example, the late arrival of a LNG vessel, interruptions to gas supply or an accident in the production sequence;
- Maintenance of the asset;
- Statutory inspection and turnaround activities;
- Corrosion management of the pipeline(s); and,
- Management of the ship to shore interface in accordance with the agreed division of responsibilities between the Transnet National Ports Authority (TNPA) and the LNG operator.

Operating facilities would include:

- Dockside/ quay berthing including LNG unloading arms;
- LNG containment in cryogenic vertical tanks;
- Low and high pressure pumping systems;
- Vapour and Boil-Off Gas (BOG) systems;
- Vents (low and high pressure);
- Maintenance Workshops;
- Administration Buildings;
- Guard Houses;
- Utility Areas; and,
- Control Room.

The LNG Terminal will be designed and operated generally in accordance with the European Standard EN 1473: Installation and Equipment for Liquefied Natural Gas: Design of Onshore Installations. Major Design Codes include:

- LNG Terminals: EN 1473
- LNG Tanks: BS 7777 – 2 – 1993
- LNG Carriers: IGC / OCIMF / SIGTTO / Class
- LNG Gas Pipelines: ASME B31.8, IGE / TD / 1, DNV 81
- LNG Installation and Equipment: EN 1160
- LNG Production and Storage: NFPA 59A

2.3.2.1 Operational Site Drainage

Stationary equipment that could release hydrocarbons and which are not located in a curbed/ bunded areas will be installed on skids containing drain pans (e.g. equipment located on the LNG Terminal). A drain system will collect spills and rainwater from all equipment skids and other areas (i.e. the entire LNG Terminal or Jetty will essentially be a bunded facility). Potentially contaminated stormwater will be collected in an oily water sump and pumped to a Corrugated Plate Interceptor type oily water separator unit for separation. Clean water (monitored for oil content and meeting Port discharge quality standards) will be discharged into the Port environment. Oil and hydrocarbons will be removed and sent to the reclaiming facility located within the Richards Bay Industrial Zone.

Should a hydrocarbon spill occur from mobile equipment fuel, oil or hydraulic hoses, prompt spill clean-up will occur using strategically placed spill clean-up equipment on the LNG Terminal. Engine wastes, such as lube oil, hydraulic fluid and engine coolant shall be transferred to a waste treatment facility for reclaiming or disposal. Solid wastes shall be sent to a proper disposal location as designated by the Port Authorities.

2.3.3 POWER BARGE TERMINAL

The proposed power barge terminal (Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033) comprises a series of power barge jetties/ quays approximately 200m x 40m in dimension (Figure 7). Each jetty supports two NIFPP power barges (Figure 7). The jetties are constructed using steel pile foundations and a concrete deck. The purpose of the jetty is to provide safe mooring to the power barges as well as foundations for the barge support equipment, such as LNG storage and regasification, chillers, piped connections and power connections. An elevated roadway and pipe support trestles connect the power barge jetties to the other infrastructure (Figure 7). Pre-fabricated 250-300m^3 vertical cryogenic LNG bulk storage tanks (Figure 8) will be located on the quay adjacent to each NIFPP Floating Power Barge and connected via a network of cryogenic pipelines (maximum distance of 1 000m to minimise the amount of boil-off gas (BOG) (see Box 2) produced during the transfer operation) to the docking/ mooring stations (offloading platforms) located on the LNG Terminal.

Box 2: Boil-off Gas (BOG)
LNG is stored and transported in tanks as a cryogenic (very low temperature) liquid. LNG continuously evaporates generating Boil-Off-Gas (BOG), so named due to the LNG exceeding its boiling point (and converting from liquid to gas). Unless managed BOG can become dangerous because it increases the pressure in the storage tank.

2.3.3.1 Supply Vessel Quay and General Services Area

A supply vessel quay is located centrally on the power barge terminal (Figure 7) as well as a general operational and maintenance supply area behind the quay wall. The area will be constructed using a precast concrete system supported by steel piles. The purpose of the quay and supply area is to allow for the transfer of personnel to and from the facility, the delivery of parts and consumables to the facility as well as to provide canteen services, ablutions, offices and control centres required during operations. The area will also be utilised for low voltage (400V) power generation to support critical operations such as power for lighting and firefighting equipment in the event of grid power outages.

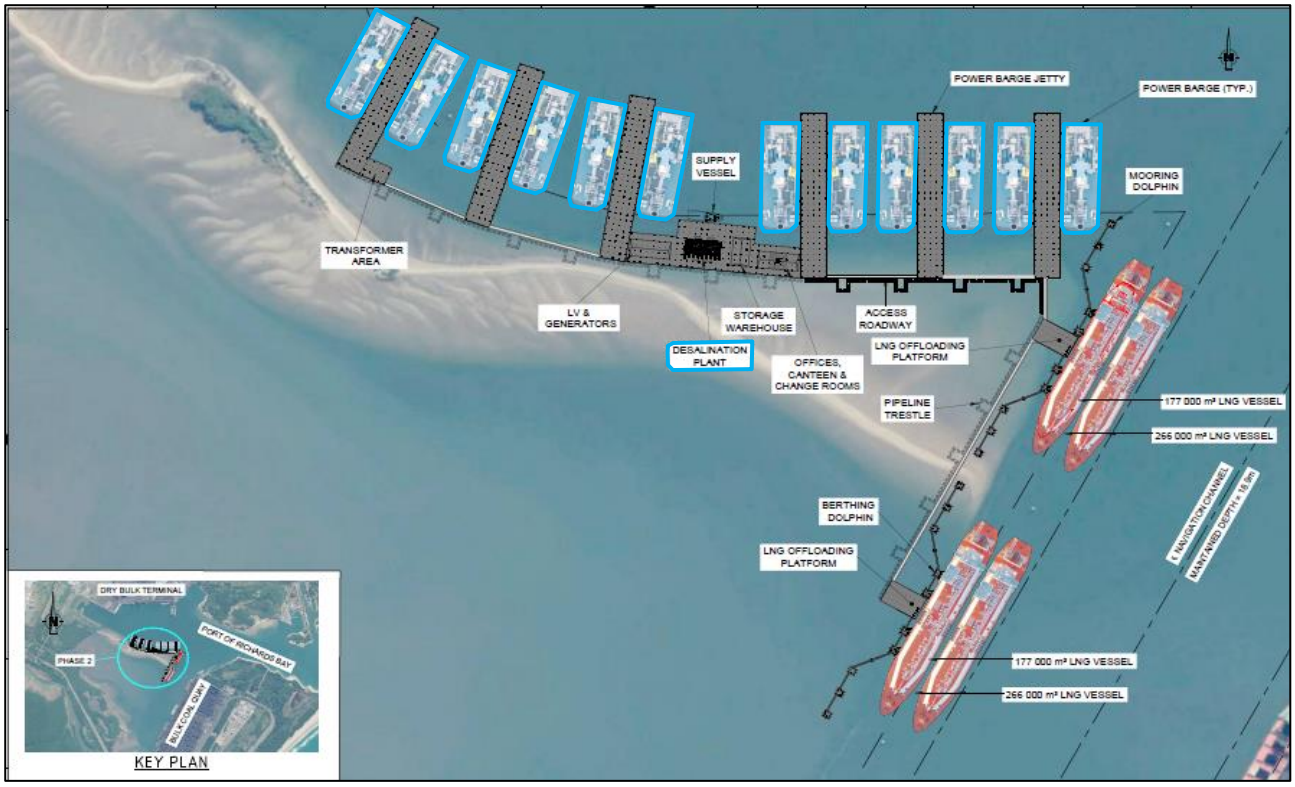


Figure 7: Power Barge Terminal/ Jetty with individual mooring bays per Floating Power Barge currently envisaged for the Richards Bay harbour. The floating power barges and desalination plant highlighted in blue are for Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032 while all other infrastructure and the LNG vessels and FSUs are for Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033.

2.3.3.2 LNG Bulk Storage Tanks

Nominal 250-300m^3 vertical double containment cylindrical VS-Series metal tanks will be used in which to store LNG (Figure 8). The following describes the containment measures to ensure safe storage of LNG.

Primary Containment

International standards and rules define containment with respect to types of structures and technologies in use. The term "containment" in this document refers to safe storage and isolation of LNG. Safe use of LNG, or any cryogenic substance, requires an understanding of how materials behave at cryogenic (very low) temperatures. For example, at extremely low temperatures, carbon steel loses its ductility and becomes brittle. The material selected for tanks, piping, and other equipment that comes in contact with LNG is critical. The use of high nickel content steels, aluminium, and stainless steels is costly but necessary to prevent embrittlement and material failures. High alloy steels composed of nine percent nickel and stainless steel typically are used for the inner tank of LNG storage tanks and for other LNG applications. Several engineering design features ensure the safety of LNG storage tanks. The industry has benefitted from advances in modern materials and engineering techniques to build safe LNG storage tanks.

LNG typically is stored in double-walled tanks at atmospheric pressure. The storage tank is a tank within a tank, with insulation between the walls of the tanks. The primary container is the primary containment for the cargo. It can be constructed of stainless-steel invar (36 percent nickel steel). The most common cargo insulation materials include polyurethane, polyvinyl chloride foam, polystyrene, and perlite. Nitrogen is placed in the insulation space. Because nitrogen does not react with other gases or materials, even minor leaks can be detected by monitoring the nitrogen-filled insulation space for the presence of methane.

Secondary Containment

Secondary containment provides protection beyond the primary containment. This applies both to storage tanks at receiving/re-gasification terminals as well as LNG vessels. A double containment tank is designed and constructed so that both the inner tank and the outer tank are capable of independently containing the LNG. The inner tank contains the LNG under normal operating conditions. The outer tank or wall (composed of ≈3 feet of concrete, 1-2m away from the inner tank) is intended to contain any LNG leakage from the inner tank and the boil-off gas. The majority of LNG storage tanks built recently around the world are designed as double or full containment tanks. LNG bulk storage tanks are designed in accordance with international LNG codes (EMMUA 147,18 EN 1473).

To contain liquid in the case of LNG leakage from double and full containment tanks, secondary containment must meet the following requirements:

- If made of metal, it shall be of cryogenic grade; or,
- If made of pre-stressed concrete (alternative), the temperature of the pre-stressed cables shall remain compatible with the strength of the maximum hydrostatic head. It is to be assumed for calculation that the temperature of the LNG is applied directly onto the internal face, including the insulation, if any.

For a secondary concrete container where a rigid base/ wall connection exists (alternative), a thermal protection system will be installed to prevent uncontrolled cracking in this connection area. This thermal protection system shall be designed in accordance with 7.1.11 of EN 14620-1:2006.

Figure 8: Typical vertical LNG cryogenic bulk storage tanks. A single 300m^3 storage tank typically stores 145 tonnes of LNG.

LNG storage tanks shall be designed to:

- Safely contain the liquid at cryogenic temperature;
- Permit the safe filling and removal of LNG;
- Permit the BOG to be safely removed;
- Prevent the ingress of air and moisture except as a last resort to prevent unacceptable vacuum conditions in the vapour space;
- Minimise the rate of heat in leak, consistent with operational requirements and prevent frost heave;
- Withstand the damage leading to loss of containment due to credible internal and external factors;
- Operate safely between the design maximum and minimum (vacuum) pressures; and,
- Withstand the number of filling and emptying cycles and the number of cool down and warming operations which are planned during its design life.

The tanks would be gas and liquid tight under normal operations and would be resistant to leakage in the event of external forces such as impact damage and thermal radiation (fire). Connections to the tanks would be designed to accept loads imposed from external and internal piping. The thermal insulation of the tanks would also be selected to ensure that this poses no threats to the integrity of the storage tanks and indeed experience no loss of efficacy of insulating properties. The tanks would also be designed to cope with the temperature and pressure variations brought about by filling and emptying. The tanks would also be equipped with a range of instruments that would serve to monitor liquid levels, pressure, temperature and density with independent alarms to signal the breaching of safety thresholds.

2.3.4 FLOATING POWER BARGES (I.E. POWER STATION FACILITY)

The proposed NIFPP Power Station Facility (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032) will comprise, initially, of 4 x nominal 700MW (50 Hz) Combined Cycle Gas Turbine (CCGT) Floating Power Barges (or modules - Figure 9) with sufficient real-estate (i.e. quays) for at least an additional 8 modules/ Floating Power Barges (Figure 7). The Initial Floating Power Barges will be connected, with additional units added at approximately 3 to 4 month intervals until the full fleet of Floating Power Barges are connected and operational.

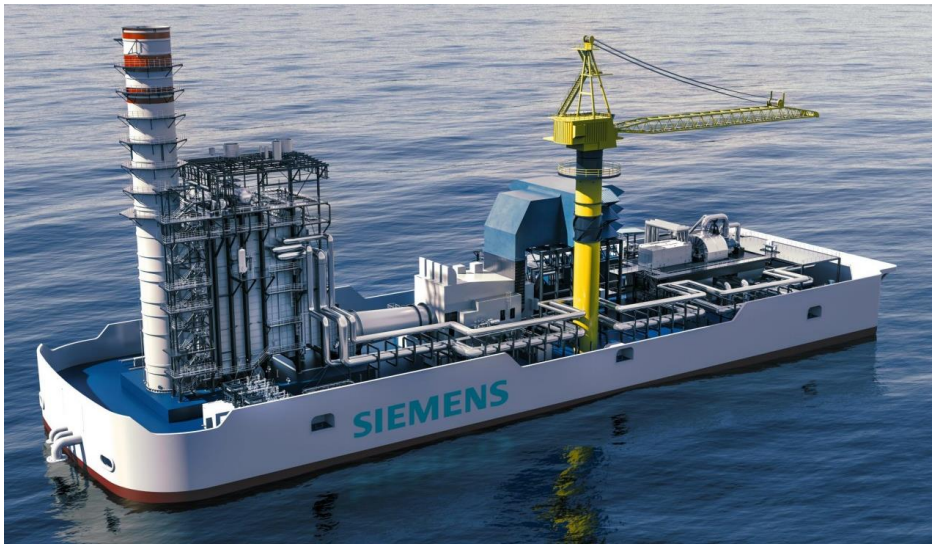


Figure 9: Typical 700 MW CCGT Floating Power Barge.

The NIFPP shall in essence operate 24 hours per day, 365 days per year with system 'inherent' availability being calculated as follows:

Table 2: CCGT and LNG Facilities Basic Operating Schedule

Item	Value	Unit
Annual Hours	8760	Hours
Less Un-scheduled Time (unforeseen)	175	Hours
Scheduled Time (ST)	8585	Hours
Idle Time ("no natural gas" periods)	0	Hours
Working Time (WT)	8585	Hours
Planned Maintenance (Pm)	430	Hours
Unplanned Maintenance (Um)	171	Hours
Available Time (AT = WT - (Pm + Um))	7984	Hours
Operational Delays	0	Hours
Operating Time (OT)	7984	Hours
Availability (AT/WT)	93	%
Utilization (OT/ST)	93	%
Use of Availability	99.5	%

2.3.4.1 Regasification technology

Regasification is a process of converting LNG stored within the LNG bulk storage tanks at −162°C (−260°F) temperature back to natural gas at atmospheric temperature so that it can be combusted, the responsibility of Anchor Energy (Pty) Ltd (14/12/16/3/3/2/2033). The regasification facility will be designed and engineered to meet the natural gas availability as required by the CCGTs. With an efficient combined cycle design, the regasification facility send-out requirement is approximately 80 MMscfd to support a 700 MW power generation Floating Power Barge. Each Floating Power Barge will have a regasification facility, located either on the floating barge itself or adjacent to it on the quay. The LNG bulk storage tank arrangements feature send-out pumps which are used to transfer the LNG via cryogenic pipes to the vaporizers/ regasification facilities. The regasification facility will be designed to utilise exhaust air from the CCGT through a glycol heat exchanger to initially raise the temperature of the LNG from the LNG bulk storage tanks. Thereafter, the gas will be further heated to the required CCGT temperatures through a purpose-built, highly efficient vaporizer. The vaporisers required to convert the LNG come in many different forms and importantly hold different potential consequences for the environment (refer to Section 8 for alternatives considered).

2.3.4.2 Combined Cycle Gas Turbine (CCGT) technology (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032)

The principle of operation of a CCGT is to capitalise on both the gas combustion process to drive a turbine as well as using, what would otherwise be, waste heat for steam generation, which is then also used to drive a steam turbine. The gas turbine compresses air, delivers the compressed air to a combustion chamber where the natural gas is introduced and burnt, resulting in hot, high-pressure combustion gas. The hot high-pressure gasses expand through the power turbine (part of the gas turbine) rotating the turbine and producing electricity via an electricity generator. The turbine itself is broadly equivalent to a jet engine.

The hot exhaust gasses that have passed through the turbine are then used in a waste recovery boiler (typically a Heat Recovery Steam Generator – HRSG) where demineralised water is heated to produce steam at a relatively high temperature and pressure. The steam is used to drive three steam turbines that each generate additional electricity (high, medium and low-pressure steam). The steam leaving the steam turbines returns through a condenser where it condenses back to liquid phase and returned to the HRSG for re-use. The steam turbine condenser is cooled by the circulation of a cooling medium such as air or water sourced typically from either sea or river water which is then returned to the atmosphere or the sea or river respectively. In this application it is intended to use a closed loop circuit utilizing possibly water or a refrigerant gas with a high latent heat index or potentially even the cooling properties of the LNG for cooling of the steam circuit. The cryogenic properties of the LNG provide for several applications in addition to cooling. For example, the sub-zero temperature of the LNG could be used for the desalination of seawater and provision of demineralised water for the steam circuit (when seawater is frozen the ice contains none of the salts in the seawater). It is intended in the detailed design process to optimise the heat balance for the entire system, for example heat from the combustion cycle could be used to regasify the LNG and the cold from the LNG to reduce the temperature in the steam circuit. For the NIFPP CCGT Power Station Facility, heating of the inlet air should not be a requirement as the ambient air temperatures during winter is always above the operating requirement of 4.4°C. The basic operating principle of a CCGT, as described above, is illustrated in Figure 10.

The use of natural gas as a fuel source has several advantages over other fuel types especially coal and oil, in that it is cleaner burning than the other fuel types with accordingly lesser air emissions and no solid waste products from the combustion process. Natural gas also results in the lowest greenhouse gas emissions of the three possible fuel types.

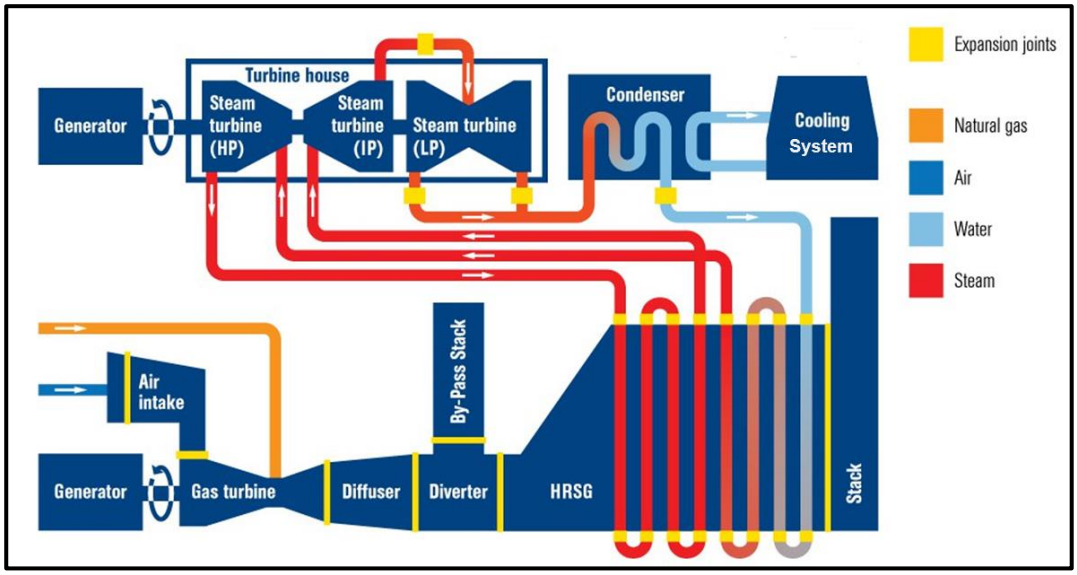


Figure 10: Schematic presentation of a Combined Cycle Gas Turbine (CCGT).

2.3.4.3 "On-Line" and "Off-Line" Cleaning and Soak Wash System

The CCGT equipment package shall feature an "on-line" cleaning system that enables cleaning of the compressor section of the engine during full power operation. The water wash equipment is mounted on the auxiliary module that is provided with a weather protection enclosure. The same system reservoir and piping are utilized for off-line soak washing. Purified Water and Air Requirements for Wash System: purified water shall be provided, filtered to 20 microns absolute and air filtered to 5 microns absolute. There would be no uncontrolled discharge of cleaning water.

2.3.5 LNG PROCESS FLOW

The LNG process flow (Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033) is be schematically summarised in Figure 11.

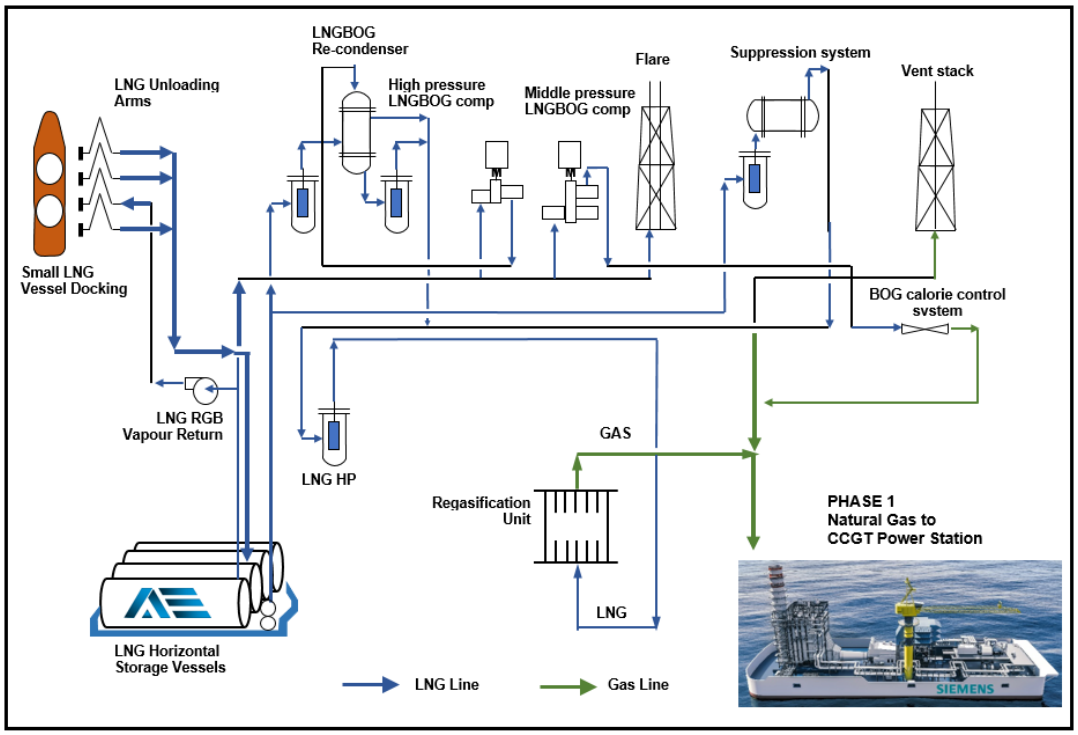


Figure 11: Schematic representation of the flow of LNG from the docked/ moored LNG vessel/ FSU to the Floating Power Barges (CCGT power plants).

2.3.6 EXPORTING ELECTRICITY INTO THE ESKOM NATIONAL GRID (NSELENI: 14/12/16/3/3/2/2032)

The electricity generated by the NIFPP will be transmitted from the transformer area (Figure 7) on the power barge terminal to a newly constructed land-based substation and transmission switching yard (Figure 12). From this substation, the electricity will be able to be transmitted either directly to local third party end users or by means of wheeling utilizing the Eskom national grid network. Voltages available from the new sub-station will conform to the full spectrum of Eskom voltages.

Box 3: What is a 'grid'?
A power transmission network is referred to as a "grid". Multiple redundant lines between points on the network are provided so that power can be routed from any power plant to any load centre, through a variety of routes, based on the economics of the transmission path and the cost of power. A transmission substation connects two or more transmission lines. The simplest case is where all transmission lines have the same voltage. In such cases, the substation contains high-voltage switches that allow lines to be connected or isolated for fault clearance or maintenance. Transformers are used to either step up the voltage for transmission or step down the voltage for distribution into a municipal supply or to individual users.

The network of high-voltage power lines linking the power station and/ or distribution sub-stations to the cities, towns, rural and residential areas where electricity is used is called the 'National Grid or Interconnected Grid' and an 'Independent Power Producer' (IPP) such as the proposed NIFPP, connecting to this grid is termed an 'Embedded Generator' (EG) i.e. a source of electricity in the grid.

There are four (4) alternatives which have been considered for the evacuation of electricity from the NIFPP to the new land-based substation (refer to Section 8: Alternatives for more details):

1. An overhead transmission powerline erected on purpose built marine piles and typical land-based transmission towers;
2. A pipe conductor (Gas Insulated Lines (GIL)) laid on the surface or buried (i.e. initially on the estuary bed and then on land south and west of the existing Bayside site boundary);
3. A pipe conductor (GIL) laid on an overhead gantry erected on purpose built marine piles and land-based pylons; or,
4. Aluminium armoured insulated cable laid on an overhead roofed gantry erected on purpose built marine piles and land-based pylons.

2.3.6.1 New Substation and Transmission Switching Yard

The new on-land transmission substation (proposed to be located to the north-west of the Bayside site) with an estimated maximum footprint of 12ha would also feature voltage control/ power factor correction devices such as capacitors, reactors or static volt-ampere reactive compensators and equipment, such as phase shifting transformers to control power flow between the two adjoining power systems, as may be required, to convert the power generated at Medium Voltage (MV) at 22 kV for transmission to High Voltage (HV) at 132/275/400/765 kV.

Figure 12: Proposed transmission powerline route to the new substation and connection to the grid.

2.3.6.2 ESKOM National Control Centre

The electricity generated by the NIFPP cannot be stored and hence must be used as it is generated. The ESKOM National Control Centre would monitor how much electricity is being used and how much electricity is either needed for the RSA national grid and/ or redirected to neighbouring countries national grids. The NIFPP shall adjust the amount of electricity generated according to the instructions received from the ESKOM National Control Centre. The NIFPP Operator (Embedded Generator (EG)) would ensure that:

- Except in the case of agreed unmanned facilities, a responsible person is available at all times to receive communications from ESKOM Control Centre, in order that emergencies requiring urgent action by the EG can be dealt with adequately. Where required by ESKOM, it will be a duty of the EG's staff to advise ESKOM's Control Centre immediately of any abnormalities that occur on the NIFPP which have caused, or might cause, disturbance to the ESKOM network.
- Where it is necessary for their employees to operate ESKOM equipment (where provided), they shall be designated in writing by ESKOM as an 'authorised person' for this purpose.
- All operations on the ESKOM equipment shall be carried out to the specific instructions of the ESKOM Control Centre. In an emergency, a switch can be opened by anybody, without prior agreement in order to avoid danger.

2.3.7 DREDGING OPERATIONS (ANCHOR ENERGY: 14/12/16/3/3/2/2033)

Dredging may be required to -8.5m Chart Datum (CD), which will provide 1.0m clearance at the 1:100 year extreme low water level below the power barges. The LNG terminal will be dredged to -13.5m to provide a minimum clearance of the largest design vessel of 1.0m at the 1:100 year extreme water level. A bathometric assessment of the estuary bed will be undertaken to ascertain the optimal layout of the Power Barge Terminal so as to minimise the volume of dredging to be undertaken. Refer to Section 8: Alternatives for the disposal alternatives to be considered during the EIA Phase.

2.4 INHERENT ENVIRONMENTAL AND SOCIAL MANAGEMENT CONTROLS FOR LNG AND CCGT

In general terms the use of natural gas is considered to be more environmentally suitable than other forms of fossil fuel power generation, most notably coal and oil/diesel. This is because natural gas is generally clean burning (it has less impurities and a lower carbon content which means it has less carbon dioxide emissions), does not result in a waste, such as ash (in the case of coal combustion) and is much cleaner to handle than oil or diesel (in respect of spills, for example). That notwithstanding there are certain environmental controls that are an essential part of natural gas as a fuel source

and that would be included in the design and construction of the proposed NIFPP CCGT, LNG Storage and Regasification facilities.

2.4.1 SAFETY (ANCHOR ENERGY: 14/12/16/3/3/2/2033)

2.4.1.1 Safety zones and safety equipment

While an LNG vessel is moored at the LNG Terminal, the waters and waterfront surrounding the LNG Terminal, located within a defined boundary, will be demarcated as a safety zone to avoid potential collision from passing traffic. The dimensions of this zone are under review to provide optimum safety for the moored carrier with minimum disruption to other port traffic. Internationally, LNG berths and activities worldwide, are governed by strict safety zones and codes of practice. For the facility in the Port of Richards Bay, safety zones will be defined during detailed design.

The vessel-handling safety features include sophisticated radar and positioning systems that alert the crew to other traffic and hazards around the ship. Also, distress systems and beacons automatically send out signals if the vessel is in difficulty. The cargo-system safety features include an extensive instrumentation package that safely shuts down the system if it starts to operate outside of predetermined performance parameters. Vessels are also equipped with gas- and fire-detection systems. At on-quay facilities, safety features include methane detectors, Ultraviolet or Infrared fire detectors, and closed-circuit TV.

2.4.1.2 LNG spill control

The flammability of natural gas, even though it cannot ignite in liquid form, is probably the most important environmental and social consideration that must be incorporated in the design of the proposed project. The safety of both staff working at the facility and people outside of the facility is paramount. LNG hazards are usually analysed in three phases:

- Source term (how much LNG would convert into gaseous form and thus become a potential combustion/ explosion hazard);
- Dispersion (the transport of the gas by atmosphere); and,
- Effect (fire damage or pressure wave from explosion).

Spilled LNG (a pool) would initially boil very rapidly with the vaporization rate controlled mainly by the heat flux into the pool from the ground. If the pool is contained by bunding for example, the ground beneath it would cool and the heat flux would diminish with time, leaving a still very hazardous pool but vaporizing slowly. If the pool is not contained then the LNG would spread over a larger area of warm ground and rapid boiling would continue, so gas production increases with increasing surface area of the pool again emphasising the importance of secondary containment to manage a potential spill. A natural gas cloud so formed is cold, concentrated and flammable and as part of the design calculations safety zones around the CCGT and the LNG Terminal would be determined. In addition, and as presented in the project description there are multiple international standards that serve to ensure a very low risk indeed of a release of LNG with high levels of redundancy being built into the design. This implies that while the consequence of an LNG spill is potential severe, the probability of it happening, and indeed the probability of formation of a gas cloud that ignites is very low indeed.

It should also be remembered that while worker and community safety is the most important driver of the various safety controls, the CCGT and the LNG storage and regasification facilities are high costs items that cannot be risked to fire or explosion damage. The loss of LNG also constitutes the loss of valuable product so there are both humanitarian and financial drivers for ensuring plant safety.

2.4.1.3 Fire protection

The CCGT power station (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032) would include a factory installed fire protection system complete with optical flame detection, hydrocarbon sensing and thermal detectors, piping and nozzles in both generator and engine compartments. The fire protection system would include cylinders containing CO_2

with standby power for the fire protection system. All alarms and shutdowns would be enunciated at the unit control panel. An alarm would sound at the turbine if the gas detectors detected high gas levels, or if the system was preparing to release CO_2. When the system is activated, the CCGT power station shuts down, and the primary CO_2 cylinders are discharged into the turbine and generator compartments via multiple nozzles, and the ventilation dampers automatically close. After a time delay a slow extended discharge of CO_2 is provided.

Fire protection at the LNG terminal (Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033) include the following:

- When a LNG vessel ties up at the terminal to transfer its cryogenic cargo, shipboard detection and Emergency Shutdown Systems (ESS) and those on shore are connected together so that they act as part of an integrated system. If anything goes wrong either on the ship or in the facility, alarms will sound and the loading or off-loading procedure will be automatically shut down.
- Both the vessel and the facility have gas sensors which will detect the presence of natural gas and also the lack of oxygen. Other sensors will detect changes in temperature. Heat detectors will alert everyone to a fire while cold temperatures will indicate a LNG leak to trigger an alarm and the ESS.
- Other sensors will monitor the tension on the mooring lines from the vessel to the facility dock. Any surge in tension that might part the lines (such as from the surge of a passing ship) would send the alarm and trigger the ESS.

The large product loading arms have a quick disconnect device built in. These Powered Emergency Release Couplers (PERCs) will close ball valves on both sides of the coupler thus shutting down flow. The coupler will then separate allowing the loading arms to retract away from the vessel while leaving the other half of the PERC valve attached to the vessels manifold. Both halves of the PERC will now have a closed ball valve at the end of the piping to prevent any flow.

Water will not extinguish an LNG vapour cloud fire. Firefighting water does have its uses in an LNG vapour cloud fire, such as keeping a vapour cloud away from a source of ignition, but the extinguishing agent used (should the vapour cloud ignite) is Dry Chemical. Within the facility there may also be High Expansion Foam Generators to flood LNG retention areas with a blanket of foam.

In the facility the Code of Federal Regulations requires certain dry chemical firefighting equipment and supplies be installed. The following applies to dry chemical systems:

- Each marine transfer area for LNG must have a dry chemical system that provides at least two dry chemical discharges to the area surrounding the loading arms, one of which must be:
    - From a monitor; and,
    - Actuated and, except for pre-aimed monitors, controlled from a location other than the monitor location.
- The dry chemical system must have the capacity to supply simultaneously or sequentially each hose or monitor in the system for 45 seconds.
- Each dry chemical hose station must have at least one length of hose that—
    - Is on a hose rack or reel; and,
    - has a nozzle with a valve that starts and stops the flow of dry-chemical,

The International Maritime Organization sets the requirements for firefighting equipment aboard LNG ships. The organisation requires that:

- Fixed dry chemical powder is fitted for firefighting in the exposed cargo area with at least two hoses or monitors capable of reaching the manifold area;
- Monitors have a discharge rate of not less than 10 Kg/sec and a range of 10 to 40 meters depending on capacity;
- Hoses have a discharge rate of at least 3Kg/sec with the rate designed so one man can operate; and,
- Consists of two independent systems with remote control monitor to cover manifold area and sufficient powder storage for a minimum discharge time of 45 sec.

In addition to this, several areas aboard ship will have inert-gas systems to flood enclosed spaces in the event of a leak. Water mains aboard LNG ships must operate on a higher than normal pressure to give a better water spray pattern to protect and cool exposures.

2.4.2 NOX EMISSIONS (NSELENI: 14/12/16/3/3/2/2032)

2.4.2.1 Low NO_x burners

Under some circumstances it may be necessary to control NO_x emissions. Reducing NO_x emissions in the gas turbine is effected by the use of low NO_x burners (Dry Low Emission) that control NO_x by burning at slightly lower temperatures than those that are optimal for NO_x formation. Should higher levels of NO_x control be required then additional controls such as selective catalytic reduction could be used but this is not expected.

2.4.2.2 Selective catalytic reduction

Selective Catalytic Reduction (SCR) system within the HRSG reduces Nitrogen oxides and/ or a catalyst to remove Carbon monoxide. The inclusion of an SCR dramatically affects the layout of the HRSG. NO_x catalyst performs best in temperatures between 650 °F (340 °C) and 750 °F (400 °C). This usually means that the evaporator section of the HRSG would have to be split and the SCR placed in between the two sections. Some low temperature NO_x catalysts have recently come to market that allows for the SCR to be placed between the Evaporator and Economizer sections (350 °F - 500 °F (175 °C - 260 °C)).

2.4.3 PARTICULATE MATTER (PM) EMISSIONS (NSELENI: 14/12/16/3/3/2/2032)

The CCGT would feature a modular, three-stage filtration system consisting of inlet screens, an EU4 pre-filter and an EU7 final barrier filter. The filtration system removes more than 99.9% of all particles 5.0 micron and larger. Subject to good design and building air tightness, this filtration approach is therefore potentially effective in reducing the higher end of respirable particle concentration.

2.4.4 NOISE (NSELENI: 14/12/16/3/3/2/2032)

The CCGT Power Station would feature weather-proof acoustic enclosures that are mounted over the equipment. The enclosure provides guaranteed average noise emission of 85 dB(A) at 1 m distance measured at 1.5 m above grade in a free field condition, during full load operation although noise levels could be higher during equipment start up. A sound pressure of 85 dB(A) is the maximum tolerable noise pressure level for occupational exposure. An assessment would be required to determine the sound pressure levels at the site boundaries as these would need to meet the requirement of 70 dB(A).

2.4.5 ENERGY SAVING MEASURES

A variety of measures may be used to maximise energy efficiency. As previously described an optimised heat balance would be developed for the entire system drawing heat, where required from the combustion of the natural gas, or cold, from the LNG. As the pipeline network of the NIFPP LNG Terminal does not feature underground storage systems that are typically found in the USA and Europe, it is necessary to absorb seasonal and hourly fluctuation on the LNG Terminal. As such, in order to mitigate possible restrictions due to the minimum send-outflow rate, the LNG BOG condensing rate shall be kept as low as possible. As the process to pre-cool BOG can keep the LNG BOG condensing rate at a low level, the limitation due to the minimum send-out requirement can be mitigated.

2.4.6 PERFORMANCE REQUIREMENTS

Specific performance requirements that need to be met by the proposed power plant are listed in Table 3. These performance requirements have been derived from the IFCs EHS Guidelines (both the General EHS Guidelines and for Thermal Power) as well as the South African national standards as set by the relevant Competent Authority.

Table 3: Performance requirements to be met by the proposed project (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032).

Parameter	Pollutant	IFC EHS Guidelines		NEMAQA MES*		NWA SAWQG for Coastal Marine Waters **	
		Limit	Units	Limit	Units	Limit	Units
Atmospheric emissions	SO_x	N/A	mg/Nm^3	400	mg/Nm^3		
	PM	N/A	mg/Nm^3	10	mg/Nm^3		
	NO_x	240***	mg/Nm^3	50	mg/Nm^3		
	Total VOC (Volatile Organic Compounds) from vapour recovery/ destruction units using thermal treatment			150	mg/Nm^3		
	Total VOC from vapour recovery/ destruction units using non-thermal treatment			40 000	mg/Nm^3		
Effluent	pH	6-9				7.3 – 8.2	
	Total Suspended Solids (TSS)	50	mg/l			<10% change	mg/l
	Oils and grease	10	mg/l				
	Total residual chlorine	0.2	mg/l				
	Total chromium	0.5	mg/l				
	Total chromium VI (as CrVI)					0.008	mg/l
	Copper	0.5	mg/l			0.005	mg/l
	Zinc	1.0	mg/l				
	Iron	1.0	mg/l			-	
	Lead	0.5	mg/l			0.012	mg/l
	Cadmium	0.1	mg/l			0.004	mg/l
	Mercury	0.005	mg/l			0.0003	mg/l
	Arsenic	0.5	mg/l			0.012	mg/l
	Cyanide					0.012	mg/l
	Fluoride					5	mg/l
	Ammonia (ionised & un-ionised) as Nitrogen					0.02	mg/l
	Nitrate/ Nitrite as Nitrogen					@	mg/l
	Temperature increase	Site specific	^{o}C			< 1	^{o}C
	Dissolved Oxygen					6	mg/l#
	Electrical Conductivity (mS/m)/ Salinity					$33x10^{-3}$ – $36x10^{-3}$	
	Faecal Coliforms					100 in 80%; 2000 in 90% of samples	Per 100ml sample
Day-time noise	Residential	55	L_{aeq} (dBA)				
	Industrial	70	L_{aeq} (dBA)				
Night-time noise	Residential	45	L_{aeq} (dBA)				
	Industrial	70	L_{aeq} (dBA)				

* National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Emission Standards – refer to Section 3.5 below for the detail.

** Department of Water Affairs and Forestry (1995) South African Water Quality Guidelines For Coastal Marine Waters: Volume 1 - Natural Environment. Pretoria, South Africa.

***Dry gas at 3% excess O_2 content

> 80-90% saturation

@ Waters should not contain concentrations of dissolved nutrients that are capable of causing excessive or nuisance growth of algae or other aquatic plants or reducing dissolved oxygen concentrations below the target range indicated for Dissolved oxygen.

3 NEED AND DESIRABILITY

3.1 GROWTH IN DEMAND FOR ELECTRICITY

Although the Republic of South Africa (RSA) is ranked as possibly one of the richest countries in the world, in terms of its natural mineral resources, its ability to meet the needs of the Country by generating cost effective electrical power from its remaining enormous and still vast coal resources, is severely constrained. A sharp increase in the demand for electricity at the turn of the 20th century, saw ESKOM in 2003 re-commission three power stations: Camden, Grootvlei and Komati which had been mothballed in the late 1980s and early 1990s. The growth in the demand for electricity culminated in demand exceeding supply in 2008 and the onset of rolling blackouts as a function of load shedding required to prevent the collapse of the entire national electricity network.

3.2 CURRENT ELECTRICITY SUPPLY

ESKOM currently operates 29 power stations with a total nominal capacity of 44 134MW, comprising 36 441MW of coal-fired stations, 1 860MW of nuclear power, 2 409MW of gas-fired, 600MW hydro and 2 724MW pumped storage stations, as well as the recently commissioned 100MW Sere Wind Farm. All four units of Ingula (pumped storage), with a nominal capacity of 331MW each, were commissioned during 2016, supplementing the capacity added by Unit 6 of Medupi Power Station, commissioned in the previous year.

As of February 2020, 5 units at Medupi are in commercial operation with unit 6 currently being commissioned and 2 units in operation at Kusile with 1 unit being commissioned. Neither station is yet operating at nameplate capacity for the operational units. There is very modest hydro capacity in two dams located on the Orange River as well as three pumped storage schemes, two in the Drakensberg (including Ingula) and the other on the Palmiet River in the Western Cape. Municipalities own 22 small power stations and back-up gas turbines, but these total only 4% of national generation capacity and generally run at low load factors. Private generators comprise the remaining 1% of capacity.

3.3 THE NATIONAL ENERGY ACT, 2008 (ACT NO. 34 OF 2008) (NEA)

The NEA requires that diverse energy resources are available in sustainable quantities and at affordable prices in South Africa. In addition, the Act provides for the increased use of renewable energy, contingency energy supplies, the holding of strategic energy feedstock and carriers, and adequate investment in energy infrastructure. At the same time economically viable coal reserves at the existing large base load power stations are being rapidly depleted and the development of new replacement power stations, underpinned by coal reserves elsewhere, are encountering severe opposition from environmental activists. The Country also has international greenhouse gas emission reduction commitments that it needs to honour.

3.4 THE INTEGRATED ENERGY PLAN

The RSA government has embarked upon an Integrated Energy Plan (“IEP”) which seeks to reduce the enormous carbon footprint of the existing fleet of thermal power stations, by introducing new, solar, photo voltaic, wind and concentrated solar, Independent Power Producers (IPPs) into the energy generation mix. Despite power demand being concentrated in Gauteng and along the coast where the Country’s major cities are located, of necessity renewable projects are far removed from these demand centres. Solar and concentrated solar have been developed in the hinterland of the Northern Cape and wind projects being primarily located on and close to the coast of the Eastern and Western Cape (Figure 13).

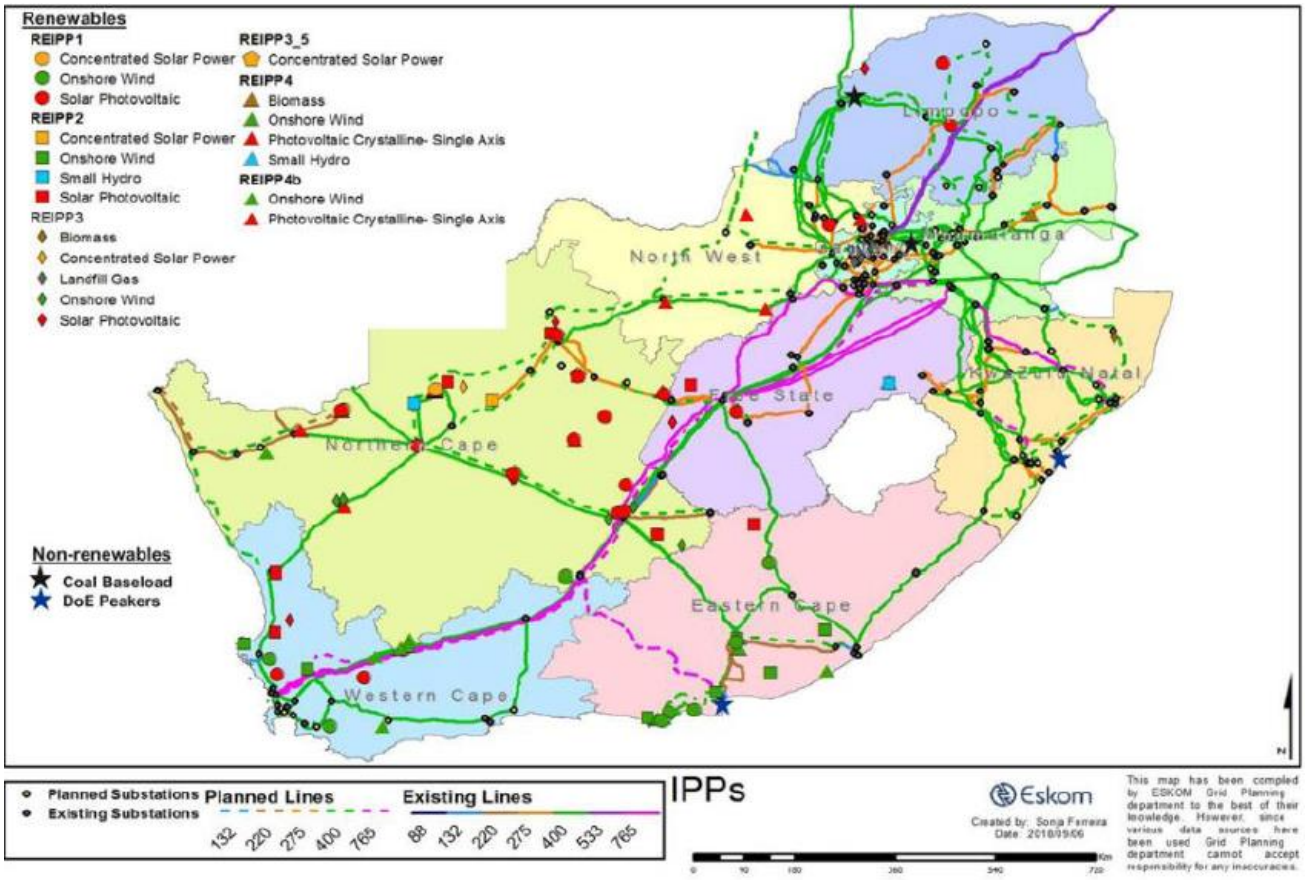


Figure 13: Approved IPP Projects in terms of the Renewable Energy Independent Power Producer (REIPP) Programme

3.5 RENEWABLE ENERGY INDEPENDENT POWER PRODUCER PROGRAMME

To date, the Renewable Energy Independent Power Producer (REIPP) programme has procured around 6 400 MW of energy from 106 IPP projects, with about 4 000 MW already in commercial operation. There are severe constraints to the further development of the REIPP programme where ESKOM is required, in terms of the programme, to finance and develop major new integration corridors (Figure 14), primarily in the Northern Cape to access the renewable projects at a time when ESKOM itself is struggling with ballooning costs and declining revenue.

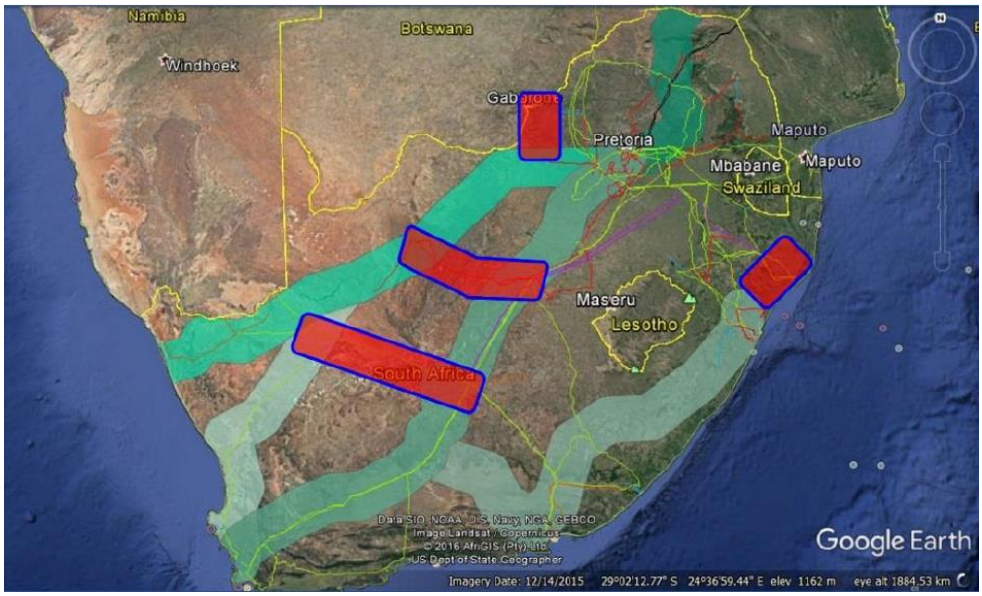


Figure 14: Transmission Network Corridors Required to Integrate IPPs

3.6 OTHER POSSIBLE SOURCES

The giant Grand Inga hydro-electric project in the Democratic Republic of Congo is postulated to have a potential capacity in excess of 56 000 MW. The low generation cost of hydroelectric power means that the potential of Inga presents a potentially sustainable solution to the power deficit problems facing many of the countries within the SADC region, including South Africa, as well as on the African continent. It is very difficult nonetheless, to see the realisation of the project within a ten to twenty year horizon, or even at all, given the significant technical and political complexities that need to be resolved.

3.7 COMBINED CYCLE GAS TURBINE TECHNOLOGY

The single most viable technology to materially improve the current power crisis in the shortest possible timeline is Combined Cycle Gas Turbine (CCGT) fuelled by Liquefied Natural Gas (LNG). Eskom has always used single cycle gas turbines as peaking plants (emergency supplies of electricity during peak demand) but fired them using uneconomic diesel as fuel source.

3.8 NSELENI INDEPENDENT FLOATING POWER PLANT

The underlying concept, of the Nseleni Independent Floating Power Plant (NIFPP), is to construct a phased approach, 8 400MW, Utility Scale, power island complex, utilizing floating marine power barges, moored in the harbour of Richards Bay in KZN. The turbines would be fuelled by LNG supplied from an LNG Terminal, to be constructed adjacent to the power island in the harbour with the bulk LNG being sourced elsewhere such as AngolaLNG's plant at Soyo. Dedicated LNG vessels sized for the NIFPP's requirements and capable of entering the Port of Richards Bay would be used to transport the gas.

Power generated from the facility would be evacuated from the facility by means of new HVAC overhead transmission lines connected into the ESKOM primary sub-stations at Athene, uMfolozi, Mbewu (planned), Impala and Invubu. The Project would have the ability to operate efficiently as a Base Load, Mid-Merit, Peaking or Peak Shaving plant (Box 4), something unable to be achieved on a continuous basis by any other power generating facility currently in operation in the RSA.

Box 4: Categories of electricity generation plants

Base load power plants operate at maximum output, and shut down or reduce power only to perform maintenance or repair or due to grid constraints. South Africa's coal-fired power stations are typically base load plants. Historically base load plants produced the cheapest electricity.

Peaking power plants run only when there is a high demand, known as peak demand, for electricity and have the flexibility to be started up and shut down quickly. Eskom has simple cycle turbines fuelled on diesel for peak demand. Historically peaking power tended to be the most expensive electricity.

Mid-merit power plants operate between base load and peak load. Eskom's pumped storage schemes are mid merit stations. Historically the cost of electricity from mid merit stations was more expensive than base load but cheaper than peaking.

Peak shaving power plants refers to levelling out peaks in electricity use by industrial and commercial power consumers in response to variations in demand.

3.9 THE NEED FOR UTILITY SCALE POWER GENERATION PROJECTS IN RSA

When considering the geographic extent of the country and the distances between generation infrastructure and load centres as well as the complexity, of the transmission networks, it becomes apparent that there is an important role for

independent utility scale generation power projects. Such generation projects would benefit from being close to transmission infrastructure or load demand centres. The proposed project has the potential to bring highly efficient, decentralized, base load type electrical power to the South African grid within a relatively short space of time and at an affordable tariff. In addition, there is no requirement for Eskom to foot the capital investment required for this project.

3.10 THE KZN TRANSMISSION NETWORK

Kwa-Zulu Natal has a transmission network with a radial pattern. With only two pumped storage peaking facilities in the Northern Drakensberg and an OCGT peaking station at Avon on the coast, the entire 6 280 Mw requirement of KZN is supplied via two HVAC lines originating at Majuba and Camden in Mpumalanga, some 600km distant (Figure 15).

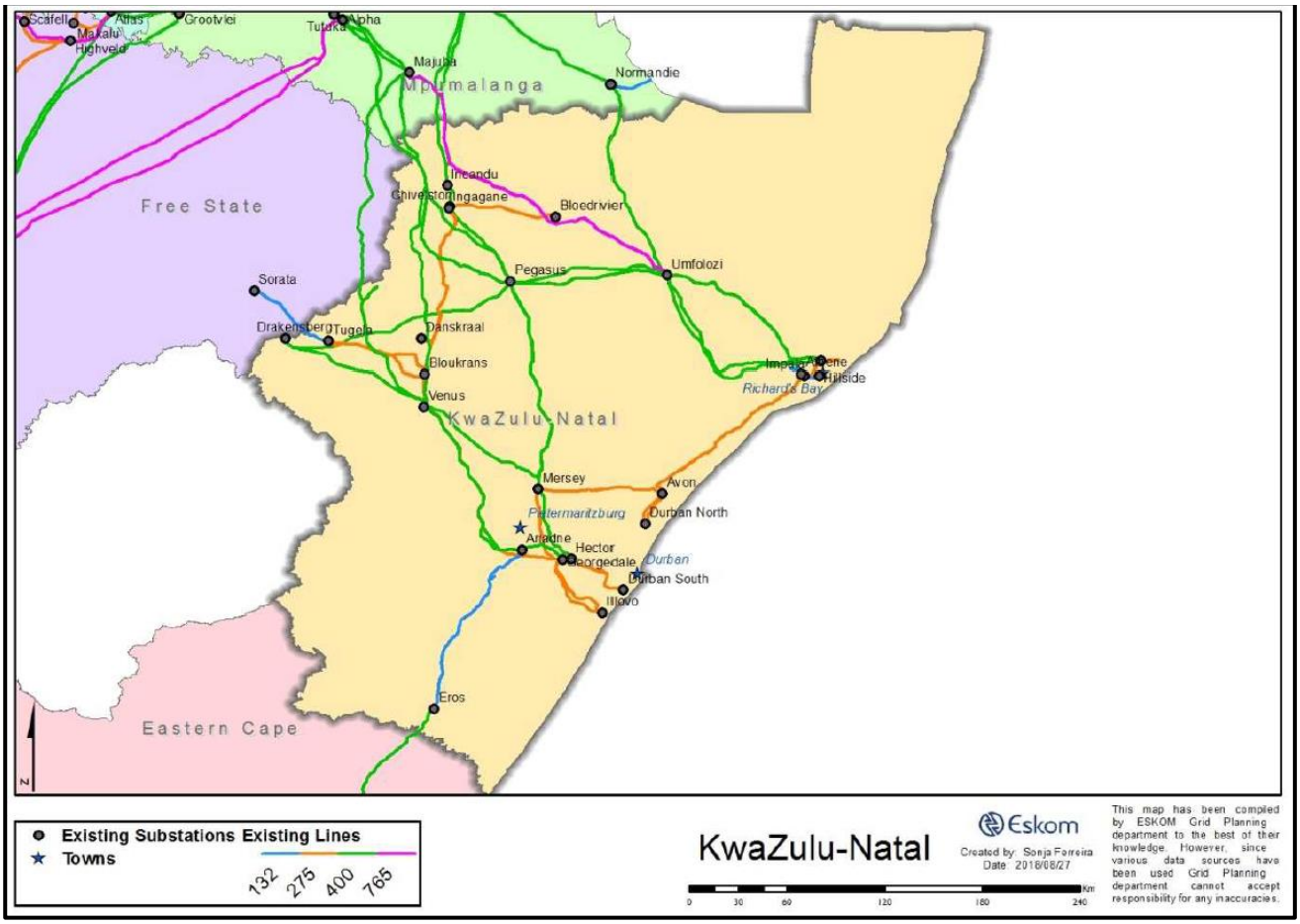


Figure 15: KwaZulu-Natal Sub-Stations and Power lines

The economic mix in KwaZulu-Natal comprises redistributors, commercial customers, and industrial customers. The demand in the province is forecast to grow steadily at about 2% annually, from 6 281 MW in 2018 to 7 562 MW by 2028 (Figure 16). The highest growth in demand is expected in the Pinetown and Empangeni Customer Load Networks due to industrial, commercial, and residential developments in those areas. Base load generating capability in Richards Bay, will eliminate the current scale of line losses and provide a completely new source of power capable of supplying the entire demand of KZN. As such KZN would be removed from the existing national demand profile but in addition flow of electricity could be reversed from KZN back into the National Transmission Network providing much needed capacity and stabilisation of the grid.

3.10.1 STRENGTHENING ELECTRICAL SUPPLY NETWORKS IN KZN

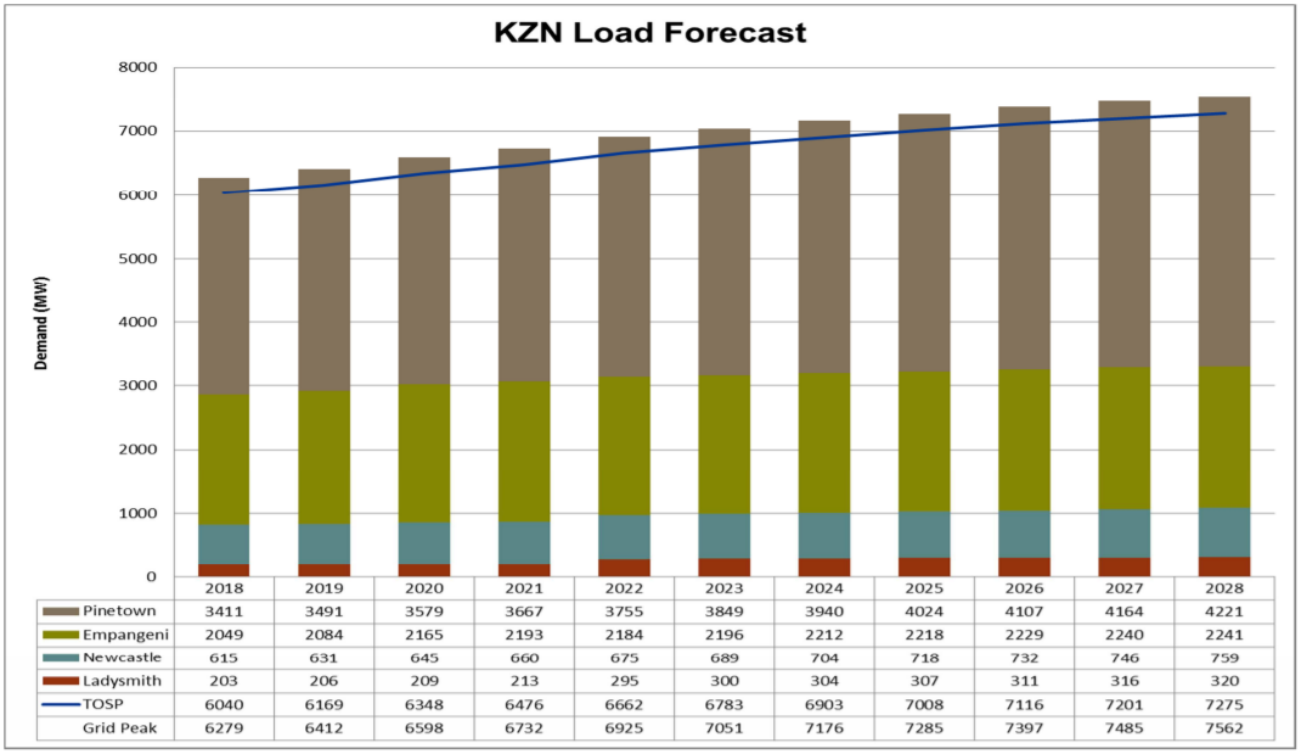
The major interventions for KwaZulu-Natal which have been undertaken by ESKOM or which could be undertaken or completed in terms of the proposed power generation project include:

3.10.1.1 KZN 765 kV strengthening

The KZN 765 kV strengthening project entails establishing 765 kV in the Pinetown and Empangeni areas, which will run from the power pool in the north and integrate it, with the 400kV network, in both areas. The Pinetown and Empangeni 765 kV networks will also be linked via two 400 kV lines. The project will be implemented in various stages.

3.10.1.2 NKZN strengthening: Iphiva 2 x 500 MVA 400/132 kV Substation

This project involves the establishment of Iphiva 400/132 kV Substation around Candover- Mkuze to address supply constraints around Pongola, Makhatini Flats, and iSimangaliso (Greater St. Lucia) Wetland Park. Two 400 kV lines, namely Normandie-Iphiva and Duma-Iphiva 400 kV lines will supply the planned Iphiva Substation. The Duma Substation is part of the planned Ermelo-Richards Bay coal link upgrade.



	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Pinetown	3411	3491	3579	3667	3755	3849	3940	4024	4107	4164	4221
Empangeni	2049	2084	2165	2193	2184	2196	2212	2218	2229	2240	2241
Newcastle	615	631	645	660	675	689	704	718	732	746	759
Ladysmith	203	206	209	213	295	300	304	307	311	316	320
TOSP	6040	6169	6348	6476	6662	6783	6903	7008	7116	7201	7275
Grid Peak	6279	6412	6598	6732	6925	7051	7176	7285	7397	7485	7562

Figure 16: KwaZulu-Natal Load Forecast

3.10.2 NIFPP ROLE IN KWAZULU-NATAL

All of the schemes mentioned above could be integrated into the proposed NIFPP in Richards Bay without burdening Eskom and thereby:

- Strengthening the National Transmission Network;
- Improving power reticulation in KZN; and,
- Securing financial capital to implement the schemes.

The technology proposed has the twofold benefit of not only providing quick to market electricity desperately needed to meet the power demands in the RSA but secondly, in assisting with the stabilisation of the national grid by virtue of the rapid response time to surge demand provided by turbine technology.

3.11 THE NATIONAL DEVELOPMENT PLAN

The NDP envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates; that is socially equitable through expanded access to energy at affordable tariffs; and that is environmentally sustainable through reduced emissions and pollution.

3.12 THE PARIS AGREEMENT

South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. In line with NDCs (Nationally Determined Contributions) submitted to the UNFCCC in November 2016, South Africa's emissions are expected to peak, plateau and from year 2025 decline. The energy sector contributes close to 80% towards the country's total greenhouse gas emissions of which 50% are from electricity generation and liquid fuel production alone. There is action to reduce emissions with investment already in renewable energy, energy efficiency and public transport but much more is needed to make such commitments a reality.

It is presented here that the proposed NIFPP would contribute materially to both objectives, while at the same time potentially facilitating the economic growth so desperately needed by the country but it must be recognised that LNG remains a non-renewable, fossil fuel.

4 INSTITUTIONAL AND LEGAL FRAMEWORK, GUIDELINES AND INTERNATIONAL LENDER REQUIREMENTS

4.1 OVERVIEW OF ENVIRONMENTAL LEGISLATION IN SOUTH AFRICA

Section 24 of the Constitution of the Republic of South Africa of 1996 guarantees everyone has a right to an environment that is not harmful to their health and well-being and to have the environment protected for the benefit of present and future generations. In order to give effect to this right, the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) was promulgated.

NEMA is the overarching environmental legislation in the country. Chapter 1 of NEMA lists the national environmental management principles (NEMA Principles) that should be the point of departure for environmental management within the country. The following two principles reflect the core of NEMA:

- Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- Development must be socially, environmentally and economically sustainable.

Several sector Specific Environmental Management Acts (SEMAs) have been promulgated and all fall under the umbrella of NEMA, these are:

- Environment Conservation Act, 1989 (Act No.73 of 1989);
- National Water Act, 1998 (Act No. 36 of 1998);
- National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004);
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004);
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008); and
- National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008).

4.2 NEMA & EIA REGULATIONS

The Environmental Impact Assessment (EIA) Regulations (Government Gazette Notice (GN) No. R. 326, 327, 325 and 324 of 07 April 2017) promulgated in terms of NEMA regulate the "*procedure and criteria as contemplated in Chapter 5 of the Act relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to environmental impact assessment, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto*."

The following tables highlights those activities that will be triggered by the proposed NIFPP and associated infrastructure project, thus requiring two separate Environmental Authorisations (EAs), by way of a single integrated Scoping and Environmental Impact Reporting (S&EIR) application process, from the Competent Authority (in this instance: the National Department of Environment, Forestry & Fisheries (DEFF)) prior to the commencement of the activities. Two separate EA Applications will be submitted in order to obtain two separate EAs, as the project is a collaboration between two entities, one responsible for infrastructure development and the other for the operational phase generation of electricity. The two applications are as follows:

1. Anchor Energy (Pty) Ltd – Proposed Liquid Natural Gas (LNG) receiving and storage facility and associated physical infrastructure to support the NIFPP. i.e. all marine based infrastructure development (refer to Table 4).
2. Nseleni Power Corporation (Pty) Ltd - Proposed NIFPP and associated infrastructure for the evacuation of power from the NIFPP to the National Grid. i.e. all construction and operational aspects associated with power generation and evacuation into the national grid (refer to Table 5).

Table 4: NEMA Listed activities that apply to Anchor Energy (Pty) Ltd: marine infrastructure development [14/12/16/3/3/2/2033]

GOVERNMENT GAZETTE NO.	LISTED ACTIVITY NO.	DESCRIPTION OF THE LISTED ACTIVITY	DESCRIBE THE PORTION OF THE PROPOSED PROJECT TO WHICH THE APPLICABLE LISTED ACTIVITY RELATES.	STUDY AREA CO-ORDINATES – MORE ACCURATE CO-ORDINATES WILL BE PROVIDED IN THE EIA REPORT AFTER SPECIALIST CONSULTATION AND INPUT
GN. No. R. 325 – Listing Notice 2	4	The development and related operation 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.	LNG will be stored on the LNG FSU and Power Barge Terminals in specially designed cryogenic bulk storage tanks each with a capacity of 1 000m^3. LNG FSU vessels can hold up to 250 000m^3.	Proposed study area corner co-ordinates: A. -28°47'54.28"S 32°02'18.05"E B. -28°47'53.96"S 32°03'10.48"E C. -28°48'34.07"S 32°03'10.79"E D. -28°48'34.43"S 32°02'18.39"E
	6	The development of facilities or infrastructure for any purpose or activity which requires a permit or licence or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.	The proposed project may require a Dumping at Sea Permit in terms of NEMICMA for dredged material.	Corner Co-ordinates of estimated areas: A. -28°47'55.31"S 32°02'22.50"E B. -28°48'01.58"S 32°03'04.26"E C. -28°48'07.29"S 32°03'04.41"E D. -28°48'09.57"S 32°03'10.03"E E. -28°48'34.19"S 32°02'54.40"E F. -28°48'32.62"S 32°02'47.26"E G. -28°48'08.20"S 32°03'03.03"E H. -28°48'07.65"S 32°02'39.79"E I. -28°48'01.85"S 32°02'19.60"E
	14	The development and related operation of – (i) an anchored platform; or (ii) any other structure or infrastructure – on, below or along the sea bed.	The proposed development entails the construction of the LNG and Power Barge Terminals which are essentially quays/ jetties based on marine piles within the Port of Richards Bay (or Richards Bay Estuary).	Proposed study area corner co-ordinates: A. -28°47'54.28"S 32°02'18.05"E B. -28°47'53.96"S 32°03'10.48"E C. -28°48'34.07"S 32°03'10.79"E D. -28°48'34.43"S 32°02'18.39"E

GN. No. R. 325 – Listing Notice 2	**26**	Development – (i) in the sea; (ii) in an estuary; (iii) within the littoral active zone; (iv) in front of a development setback; or (v) if no development setback exists, within a distance of 100 metres of the high-water mark of the sea or an estuary, whichever is the greater; in respect of – a) Facilities associated with the arrival and departure of vessels and the handling of cargo; b) Piers; c) Inter- and sub-tidal structures for entrapment of sand; d) Breakwater structures; e) Coastal marinas; f) Coastal harbours or ports; g) Tunnels; or h) Underwater channels; But excluding the development of structures within existing ports or harbours that will not increase the development footprint of the port or harbour.	The proposed development entails the construction of the LNG and Power Barge Terminals which are essentially quays/ jetties based on marine piles within the Port of Richards Bay (or Richards Bay Estuary). The CCGT power plants will be modular and located on floating barges moored to the Power Barge Terminal. LNG will be supplied via LNG vessels and offloaded when vessels dock/moor with the LNG Terminal.	Proposed study area corner co-ordinates: A. -28°47'54.28"S 32°02'18.05"E B. -28°47'53.96"S 32°03'10.48"E C. -28°48'34.07"S 32°03'10.79"E D. -28°48'34.43"S 32°02'18.39"E

GN. No. R. 327 – Listing Notice 1	**17**	Development – (i) in the sea; (ii) in an estuary; (iii) within the littoral active zone; (iv) in front of a development setback; or (v) if no development setback exists, within a distance of 100 metres of the high-water mark of the sea or an estuary, whichever is the greater; in respect of – (a) Fixed or floating jetties and slipways; (b) Tidal pools; (c) embankments; (d) rock revetments or stabilising structures including stabilising walls; or (e) infrastructure or structures with a development footprint of 50 square metres or more - But excluding - (aa) the development of infrastructure and structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (dd) where such development occurs within an urban area.	The proposed infrastructure to receive and store LNG will be constructed within the Port of Richards Bay (thus, within the sea / estuary). The definition of an urban area is an area adopted as such by the Competent Authority – no such area exists. The entire Port of Richards Bay (including future expansion activities) is included within the Urban Development Boundary as per the City of uMhlathuze's Spatial Development Framework; however this document has not been adopted by the Competent Authority. The adopted Environmental Management Framework (EMF) of the Richards Bay Industrial Zone and Port Expansion – does not specifically define the urban area. The actual estuarine environment of the Port and the remainder of the study area (on land) falls outside of a "built up environment".	Proposed study area corner co-ordinates: A. -28°47'54.28"S 32°02'18.05"E B. -28°47'53.96"S 32°03'10.48"E C. -28°48'34.07"S 32°03'10.79"E D. -28°48'34.43"S 32°02'18.39"E
	19A	The filling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from – (ii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater.	Dredging of or movement of sediment on the estuary bed (Port of Richards Bay) will be required to construct the necessary infrastructure (i.e. quays/ terminals) for the receiving and storage of LNG and for the mooring of LNG vessels/ Floating Storage Units.	Corner Co-ordinates of estimated areas: A. -28°47'55.31"S 32°02'22.50"E B. -28°48'01.58"S 32°03'04.26"E C. -28°48'07.29"S 32°03'04.41"E D. -28°48'09.57"S 32°03'10.03"E E. -28°48'34.19"S 32°02'54.40"E F. -28°48'32.62"S 32°02'47.26"E G. -28°48'08.20"S 32°03'03.03"E H. -28°48'07.65"S 32°02'39.79"E I. -28°48'01.85"S 32°02'19.60"E

Table 5: NEMA Listed activities that apply to Nseleni Power Corporation (Pty) Ltd: power generation & evacuation into the National Grid [14/12/16/3/3/2/2032]

GOVERNMENT GAZETTE NO.	LISTED ACTIVITY NO.	DESCRIPTION OF THE LISTED ACTIVITY	DESCRIBE THE PORTION OF THE PROPOSED PROJECT TO WHICH THE APPLICABLE LISTED ACTIVITY RELATES	STUDY AREA CO-ORDINATES – MORE ACCURATE CO-ORDINATES WILL BE PROVIDED IN THE EIA REPORT AFTER SPECIALIST CONSULTATION AND INPUT
GN. No. R. 325 – Listing Notice 2	**2**	The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where the electricity output is 20 megawatts or more.	While the development of the CCGT floating power plants/ barges will be built/ developed off-site and shipped to site, the operation of the CCGT will be undertaken on site. It is proposed that the total capacity of the NIFPP will be between 2 800 – 8 400MW. The proposed transmission powerline corridor/ servitude is required to evacuate power from the proposed NIFPP to the new proposed substation connected to the National Grid.	Proposed study area corner co-ordinates: A. -28°47'54.82"S 32°02'22.44"E B. -28°48'01.30"S 32°03'04.77"E C. -28°48'06.84"S 32°03'05.05"E D. -28°48'10.57"S 32°03'02.26"E E. -28°48'11.26"S 32°02'51.67"E F. -28°48'10.40"S 32°02'36.25"E G. -28°48'03.57"S 32°02'18.83"E
	4	The development and related operation 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.	The NIFPP will have storage of dangerous goods in combined capacities of more than 500m^3.	Proposed study area corner co-ordinates: A. -28°47'54.28"S 32°02'18.05"E B. -28°47'53.96"S 32°03'10.48"E C. -28°48'34.07"S 32°03'10.79"E D. -28°48'34.43"S 32°02'18.39"E

GN. No. R. 325 – Listing Notice 2	**6**	The development of facilities or infrastructure for any purpose or activity which requires a permit or licence or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.	The proposed NIFPP will require an Atmospheric Emissions License (AEL) in terms of NEMAQA. The proposed NIFPP may require a Dumping at Sea Permit in terms of NEMICMA for any operational phase dredging.	Proposed study area corner co-ordinates (estimate central co-ordinates of each power barge will be provided in the EIA Report): A. -28°47'54.82"S 32°02'22.44"E B. -28°48'01.30"S 32°03'04.77"E C. -28°48'06.84"S 32°03'05.05"E D. -28°48'10.57"S 32°03'02.26"E E. -28°48'11.26"S 32°02'51.67"E F. -28°48'10.40"S 32°02'36.25"E G. -28°48'03.57"S 32°02'18.83"E The proposed NIFPP may require a Dumping at Sea Permit in terms of NEMICMA for any operational phase dredging. Corner Co-ordinates of areas that may require dredging: A. -28°47'55.31"S 32°02'22.50"E B. -28°48'01.58"S 32°03'04.26"E C. -28°48'07.29"S 32°03'04.41"E D. -28°48'09.57"S 32°03'10.03"E E. -28°48'34.19"S 32°02'54.40"E F. -28°48'32.62"S 32°02'47.26"E G. -28°48'08.20"S 32°03'03.03"E H. -28°48'07.65"S 32°02'39.79"E I. -28°48'01.85"S 32°02'19.60"E

GN. No. R. 325 – Listing Notice 2	**9**	The development of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.	The proposed transmission powerline will be more than 275kV.	Study area co-ordinates: A. -28°48'11.87"S 32°01'20.94"E B. -28°47’45.26”S 32°00’14.07”E C. -28°46’56.21”S 32°00’34.08”E D. -28°46’53.18”S 32°00’15.22”E E. -28°46’41.79”S 32°00’21.49”E F. -28°46’43.85”S 32°00’40.35”E G. -28°46’45.76”S 32°00’46.01”E H. -28°47’38.17”S 32°00’24.94”E I. -28°47’46.27”S 32°00’50.94”E J. -28°47’45.01”S 32°00’55.98”E K. -28°47'54.75"S 32°01'28.96"E L. -28°48'00.80"S 32°01'26.36"E M. -28°47'55.91"S 32°02'23.25"E N. -28°48'07.90"S 32°02'24.36"E O. -28°48'12.78"S 32°01'27.58"E
	14	The development and related operation of – (i) an anchored platform; or (ii) any other structure or infrastructure – on, below or along the sea bed.	The proposed transmission powerline will be overhead on marine piles.	Proposed study area corner co-ordinates (over water): A. -28°48'00.80"S 32°01'26.36"E B. -28°47'55.91"S 32°02'23.25"E C. -28°48'07.90"S 32°02'24.36"E D. -28°48'12.78"S 32°01'27.58"E

GN. No. R. 327 – Listing Notice 1	**12**	The development of – (ii) infrastructure or structures with a physical footprint of 100 square metres or more, where such development occurs – (a) Within a wetland; (b) In front of a development setback; or (c) If no development setback exists, within 32 metres of a watercourse, measured from the edge of the watercourse.	The proposed transmission powerline corridor/ servitude and new substation will impact on wetland environments.	Proposed study area corner co-ordinates: A. -28°48'11.87"S 32°01'20.94"E B. -28°47’45.26”S 32°00’14.07”E C. -28°46’56.21”S 32°00’34.08”E D. -28°46’53.18”S 32°00’15.22”E E. -28°46’41.79”S 32°00’21.49”E F. -28°46’43.85”S 32°00’40.35”E G. -28°46’45.76”S 32°00’46.01”E H. -28°47’38.17”S 32°00’24.94”E I. -28°47’46.27”S 32°00’50.94”E J. -28°47’45.01”S 32°00’55.98”E K. -28°47'54.75"S 32°01'28.96"E
	16	The development and related operation of facilities for the desalination of water with a design capacity to produce more than 100 cubic metres of treater water per day.	A Demineralisation/ Desalination Plant will be required to treat estuarine/ sea water abstracted from the Port of Richards Bay for use in the Combined Cycle Gas Turbine (CCGT) Power Plants. Potable water will also be required for personnel during the operational phase of the facility.	Estimated centre co-ordinate: -28°48'08.46"S 32°02'41.10"E

GN. No. R. 327 – Listing Notice 1	**17**	Development – (i) in the sea; (ii) in an estuary; (iii) within the littoral active zone; (iv) in front of a development setback; or (v) if no development setback exists, within a distance of 100 metres of the high-water mark of the sea or an estuary, whichever is the greater; in respect of – (a) Fixed or floating jetties and slipways; (b) Tidal pools; (c) embankments; (d) rock revetments or stabilising structures including stabilising walls; or (e) infrastructure or structures with a development footprint of 50 square metres or more - But excluding - (aa) the development of infrastructure and structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (dd) where such development occurs within an urban area.	The proposed transmission powerline corridor/ servitude will be located in the Richards Bay Port/ Estuary and within the estuarine functional zone. The definition of an urban area is an area adopted as such by the Competent Authority – no such area exists. The entire Port of Richards Bay (including future expansion activities is included within the Urban Development Boundary as per the City of uMhlathuze's Spatial Development Framework; however this document has not been adopted by the Competent Authority. The adopted Environmental Management Framework (EMF) of the Richards Bay Industrial Zone and Port Expansion – does not specifically define the urban area. The actual estuarine environment of the Port and the remainder of the study area (on land) falls outside of a "built up environment".	Proposed study area corner co-ordinates (over water): A. -28°48'00.80"S 32°01'26.36"E B. -28°47'55.91"S 32°02'23.25"E C. -28°48'07.90"S 32°02'24.36"E D. -28°48'12.78"S 32°01'27.58"E

GN. No. R. 327 – Listing Notice 1	**19**	The filling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.	The proposed transmission powerline corridor/ servitude and new substation will require excavation of soil from wetlands in the area.	Proposed study area corner co-ordinates: A. -28°48'11.87"S 32°01'20.94"E B. -28°47’45.26”S 32°00’14.07”E C. -28°46’56.21”S 32°00’34.08”E D. -28°46’53.18”S 32°00’15.22”E E. -28°46’41.79”S 32°00’21.49”E F. -28°46’43.85”S 32°00’40.35”E G. -28°46’45.76”S 32°00’46.01”E H. -28°47’38.17”S 32°00’24.94”E I. -28°47’46.27”S 32°00’50.94”E J. -28°47’45.01”S 32°00’55.98”E K. -28°47'54.75"S 32°01'28.96"E
	19A	The filling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from – (ii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater.	Dredging of the estuary bed (Port of Richards Bay) during the operational phase may be required to provide sufficient draft depth for the Floating Power Barges.	Corner Co-ordinates of estimated areas: A. -28°47'55.31"S 32°02'22.50"E B. -28°48'01.58"S 32°03'04.26"E C. -28°48'07.29"S 32°03'04.41"E D. -28°48'09.57"S 32°03'10.03"E E. -28°48'34.19"S 32°02'54.40"E F. -28°48'32.62"S 32°02'47.26"E G. -28°48'08.20"S 32°03'03.03"E H. -28°48'07.65"S 32°02'39.79"E I. -28°48'01.85"S 32°02'19.60"E
	25	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres.	The Combined Cycle Gas Turbine (CCGT) Power Plants; Demineralisation/ Desalination Plants and Regasification Plants will generate wastewater that will be treated prior to discharge into the Port environment.	Corner Co-ordinates of estimated area for treatment facility: A. -28°48'07.22"S 32°02'37.19"E B. -28°48'07.14"S 32°02'47.37"E C. -28°48'10.28"S 32°02'47.41"E D. -28°48'10.35"S 32°02'37.27"E

GN. No. R. 327 – Listing Notice 1	**27**	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation.	The transmission powerline servitude and site for the proposed substation and switching yard will need to be cleared of vegetation.	Proposed study area corner co-ordinates: A. -28°48'11.87"S 32°01'20.94"E B. -28°47’45.26”S 32°00’14.07”E C. -28°46’56.21”S 32°00’34.08”E D. -28°46’53.18”S 32°00’15.22”E E. -28°46’41.79”S 32°00’21.49”E F. -28°46’43.85”S 32°00’40.35”E G. -28°46’45.76”S 32°00’46.01”E H. -28°47’38.17”S 32°00’24.94”E I. -28°47’46.27”S 32°00’50.94”E J. -28°47’45.01”S 32°00’55.98”E K. -28°47'54.75"S 32°01'28.96"E

GN No. R. 324 – Listing Notice 3	**12**	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. a. KwaZulu-Natal iv. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004. vi. Within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone, whichever distance is the greater, excluding where such removal will occur behind the development setback line or erven in urban areas. xii. Sensitive areas as identified in an environmental management framework as contemplated in Chapter 5 of the Act and as adopted by the competent authority; or xiii. In an estuarine functional zone.	The transmission powerline servitude and site for the proposed substation and switching yard will need to be cleared of vegetation. The majority of the study area falls within the estuarine functional zone and areas identified as sensitive in the EMF for the Richards Bay Industrial Zone and Port Expansion. Kwambonambi Dune Forest and Kwambonambi Hygrophilous Grassland ecosystems are listed as Critically Endangered and occur within the greater study area.	Proposed study area corner co-ordinates: A. -28°48'11.87"S 32°01'20.94"E B. -28°47’45.26”S 32°00’14.07”E C. -28°46’56.21”S 32°00’34.08”E D. -28°46’53.18”S 32°00’15.22”E E. -28°46’41.79”S 32°00’21.49”E F. -28°46’43.85”S 32°00’40.35”E G. -28°46’45.76”S 32°00’46.01”E H. -28°47’38.17”S 32°00’24.94”E I. -28°47’46.27”S 32°00’50.94”E J. -28°47’45.01”S 32°00’55.98”E K. -28°47'54.75"S 32°01'28.96"E

GN No. R. 324 – Listing Notice 3	**14**	The development of- (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs- (a) within a watercourse; or (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. (d) In KwaZulu-Natal: i. In an estuarine functional zone; vii. Critical biodiversity areas or ecological support areas as identified in schematic biodiversity plans adopted by the competent authority or in bioregional plans. viii. Sensitive areas as identified in an environmental management framework as contemplated in Chapter 5 of the Act and as adopted by the competent authority. x. Outside urban areas (bb) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined. xi. Inside urban areas (cc) Areas seawards of the development setback line or within 100 metres from the high-water mark of the sea if no such development setback line is determined.	The proposed transmission powerline corridor/ servitude and proposed new substation will impact on wetland environments. The majority of the study area falls within the estuarine functional zone and areas identified as sensitive in the EMF for the Richards Bay Industrial Zone and Port Expansion. The proposed NIFPP is located within the Port of Richards Bay.	Proposed study area corner co-ordinates: A. -28°48'11.87"S 32°01'20.94"E B. -28°47’45.26”S 32°00’14.07”E C. -28°46’56.21”S 32°00’34.08”E D. -28°46’53.18”S 32°00’15.22”E E. -28°46’41.79”S 32°00’21.49”E F. -28°46’43.85”S 32°00’40.35”E G. -28°46’45.76”S 32°00’46.01”E H. -28°47’38.17”S 32°00’24.94”E I. -28°47’46.27”S 32°00’50.94”E J. -28°47’45.01”S 32°00’55.98”E K. -28°47'54.75"S 32°01'28.96"E

4.2.1 INTEGRATED ENVIRONMENTAL MANAGEMENT (IEM)

"*IEM provides a holistic framework that can be embraced by all sectors of society for the assessment and management of environmental impacts and aspects associated with an activity for each stage of the activity life cycle, taking into consideration a broad definition of environment and with the overall aim of promoting sustainable development*".[2]

The general objective of IEM, according to NEMA Chapter 5, is to -

- Promote the integration of the principles of environmental management set out in Section 2 into the making of all decisions which may have a significant effect on the environment;
- Identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management set out in Section 2;
- Ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;
- Ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;
- Ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment; and
- Identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in Section 2.

The Department of Environmental Affairs (DEA) Integrated Environmental Management Information Series guidelines were also consulted during this S&EIR application process.

4.2.2 EIA REGULATIONS – GUIDELINES

Various guidelines documents have been developed and published over the years to provide clarity on aspects of the EIA Regulations. All applicable and relevant guidelines have been used during this S&EIR application process.

4.3 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT NO. 59 OF 2008), AS AMENDED [NEMWA]

NEMWA aims to *inter alia* protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development, to provide for specific waste management measures, to provide for the licensing and control of waste management activities, to provide for the remediation of contaminated land, and to provide for compliance and enforcement.

In terms of Section 19(1) of the Act, the Minister published a list of waste management activities which have, or are likely to have a detrimental effect on the environment on 03 July 2009 (GN No. R 718 of July 2009). As such no person may commence, undertake or conduct a waste management activity, except in accordance with the requirements or standards determined in terms of Section 19(3) for that activity or a Waste Management License (WML) issued in respect of that activity, if a license is required (Section 20 of NEMWA).

The proposed development at this stage does not require a WML.

[2] DEAT (2004) Overview of Integrated Environmental Management, Integrated Environmental Management, Information Series 0, Department of Environmental Affairs and Tourism (DEAT), Pretoria.

4.4 NATIONAL WATER ACT, 1996 (ACT NO. 36 OF 1996) (NWA)

The NWA recognises that water is a scarce and unevenly distributed national resource and that while water is a natural resource that belongs to all people, the discriminatory laws and practices of the past have prevented equal access to water, and use of water resources. The NWA gives expression to National Government's overall responsibility for and authority over the nation's water resources and their use, including the equitable allocation of water. The ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users and that the protection of the quality of water resources is necessary to ensure sustainability in the interests of all water users. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in responsible ways.

In terms of Section 21 of the NWA, a water use must be licensed unless it is listed in Schedule I, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. The following water uses are listed in Section 21:

a) Taking water from a water resource;
b) Storing water;
c) Impeding or diverting the flow of water in a watercourse;
d) Engaging in a stream flow reduction activity contemplated in section 36;
e) Engaging in a controlled activity identified as such in section 37 (1) or declared under section 38 (1);
f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
g) Disposing of waste in a manner which may detrimentally impact on a water resource;
h) Disposing in any manner of water which contains waste from, or which has been heated in any industrial or power generation process;
i) Altering the bed, banks, course or characteristics of a watercourse;
j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
k) Using water for recreational purposes.

Based on the project description, the proposed activities may require a Water Use License (WUL) from the Department of Water & Sanitation (DWS) as the Nseleni Power Corporation (Pty) Ltd [14/12/16/3/3/2/2032] NIFPP and associated infrastructure would trigger the following Section 21 water uses, and they are not regarded as either an existing water use or permissible in terms of a General Authorisation (GA):

a) Taking water from a water resource;
c) Impeding or diverting the flow of water in a watercourse;
e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1): 37(1)(c) A power generation activity which alters the flow regime of a water resource;
f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
g) Disposing of waste in a manner which may detrimentally impact on a water resource;
h) Disposing in any manner of water which contains waste from, or which has been heated in any industrial or power generation process; and,
i) Altering the bed, banks, course or characteristics of a watercourse.

4.5 NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT, 2004 (ACT NO. 39 OF 2004) [NEMAQA]

The objectives of the Act are to:

- Protect the environment by providing reasonable measures for:
    - The protection and enhancement of the quality of air in the Republic;

- The prevention of air pollution and ecological degradation; and
- Securing ecologically sustainable development while promoting justifiable economic and social development; and

- Generally to give effect to the Constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and well-being of people.

In terms of Section 21(1)(a) and 21(3)(a) and (b) of the Act, the Minister published a list of activities and associated minimum emission standards in March 2010 (GN No. R 248 of March 2010). As such, no person may without a provisional atmospheric emission license or an Atmospheric Emission License (AEL) conduct an activity listed on the national list anywhere in the Republic, or listed on the list applicable to a province anywhere in that province (Section 22 of NEMAQA).

The proposed NIFPP and associated infrastructure (Nseleni Corporation (Pty) Ltd: 14/12/16/3/3/2/2032) will require an AEL from the King Cetshwayo District Municipality (KCDM) as it triggers listed activities subcategory 1.4 – gas combustion installations and subcategory 2.4 - all liquid storage facilities with combined storage of greater than 1000 m³ (see below) in terms of the list of activities (GN No. R 248 of March 2010).

4.5.1 SUB-CATEGORY 1.4: GAS COMBUSTION INSTALLATIONS

Description:	Gas combustion (including gas turbines burning natural gas) used primarily for steam raising or electricity generation.		
Application:	All installations with design capacity equal to or greater than 50 MW heat input per unit, based on the lower calorific value of the fuel used.		
Substance or mixture of substances		**Plant status**	**mg/Nm³ under normal conditions of 3% O_2 , 273 Kelvin and 101.3 kPa.**
Common name	**Chemical symbol**		
Particulate matter	NA	New	10
		Existing	10
Sulphur dioxide	SO_2	New	400
		Existing	500
Oxides of nitrogen	NO_X expressed as NO_2	New	50
		Existing	300

(a) The following special arrangements shall apply –

(i) Reference conditions for gas turbines shall be 15% O_2, 273K and 101.3kPa.

(ii) Where co-feeding with waste materials with calorific value allowed in terms of the Waste Disposal Standards published in terms of the Waste Act, 2008 (Act No.59 of 2008) occurs, additional requirements under subcategory 1.6 shall apply.

4.5.2 SUB-CATEGORY 2.4: STORAGE AND HANDLING OF PETROLEUM PRODUCTS

(4) *Subcategory 2.4: Storage and Handling of Petroleum Products*

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

Leak detection and repair (LDAR) program approved by licensing authority to be instituted, by 01 January 2014.

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

(i) Storage vessels for liquids shall be of the following type:

Application	All permanent immobile liquid storage facilities at a single site with a combined storage capacity of greater than 1000 cubic meters.
True vapour pressure of contents at product storage temperature	**Type of tank or vessel**
Type 1: Up to 14 kPa	Fixed-roof tank vented to atmosphere, or as per Type 2 and 3
Type 2: Above 14 kPa and up to 91 kPa with a throughput of less than 50'000 m³ per annum	Fixed-roof tank with Pressure Vacuum Vents fitted as a minimum, to prevent "breathing" losses, or as per Type 3
Type 3: Above 14 kPa and up to 91 kPa with a throughput greater than 50'000 m³ per annum	a) External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20m, or b) fixed-roof tank with internal floating deck / roof fitted with primary seal, or c) fixed-roof tank with vapour recovery system.
Type 4: Above 91 kPa	Pressure vessel

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

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

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

(i) All installations with a throughput of greater than 50'000 m³ per annum of products with a vapour pressure greater than 14 kPa, must be fitted with vapour recovery / destruction units. Emission limits are set out in the table below -

Description:	Vapour Recovery Units		
Application:	All loading/ offloading facilities with a throughput greater than 50 000 m³		
Substance or mixture of substances		**Plant status**	**mg/Nm³ under normal conditions of 273 Kelvin and 101.3 kPa.**
Common name	**Chemical symbol**		
Total volatile organic compounds from vapour recovery/ destruction units using thermal treatment.	N/A	New	150
		Existing	150
Total volatile organic compounds from vapour recovery/ destruction units using non-thermal treatment.	N/A	New	40 000
		Existing	40 000

(ii) For road tanker and rail car loading / offloading facilities where the throughput is less than 50'000 m³ per annum, and where ambient air quality is, or is likely to be impacted, all liquid products shall be loaded using bottom loading, or equivalent, with the venting pipe connected to a vapour balancing system. Where vapour balancing and / or bottom loading is not possible, a recovery system utilizing adsorption, absorption, condensation or incineration of the remaining VOC's, with a collection efficiency of at least 95%, shall be fitted.

4.6 OTHER RELEVANT NATIONAL LEGISLATION

4.6.1 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004) [NEMBA]

The objectives of the Act are:

- To provide for:
  - The management and conservation of biological diversity within the Republic and of the components of such biological diversity;
  - The use of indigenous biological resources in a sustainable manner; and
  - The fair and equitable sharing among stakeholders of benefits arising from bioprospecting involving indigenous biological resources;
- To give effect to ratified international agreements relating to biodiversity which are binding on the Republic;
- To provide for co-operative governance in biodiversity management and conservation; and,
- To provide for a South African National Biodiversity Institute to assist in achieving the objectives of the Act.

The proposed location of land-based structures, such as the pylons for the power transmission line and the new substation may impact on sensitive ecosystems, fauna and/or flora. The Biodiversity Assessment to be undertaken during the EIA Phase will highlight if any activities or actions are required in terms of NEMBA. NEMBA permits would be the responsibility of Nseleni Power Corporation (Pty) Ltd [14/12/16/3/3/2/2032].

4.6.2 NATIONAL HERITAGE RESOURCES ACT, 1999 (ACT NO. 25 OF 1999) [NHRA]

A few of the objectives of the Act are to introduce an integrated and interactive system for the management of the national heritage resources and empower civil society to nurture and conserve their heritage resources so that they may be bequeathed to future generations. The Act further lays down general principles for governing heritage resources management throughout the Republic; enables the provinces to establish heritage authorities which must adopt powers to protect and manage certain categories of heritage resources; and provides for the protection and management of conservation-worthy places and areas by local authorities.

The NHRA states in Section 38 that the relevant heritage resources authority must be notified of the proposed development/ activities where such activities trigger either of the following:

- The construction of a linear development (e.g. road, wall, etc.) or barrier exceeding 300m in length;
- The construction of a bridge or similar structure exceeding 50m in length;
- Any development or activity which will change the character of a site:
  - Exceeding 5 000m^2 (½ha) in extent; or
  - Involving 3 or more existing erven or subdivision thereof; or
  - Involving 3 or more existing erven or subdivision thereof which have been consolidated within the past 5 years; or
- The rezoning of a site exceeding 10 000m^2 (1ha) in extent.

Thus, the implication of the NHRA will be investigated by a Heritage Impact Assessment Practitioner during the EIA Phase of the S&EIR application process, as the proposed activities may significantly alter the character of the site.

4.6.3 NATIONAL ENVIRONMENTAL MANAGEMENT: INTEGRATED COASTAL MANAGEMENT ACT, 2008 (ACT NO. 24 OF 2008) [NEMICMA]

The objectives of the Act are:

- To determine the coastal zone of the Republic;

- To provide for the co-ordinated and integrated management of the coastal zone by all spheres of government;
- To preserve, protect, extend and enhance the status of coastal public property;
- To secure equitable access to the opportunities and benefits of coastal public property; and,
- To give effect to the Republic's obligations in terms of international law regarding coastal management and the marine environment.

In terms of Section 70 of NEMICMA no person may dump any waste or other material at sea or even load this material on a vessel/ ship with the intention of dumping at sea, without a Dumping Permit issued in terms of Section 71 of the Act. The proposed project (Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033) may require a Dumping at Sea Permit. The authority issuing the Dumping Permit must take into account the following before making a decision:

- The Waste Assessment Guidelines set out in Schedule 2 of the Act;
- Any coastal management programme applicable in the area;
- The likely environmental impact of the proposed activity;
- National legislation dealing with waste;
- The interests of the whole community;
- Transboundary impacts and international obligations and standards; and,
- Any other factors that may be prescribed.

Schedule 2 of the Act presents the guidelines for reducing the necessity for dumping at sea in accordance with Schedule II to the Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters adopted on 7 November 1996. Of particular relevance is the need to establish the following during the assessment of the alternatives to dumping at sea:

- The types, amounts and relative hazard of wastes generated;
- The feasibility of the following waste reduction techniques;
- Destruction of hazardous constituents;
- Treatment to reduce or remove the hazardous constituents; and,
- The practical availability of other means of disposal should be considered in the light of a comparative risk assessment involving both dumping at sea and the alternatives.

In addition, a detailed description and characterisation of the waste is an essential precondition for the consideration of alternatives and the basis for a decision as to whether a waste may be dumped. If a waste is so poorly characterised that a proper assessment cannot be made of its potential impacts on health and the environment, that waste may not be dumped. Characterisation of the wastes and their constituents must take into account -

- Origin, total amount, form and average composition;
- Properties: physical, chemical, biochemical and biological;
- Toxicity;
- Persistence: physical, chemical and biological; and,
- Accumulation and biotransformation in biological materials or sediments.

4.6.4 NATIONAL FOREST ACT, 1998 (ACT NO. 84 OF 1998) (NFA)

The objectives of the Act are:

- Promote the sustainable management and development of forests for the benefit of all;
- Create the conditions necessary to restructure forestry in State forests;
- Provide special measures for the protection of certain forests and trees;
- Promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes;
- Promote community forestry; and,

- Promote greater participation in all aspects of forestry and the forest products industry by persons disadvantaged by unfair discrimination.

The NFA has listed a number of protected trees (latest listing: Government Gazette Notice No. R. 1602 of 23 December 2016) that require a permit from DEFF prior to the disturbance or destruction of any protected tree. The following protected trees (identified in the immediate surrounding areas) may require permits from DEFF, issued to Nseleni Power Corporation (Pty) Ltd [14/12/16/3/3/2/2032], prior to the commencement of activities that specifically impact on the trees identified:

- *Ficus tricopoda* (Swamp Fig);
- Various Mangrove Tree species; and,
- *Sclerocarya birrea* subsp. *caffra* (Marula).

4.6.5 NATIONAL ENERGY ACT, 2008 (ACT NO. 34 OF 2008)

The Act requires that diverse energy resources are available in sustainable quantities and at affordable prices in South Africa. In addition, the Act provides for the increased use of renewable energies, contingency energy supplies, the holding of strategic energy feedstock and carriers, and adequate investment in energy infrastructure.

4.7 RELEVANT PROVINCIAL AND MUNICIPAL LEGISLATION

4.7.1 NATAL NATURE CONSERVATION ORDINANCE (NO. 15 OF 1974)

In terms of Chapter XI: Indigenous Plants, the removal and/or relocation of possible individuals of Large Yellow Eulophia (*Eulophia speciosa*), i.e. orchid (found on the adjacent Bayside site) requires a permit from Ezemvelo KZN Wildlife. The White Arum Lily (*Zantedeschia aethiopica)* (Regionally Protected) may occur in marshy habitats corresponding with wetland areas and would also require a permit prior to any disturbances. The Biodiversity Assessment to be undertaken will identify any protected flora and/or fauna that require permits prior to disturbance. If required, Nseleni Power Corporation (Pty) Ltd [14/12/16/3/3/2/2032] would apply for such permits.

4.7.2 ENVIRONMENTAL HEALTH BYLAWS

4.7.2.1 City of uMhlathuze Environmental Health Bylaws

The main purpose of the Environmental Health Bylaws is to enable the Council to protect and promote the long-term health and well-being of people in the municipal area. Section 10 of the Bylaws allows the Council to list "Potentially Hazardous Uses" or activities. As such, any person who uses premises in a manner or for a purpose listed in Annexure B (Potentially Hazardous Uses or "Scheduled Trades") must obtain a Public Health Permit before commencing that use and must comply with the terms and conditions of that permit (Section 13(1)) as well as Chapter 9 of the Bylaws.

The project may trigger the following activities listed in Annexure B: Scheduled Trades of the Environmental Health Bylaws:

48. The handling or storage of any substance or material which can lead to a public health hazard.

4.7.3 WATER SERVICES BYLAWS

4.7.3.1 uThungulu District Municipality – Water Services Bylaws (May 2003)

Section 76 of the Water Services Bylaws imposes additional conditions that must be adhered too, over and above conditions imposed in terms of the NWA. One such condition is compliance with the standards and criteria as set out in Schedule B of the Bylaws.

4.8 RELEVANT SOUTH AFRICAN POLICIES, PROGRAMMES, PLANS AND GUIDELINES

4.8.1 WHITE PAPER ON THE ENERGY POLICY, DECEMBER 1998

The White Paper was developed so as to clarify government policy regarding the supply and consumption of energy for the next decade. It was intended to address all elements of the energy sector as practically as it could. This White Paper gives an overview of the South African energy sector's contribution to GDP, employment, taxes and the balance of payments. It concludes, that the sector can greatly contribute to a successful and sustainable national growth and development strategy. The main objectives of the White Paper are the following:

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

The proposed NIFPP will address and positively contribute to all of the main objectives listed above, refer to Section 3: Need and Desirability for more details.

4.8.2 INTEGRATED ENERGY PLAN (IEP)

The IEP is a multi-faceted, long-term energy framework which takes into consideration the crucial role that energy plays in the entire economy and is informed by the output of analyses founded on a solid fact base. The IEP was undertaken to determine the best way to meet current and future energy service needs in the most efficient and socially beneficial manner. The IEP has multiple 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 and the development of energy infrastructure in South Africa; and,
- 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.

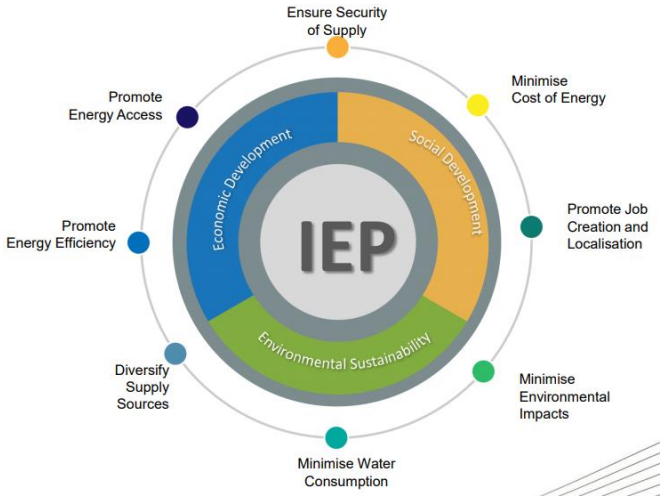


Figure 17: 8 key energy planning objectives as highlighted in the Integrated Energy Plan (2016)

The proposed NIFPP will address and contribute to all of the 8 key energy planning objectives as reflected in Figure 17 above, refer to Section 3: Need and Desirability for more details.

4.8.3 INTEGRATED RESOURCE PLAN (IRP) 2019

The IRP is an electricity infrastructure development plan based on least cost supply and demand balance taking into account security of supply and the environment (minimize negative emissions and water usage). The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development. Following the promulgation of the IRP 2010–2030, implementation followed in line with Ministerial Determinations issued under Section 34 of the Electricity Regulation Act, 2006 (Act No. 4 of 2006). The Ministerial Determinations give effect to planned infrastructure by facilitating the procurement of the required electricity capacity. Since the promulgated IRP 2010–2030, the following capacity developments have taken place:

- A total 6 422 MW under the Renewable Energy Independent Power Producers Programme (REIPPP) has been procured, with 3 876 MW operational and made available to the grid.
- In addition, IPPs have commissioned 1 005 MW from two Open Cycle Gas Turbine (OCGT) peaking plants.
- Under the Eskom build programme, the following capacity has been commissioned:
    - 1 332 MW of Ingula pumped storage;
    - 1 588 MW of Medupi, 800 MW of Kusile; and,
    - 100 MW of Sere Wind Farm.
- In total, 18 000MW of new generation capacity has been committed to.

Besides capacity additions, a number of assumptions have changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. These changes necessitated the review and update of the IRP. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity (refer to Table 6 for timelines).

Coal: Beyond Medupi and Kusile coal will continue to play a significant role in electricity generation in South Africa in the foreseeable future as it is the largest base of the installed generation capacity and it makes up the largest share of energy generated.

Nuclear: Koeberg Power Station reaches end of design life in 2024. The development of small nuclear units elsewhere in the world is therefore particularly interesting for South Africa, and upfront planning with regard to additional nuclear capacity is requisite, given the >10-year lead time, for timely decision making and implementation.

Natural Gas: Gas to power technologies in the form of CCGT, CCGE or ICE provide the flexibility required to complement renewable energy. While in the short term the opportunity is to pursue gas import options, local and regional gas resources will allow for scaling up within manageable risk levels. Exploration to assess the magnitude of local recoverable shale and coastal gas are being pursued and must be accelerated.

Renewable Energy: Solar PV, wind and Concentrated Solar Power with storage present an opportunity to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Renewable technologies also present huge potential for the creation of new industries, job creation and localisation across the value chain.

Hydro: South Africa's rivers carry potential for run-off river hydro projects.

Energy Storage: The traditional power delivery model is being disrupted by technological developments related to energy storage, and more renewable energy can be harnessed despite the reality that the timing of its production might be during low-demand periods. Storage technologies including battery systems, compressed air energy storage, flywheel energy storage, hydrogen fuel cells etc. are developments which can address this issue, especially in the South African context where over 6 GW of renewable energy has been introduced, yet the power system does not have the requisite storage capacity or flexibility.

4.8.3.1 Key considerations and actions from the IRP 2019 which are relevant in terms of the proposed NIFPP:

Decision 1: Undertake a power purchase programme to assist with the acquisition of capacity needed to supplement Eskom's declining plant performance and to reduce the extensive utilisation of diesel peaking generators in the immediate to medium term. Lead-time is therefore key.

Decision 7: To support the development of gas infrastructure and in addition to the new gas to power capacity, convert existing diesel-fired power plants (Peakers) to gas.

Decision 9: In support of regional electricity interconnection including hydropower and gas, South Africa will participate in strategic power projects that enable the development of cross border infrastructure needed for the regional energy trading.

Table 6: IRP 2019

	Coal	Coal (Decommissioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37 149		1 860	2 100	2 912	1 474	1 980	300	3 830	499
2019	2 155	-2373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1 433	-557				114	300			
2021	1 433	-1403				300	818			
2022	711	-844			513	400 1000	1600			
2023	750	-555				1000	1600			500
2024			1860				1600		1000	500
2025						1000	1600			500
2026		-1219					1600			500
2027	750	-847					1 600		2000	500
2028		-475				1000	1 600			500
2029		-1694			1575	1000	1 600			500
2030		-1050		2 500		1 000	1 600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33364		1860	4600	5000	8288	17742	600	6380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

Installed Capacity
Committed / Already Contracted Capacity
Capacity Decommissioned
New Additional Capacity
Extension of Koeberg Plant Design Life
Includes Distributed Generation Capacity for own use

- 2030 Coal Installed Capacity is less capacity decommissioned between years 2020 and 2030
- Koeberg power station rated / installed capacity will revert to 1926 MW (original design capacity) following design life extension work.
- Other / Distributed generation includes all generation facilities in circumstances in which the facility is operated solely to supply electricity to an end-use customer within the same property with the facility
- Short term capacity gap is estimated at 2000 MW

The model is unable to deploy gas to complement renewables as it is assumed gas will only be available from year 2024.

Risk and mitigation considerations within the IRP as they pertain to gas

Gas	The availability of gas in the short to medium term is a risk as South Africa does not currently have gas resources. There is also a supply and foreign exchange risk associated with likely increase in gas volumes depending on the energy mix adopted post 2030 when a large number of coal fired power stations are decommissioned.	• For the period up to 2030 gas to power capacity in the IRP has realistically taken into account the infrastructure and logistics required around ports/pipelines, electricity transmission infrastructure. The IRP has therefore adjusted the lead times. • As proposed in the draft IRP update, work to firm up on the gas supply options post 2030 is ongoing. This work will inform in detail the next iteration of the IRP.

The proposed NIFPP will significantly contribute to the Natural Gas component of the energy mix as well as assist with key decisions 1, 7 and 9 as listed above. Refer to Section 3: Need and Desirability for more details.

4.8.4 2035 KZN PROVINCIAL GROWTH AND DEVELOPMENT STRATEGY (2016)

The KZN's Provincial Growth and Development Strategy (PGDS) is concisely summarised in the figure below. Of particular relevance to this project is "***Strategic Objective 4.5: Ensure access to affordable, reliable, sustainable and modern energy for all. Sufficient electricity is available for the growth and development needs of KZN***". The PGDS states that energy supply in the province, and country, is becoming increasingly expensive for both domestic and business/industrial consumers, and this is exacerbated by the lack of investment in electricity infrastructure (new and maintenance of existing infrastructure). It highlights that the province must prioritise alternative energy projects and/or programmes as a reliable supply of energy. Alternative energy supply or the green economy must become measurable within the Provincial Growth and Development Plan.

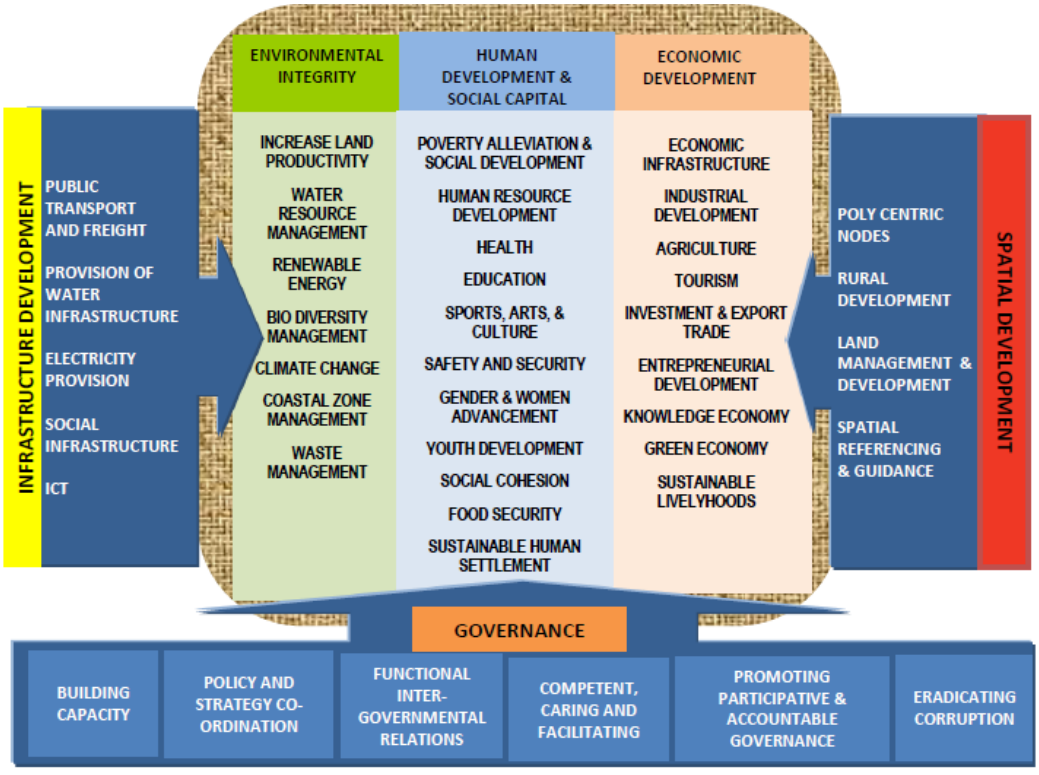


Figure 18: KZN Provincial Growth and Development Strategy

The NIFPP will significantly contribute to the overall sustainability and security of electricity within the KZN province. Refer to Section 3: Need and Desirability for more details.

4.8.5 KING CETSHWAYO DISTRICT MUNICIPALITY INTEGRATED DEVELOPMENT PLAN (2019/20 – 2021/22)

The KCDM IDP's Vision is "*By 2035 King Cetshwayo District Municipality will be a cohesive; economically viable district, with sustainable strategic infrastructure; supporting job creation through radical economic transformation rural development and promotion of our heritage*".

KCDM's mission is that it will serve its communities to create a prosperous district through:

- Provision of sustainable; quality water and sanitation services;
- Developing the economy through radical economic transformation and job creation;
- Promoting rural development; agrarian reform and food security;
- Co-ordinate planning, spatial equity and environmental sustainability; and,
- Promoting heritage, community participation, nation building and good governance.

The articulated vision of the KCDM is as follows:
By 2035, King Cetshwayo district is renowned for the vastly improved socio-economic status of its residents resulting from 15 years of sustained economic growth. The district is internationally recognized as a world leader in innovative and sustainable manufacturing based on the successful implementation of the RBIDZ initiative. This economic growth, together with the district rural development programme resulted in the creation of decent employment opportunities leading to the fastest growing household and individual income levels in the province, and reducing the unemployment rate of the youth in the district by more than 50%. It also resulted in a significant decrease in the economic dependency ratio and improving the overall quality of life in the district. The economic growth is underpinned by a vastly improved information and telecommunication infrastructure network with the entire district having access to a wireless broadband service, all businesses, and more than 50% of households with access to a computer and internet service. By 2035, the district is characterised by a high-quality infrastructure network supporting both household needs and economic growth. All households are provided with access to appropriate water infrastructure, adequate sanitation, and sustainable energy sources. Improved access to health facilities and quality of health services provided resulted in continually improving health indictors in the district. The quality of the output from the primary and secondary education system has improved dramatically and all learners have access to fully equipped primary and secondary education facilities. Sustainable and coherent spatial development patterns have been successfully implemented through innovative spatial planning frameworks and effective land use management systems implemented by highly skilled officials. Improved public sector management and skills levels resulted in sound local governance and financial management.

The KCDM IDP specifically emphasises that the national energy crises has far reaching implications on the supply and maintenance of infrastructure services to the district, notable the cost for stand by generators at pump stations as well as the running costs of such generators. The environmental costs of increased combustion into the atmosphere as a result of generator operations was also highlighted as a risk to be considered.

The proposed NIFPP will contribute to the 2035 vision of the District Municipality through the provision of sustainable and assured supply of electricity for supporting households and economic growth envisioned. Refer to Section 3: Need and Desirability for more details

4.8.6 CITY OF UMHLATHUZE FINAL IDP REVIEW 2019/2020 (2ND REVIEW OF THE 2017/2022 IDP)

The City of uMhlathuze has produced the Integrated Development Plan (IDP), in order to further their vision: "The Port City of uMhlathuze offering improved quality of life for all its citizens through sustainable development." The IDP review highlights the Sustainable Development Goals (SDG) offer major improvements on the Millennium Development Goals

(MDGs). The SDG framework addresses key systemic barriers to sustainable development such as inequality, unsustainable consumption patterns, weak institutional capacity, and environmental degradation that the MDGs neglected. As such, the City of uMhlathuze have outlined how their interventions will align with the SDGs. The following is of relevance to this proposed project:

7.	Ensure access to affordable, reliable and modern energy for all.		• Energy Master Plan • Target reduction of 30% of coal powered stations by 2030 • 2000MW Gas to Power • Renewable Energy Efficiency initiatives • Waste to Energy Project • Energy infrastructure upgrade
13.	Take urgent action to combat climate change and its impacts.	Optimal management of natural resources and commitment to sustainable environmental management.	• Climate Change Action Plan • International Partnerships and collaborations (ICELI) • Adaptation and Mitigation Programme • Accelerating low emission development • Responding with adaption initiatives • Urban Air Quality Management • Signed Global Compact of Mayors • Gas to Power Project • Waste Water Reuse

Figure 19: Extracts from the table within the IDP review that highlights the alignment between the SDGs and the City of uMhlathuze's Strategic Framework.

The proposed NIFPP will assist in meeting the gas to power target of 2000MW, which in addition may also lead to a reduced dependence on electricity from the Highveld coal powered stations. LNG is also known to be a cleaner and more environmentally friendly alternative to coal and other fossil fuels. This will also assist with reducing air quality and knock-on climate change impacts. Refer to Section 3: Need and Desirability for more details.

4.8.7 ENVIRONMENTAL MANAGEMENT FRAMEWORK FOR THE RICHARDS BAY PORT EXPANSION AND INDUSTRIAL DEVELOPMENT ZONE – ADOPTED 01 DECEMBER 2015

This Environmental Management Framework (EMF) was compiled in 2011, for an area of 25 000ha, containing the Richards Bay Port and Industrial Development Zone (IDZ). The overall objective of the EMF is to "secure environmental protection and promote sustainability and cooperative environmental governance"[3]. The baseline assessment showed that the study area has four distinct landscape features, namely floodplain on low-lying areas, coastal plain on higher ground, coastal dunes and surface water features. The adjoining oceans make up the fifth distinct feature and, although not part of the EMF, interacts with and influence the characteristics of the area. Within these broad areas there are distinct sub-areas that are defined by biophysical, economic and social factors. The EMF focused on these subareas to distinguish them from each other in terms of how they are used, their environmental sensitivity, their respective opportunities and constraints, and the expectations that stakeholders have for them. This focus was necessary to establish the way they should be managed in future to realize the EMF vision. The result of this process is eight environmental management zones that spatially depict sensitive environmental features and attributes, and land use characteristics of the area (Figure 20). A ninth management zone has been created as an overlay to address issues of conflicting and long-term land use proposals (Figure 20).

[3]DAERD (2011) Environmental Management Framework for the Richards Bay Port Expansion Area and Industrial Development Zone. Department of Agriculture, Environmental Affairs and Rural Development (DAERD), Pietermaritzburg, South Africa.

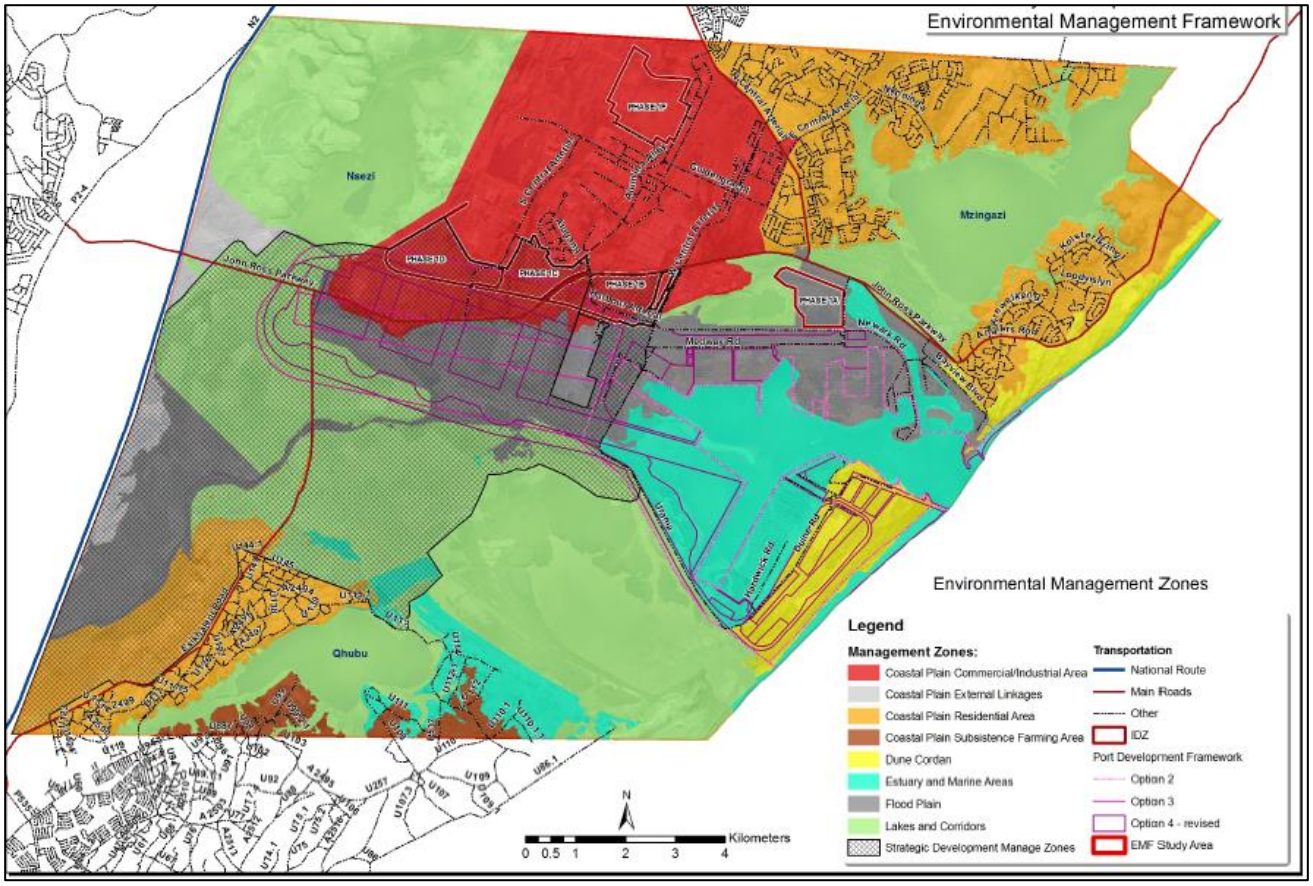


Figure 20: Environmental Management Zones as well as well as the Strategic Development Management Zone of the Richards Bay Port Expansion and IDZ EMF.

Zone 3: Port Estuarine, Marine & Seashore Area: Figure 21 below highlights the environmental sensitivities applicable to the study area for the proposed NIFPP.

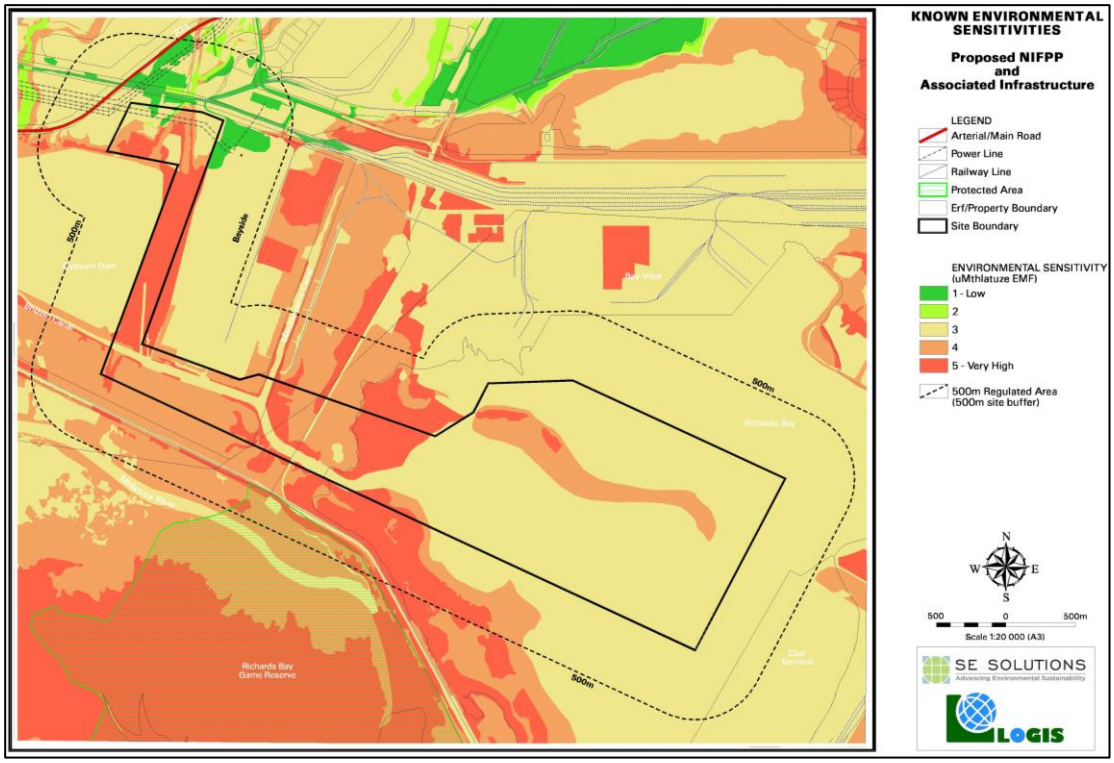


Figure 21: Environmental sensitivity of Zone 3 as per the Richards Bay Port Expansion and IDZ EMF.

Table 7 highlights the assessment issues and decision-making criteria within this zone, while Table 8 provides the strategic management guidelines that should be considered for all development within this zone.

Table 7: Sustainability criteria for Zone 3.

DECISION-MAKING CRITERIA FOR THE PORT ESTUARY, MARINE AND SEASHORE AREA (ZONE 3)			
Sustainability Objective (Policy Priorities)	**Strategic Issues**	**Sensitive attributes** (Assessment issues)	**Thresholds** (Measurement endpoints)
1. Protect the quality and character of the landscape	Conservation Priorities	• Character of the landscape (areas of high visual quality and/or scenic value, as well as sense of place). • The interaction between the estuary and the coastal plain, lakes in the area and the marine environment. • Hydrodynamic features and changes in the hydrodynamic functioning of the port • Coastal erosion	• Development should not significantly impact on the landscape or townscapes, changing the sense of place. • Development should not disturb the hydrological linkages it contains with the coastal plain, the area's lake systems or the marine environment.
2. Protect the hydrological functioning of the area (including water quality and quantity)		• Hydrological functioning of the estuarine systems • Water quality of the estuaries • Flow and water quality of hydrological linkages entering the system • The area where the Mhlathuze enters the Sanctuary (Mhlathuze Lagoon) • Tidal prism	• Development should not impair the hydrological functioning of the estuary • Development should not affect water quality and/or the Sanctuary. • There should be 100% compliance with water quality guidelines
3. Protect critical ecological assets to maintain biodiversity integrity		• Formal conservation areas • Mangrove forests (critically endangered vegetation types) • Estuarine habitats • Intertidal habitat productivity	• Development should not impact/destroy the remaining ecological assets (critical habitats) in the area. • Development should not compromise the future of the conservation area. • 100% of mangrove forests are protected
4. Protect atmospheric integrity and air quality in the interest of local people	Consumption & Production	• Shipping emissions • Air quality limits and/or emission standards	• Development should not exceed local air quality guidelines (cumulative impact) and it must comply with national emission standards. • Indicators as defined for air quality (emission standards)
5. Promote sustainable consumption and production patterns whilst rectifying the results of past practices.		• Energy efficiency of sectors • Waste streams and disposal • Pollution potential of activities (air, water and land) to ground and surface water. • Existing waste management infrastructure and services	• Improvement in energy efficiency as per the demand side energy targets for sectors specified in the Mhlathuze Energy Strategy (2009) • Development must manage and minimise waste streams • 0 waste to landfill policy with targets of 50% reduction by 2012 and 0% waste by 2020.
6. Protect community needs & secure sustainable livelihoods 7. Protect the interests of the Port of Richards Bay 8. Protect the interest of industrial development. 9. Protect the interests of locally important development (tourism and recreation. 10. Protect and maintain services infrastructure	Development Priorities	• Port Development Framework • SDF and other development plans and proposals • Areas that have recreational value to communities. • Areas that have subsistence value to communities.	• Development should not have detrimental impact on the value of, or access to, recreational areas that are important to communities. • Development should not have detrimental impact on the value of, or access to, resources that have subsistence value to communities.
11. Promote integrated planning and improve coordination between relevant stakeholders to achieve the sustainability objectives.	Institutional Capacity	• Port access control legislation and protocols • Transnet Sustainability Framework and associated environmental management programmes • Arrangements for the implementation, management and monitoring of offsets	• Decisions that are made in respect of offsets without a national offset policy is an institutional risk with potential ecological consequences. • Decisions that ignore the impact of development on the whole study area should be discouraged.
12. Manage risks and uncertainties 13. Build resilience in the landscape to adapt to climate change and sea level rise	Uncertainty	• Flood cycles • Landscape-level ecosystem risks • Sea level rise • The historical floodplain delineation (2m contour) and the potential impact of sea level rise on parcels of land over time.	• Development should not reduce the ecosystem's resilience and ability to adapt to changes associated with global warming and sea level rise.

Table 8: Strategic Management Guidelines for Zone 3.

Strategic Issues	Guideline	Responsibility
Conservation Priorities	**Critical ecological assets and linkages** must be protected and managed in this zone by: • Discouraging activities that would cause irreparable damage to remaining ecological assets as identified in the EMF and/or assets that are currently protected in the City's Environmental Service Management Plan; • Discouraging activities that would impair the hydrological functioning and ecological integrity of the Mhlathuze River and the Mzingazi canal; • Discouraging uncontrolled resource harvesting; • Implementing buffers zones around key assets to reduce disturbances; • Implementing a precautionary management strategy for biodiversity offsets to facilitate a no net loss policy and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity; • Implementing the best practice guidelines and recommendations for land use planning and management of specific coastal features and aspects of development as specified in local guidelines (CSIR, 2006: Schoonees et al, 2008; and CPEC, 2008); and • Initiating the development of an Estuary Management Plan in terms of the Integrated Coastal Management Act (2008) for the Port Estuary.	• The City of uMhlathuze • Ezemvelo KZN Wildlife • Provincial Environmental Affairs (DAERD) • Transnet • Landowners/Developers
Consumption & Production	Current and future **waste and pollution streams** in this zone must be managed by: • Strengthening port environmental management programmes to manage the range of environmental issues associated with port construction such as water pollution, contamination of bottom sediments, loss of bottom biota, damage to fisheries, beach erosion, waste discharges, oil leakages and spillage, hazardous materials, air emissions, noise and odour, etc; • Adhering to minimum emission standards as promulgated by national government (GN 248 of 31 March 2010); and • Ensuring that development proposals adjacent to this zone minimise and/or avoid waste and pollution that may negatively impact water quality through appropriate design measures.	• The City of uMhlathuze • Provincial Environmental Affairs (DAERD) • Transnet • Landowners/Developers
Development Priorities	The **port expansion potential** in this zone and the associated offset proposals must be managed by: • Implementing a precautionary management strategy for biodiversity offsets to facilitate a no net loss policy and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity; • Taking into account the draft policy documents and Best Practice Guidance that were developed by relevant authorities and other organisations as listed in Addendum 8 of this report; and • Adhering to the desired state and guidelines as specified in Zone 9 of the EMF.	• The City of uMhlathuze • Ezemvelo KZN Wildlife • Provincial Environmental Affairs (DAERD) • National Department of Environmental Affairs • SANBI • Transnet
	Planning must ensure that **tourism and recreational development** is sustainable over the long-term. This must be achieved by: • Ensuring that development is compatible with the long-term port development objectives and plans (50 years+) and the potential impact that this may have on short-term proposals; • Discouraging proposals that may significantly reduce public access to recreational assets; • Encouraging low-density tourism and recreational activities; • Incorporating the potential impact that port operations, specifically nuisance factors such as noise, dust and visual impacts, may have on the establishment of development; • Ensuring that the layout and design of development proposals have incorporated current knowledge and scenarios of sea level rise; • Ensuring that the layout & design of development proposals secure adequate access to the variety of landscape features that are presently available; and • Implementing measures to control the quality of stormwater runoff.	• The City of uMhlathuze • Ezemvelo KZN Wildlife • Provincial Environmental Affairs (DAERD)
Institutional Capacity	Due to the adverse impacts that are expected with port expansion appropriate **institutional arrangements for achieving conservation priorities** must be designed and implemented by: • Addressing the "policy vacuum" that exist on a national level to give effect to offsets by implementing the desired state and guidelines as specified in Zone 9 of the EMF.	• The City of uMhlathuze • Ezemvelo KZN Wildlife • Provincial Environmental Affairs (DAERD) • National Environmental Affairs • SANBI • Transnet • Landowners • Scientific Community
Uncertainty	Due to the long-term risks that **climate change and sea level** rise pose to this area, the long-term sustainability of all developments in this zone must be secured by: • Assessing the adaptive capacity, impacts and risk tolerance of proposed projects in this zone making use of the sea level rise estimates that were undertaken for the area (Mather & Smith, 2009); • Ensuring that development has capacity to adapt to change by employing appropriate design and engineering measures; • Ensuring that the layout and design of development proposals have considered current knowledge and scenarios of sea level rise; • Implementing mitigating and adaptation measures through various engineering and ecological management methods (such as artificial manipulation of environments); • Reviewing and implementing appropriate setback lines and natural buffers; and • Considering the recommendations made by the City's Climate Change Strategy (uMhlathuze, 2009).	• All role-players
	Due to the vulnerability of the area and its interconnectedness with asset systems beyond the zone on various scales, all assessments in this zone must carefully consider the area of impact, and report on cumulative impacts and **landscape risks**. This must be done by referring to the following guideline documents : • DEAT (2002) Ecological Risk Assessment, Integrated Environmental Management, Information Series 6, Department of Environmental Affairs and Tourism (DEAT), Pretoria. • DEAT (2004) Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Department of Environmental Affairs and Tourism (DEAT), Pretoria.	• Environmental Assessment Practitioners (Consultants) • Decision-makers

This EIA is designed to investigate and assess the potential positive and negative impacts on environmentally sensitive areas; socio-economic aspects related to increased economic development and its knock-on effects on social issues. The specialist studies to be undertaken will provide a description of sensitive receptors and propose mitigation to either enhance positive impacts and/or reduce negative impacts. The above sustainability criteria and management guidelines will be taken into account to assist with the decision-making for this proposed project.

4.8.8 DRAFT UMHLATHUZE/ RICHARDS BAY ESTUARINE MANAGEMENT PLAN (NOVEMBER 2019)

The Estuarine Management Plan was developed in accordance with the provisions of the NEMICMA and the National Estuarine Management Protocol. This introductory chapter is followed by a synopsis of the Situation Assessment Report (largely summarised in Section 4.1.3 below). The Vision and Objectives to achieve the vision (or Goals) for estuarine management planning in the uMhlathuze/Richards Bay estuarine systems, as developed by the stakeholders, is provided. Overall management objectives, as well as associated actions to address those objectives are summarised, including objectives and proposed actions relating to awareness and education. Details on each of the proposed management actions to assist with the confirmation of specific priorities for implementation over the next five years are provided. The proposed zonation planning for the uMhlathuze/Richards Bay estuarine system, including the demarcation of protected areas, sensitive ecosystems as well as different use areas, is also provided. The Estuarine Management Plan also presents

an integrated monitoring plan, specifically related to environmental management in the uMhlathuze/Richards Bay estuarine system. The following highlights information pertinent to the proposed development of the NIFPP and its associated infrastructure.

4.8.8.1 Threats to biodiversity and socio-economic value

The estimated extent of existing (negative) impacts associated with identified threat (or issues) on the biodiversity and socio-economic value of the uMhlathuze/Richards Bay, as well as the status of existing legislation and management responses to mitigate such impacts, are summarised in Table 9.

Table 9: Estimated extent of existing (negative) impacts of identified threats on biodiversity and socio-economical value of the uMhlathuze and Richards Bay estuaries (depicted as H= high; M = medium; L = low), as well the status of existing legislation and management responses to mitigate such impact (G = good; F = fair; P = poor)

GROUPING	EXISTING THREAT/ISSUE	NEGATIVE IMPACT		EXISTING LEGISLATION	MANAGEMENT RESPONSE
		Biodiversity	Socio-Economic		
Loss and destruction of habitat	Dredging activities in Port	H	L	G	F
	New port infra-structure development	H	L	G	P
Exploitation of resources	Illegal gill netting and poaching of fish	H	H	F	P
	Illegal harvesting of mangroves	L	L	F	P
	Sand mining	L	M	P	P
Modification of freshwater inflows	Increased water abstraction	H	M	G	F
	Weirs and barriers in water courses	H	M	P	P
Deterioration of water quality	Contamination of ground water inflow	M	L	F	P
	Pollution from Hillendale Slimes Dam	M	L	G	P
	Pollution from industrial areas (water)	M	L	F	P
	Pollution from industrial areas (air)	M	M	F	P
	Pollution from dredging activities	M	L	G	G
	Pollution from cargo handling activities	M	L	F	P
	Pollution from agricultural activities	M	L	F	P
	Pollution from urban settlements (diffuse stormwater)	L	L	P	P
	Ballast water discharges	L	L	F	F
	Brine discharge (desalination)	L	L	F	F
	Pollution from alien vegetation treatment	H	M	F	P
	Pollution from marine aquaculture	L	L	F	P
Inappropriate Governance	Non-compliance and lack of enforcement	H	H	G	P
	Not fully enclosed formally protected areas	M	L	G	F
	Lack of trust and collaboration among stakeholders	H	H	F	P
	Lack of education and awareness initiatives	M	M	F	P
Climate change	Impact of sea level rise on mangroves	H	L	F	P
	Increased coastal vulnerability (e.g. erosion)	H	H	G	P

4.8.8.2 Opportunities and constraints

Future planning and development holds several socio-economic opportunities, but a number of potential constraints, both in terms of biodiversity and sustained socio-economic value, pose some challenges. ***The Richards Bay area (including the Richards Bay Estuary) has been identified as a development node within the KZN province***, and will therefore benefit from envisaged economic investments with excellent opportunities for socio-economic growth and development for surrounding communities. On the other hand, the uMhlathuze Estuary is largely managed as a conservation area, and present potential opportunities for eco-tourism development, also involving the local communities living along its shores. The Richards Estuary has also been earmarked for key development projects under

the national government's Operation Phakisa initiative (www.operationphakisa.gov.za) aimed at fast tracking the aims of the National Development Plan (NDP). These include a marine aquaculture development (i.e. cage culture of Dusky cob) and ship repair terminal and dry-docking facilities. While initiatives of this nature hold great growth and development opportunities for the area, implementation of environmentally unsustainable practices can hold serious constraints or risks to socio-economic values benefiting other users.

The biggest challenges (or potential constraints) relate to the ability to conduct growth and development in an environmentally sustainable manner. This is especially relevant to the large port, industrial and municipal infrastructure developments planned for the Richards Bay Estuary and its surroundings. ***While it is recognised that future growth and development for the Richards Bay areas need to have a stronger economic/industrial focus, all efforts must be taken to construct and operate these facilities is an environmentally responsible manner.***

4.8.8.3 uMhlathuze/ Richards Bay Estuarine Management Plan Vision

"The uniqueness and socio-economic values of our beautiful estuaries are sustainably protected for future generations through responsible, holistic and inclusive management approaches"

4.8.8.4 Management objectives to support the vision

The following highlights those management objectives and associated activities that have a bearing on the proposed NIFPP development.

Objective 6: Ensure that planning, construction, maintenance of infrastructure in uMhlathuze/ Richards Bay EFZs e.g. in Port of Richards Bay, Richards Bay IDZ and Waterfront Development, is undertaken in an environmentally sustainable manner to protect biodiversity and socio-economic values benefiting other users.

- Action 6.1: Conduct strategic planning for future port development, Richards Bay IDZ and Waterfront development taking into consideration biodiversity requirements and socio-economic values benefiting other users in uMhlathuze/Richards Bay estuaries
- Action 6.2: Conduct appropriate EIA studies for infrastructure developments in port (e.g. boat repair and dry dock facilities), IDZ and waterfront for future marine aquaculture development in Richards Bay EFZ as per requirements under the NEMA EIA regulations Notice 3.
- Action 6.3: Maintain infrastructure in the study area so as to not detrimentally impact on biodiversity and socio-economic values benefiting other users in uMhlathuze/Richards Bay estuaries.

Objective 7: Ensure appropriate pollution prevention/mitigation measures are implemented in uMhlathuze/Richards Bay estuaries

- Action 7.1: Prepare standard operational procedures (SOPs) for pollution management and control in uMhlathuze/Richards Bay system, explicitly stating relevant legislation applying to atmospheric emissions, wastewater discharges (both point and diffuse stormwater runoff) and solid waste disposal, specifying approval and permitting processes, operational requirements, as well as responsible authorities in terms of approval, compliance and enforcement.
- Action 7.2: Prepare an inventory of sources of atmospheric emissions originating within uMhlathuze/Richards Bay and stipulate mitigation actions where required in accordance with SOPs.
- Action 7:3: Prepare an inventory of sources and location of wastewater discharges into uMhlathuze/Richards Bay estuaries (surface and sub-surface runoff) and stipulate mitigation actions, where required, in accordance with SOPs.
- Action 7.4: Prepare an inventory of sources and location of solid waste disposal within uMhlathuze/Richards Bay EFZs and stipulate mitigation actions, where required, in accordance with SOPs.
- Action 7.5: Prepare/revise oil spill contingency plan for uMhlathuze/Richards Bay estuaries, including disaster management planning, and handling and disposal of waste originating from clean-up.
- Action 7.6: Instate a ballast water auditing programme for vessels entering Port of Richards Bay.

Objective 11: Address coastal vulnerability to climate change in uMhlathuze/Richards Bay estuaries Action 11.1: Establish appropriate management lines in terms of the NEMICMA to reduce hazard risks (e.g. flooding) and to ensure environmentally suitable development in uMhlathuze/Richards EFZs to assist with preventing "coastal squeeze" under future sea level rise conditions.

- Action 11.2: Prepare and implement coastal defence strategies (e.g. retreat, environmental engineering) to ensure community safety and protect infrastructure from potential climate change impacts (e.g. increased storminess, sea level rise, fluvial flooding) in uMhlathuze/Richards EFZs.

Objective 13: Establish a coordinated environmental monitoring programme among various mandated authorities within uMhlathuze/Richards Bay estuaries to share and optimise limited human and financial resources.

- Action 13.1: Prepare standard operational procedures (SOPs) on agreed roles and responsibilities to implement environmental monitoring programmes (as proposed in this EMP), so as to optimally utilise limited resources across various mandated authorities.

Objective 17: Encourage collaboration with tertiary education and other scientific research institutions to strengthen research initiatives within the uMhlathuze/Richards Bay study area so as to build a stronger evidence-based knowledge system in support of the EMP.

- Action 17.1: Establish an extensive, large-scale sediment dynamic research programme to inform management interventions to the regional-scale problem affecting sediment processes across the KZN coastal region, including the uMhlathuze/Richards Bay area.

4.8.8.5 Proposed zonation plan

The following figures highlight the existing environmental sensitivities (Figure 22) and industrial and other activities (Figure 23) within the Port Estuary.

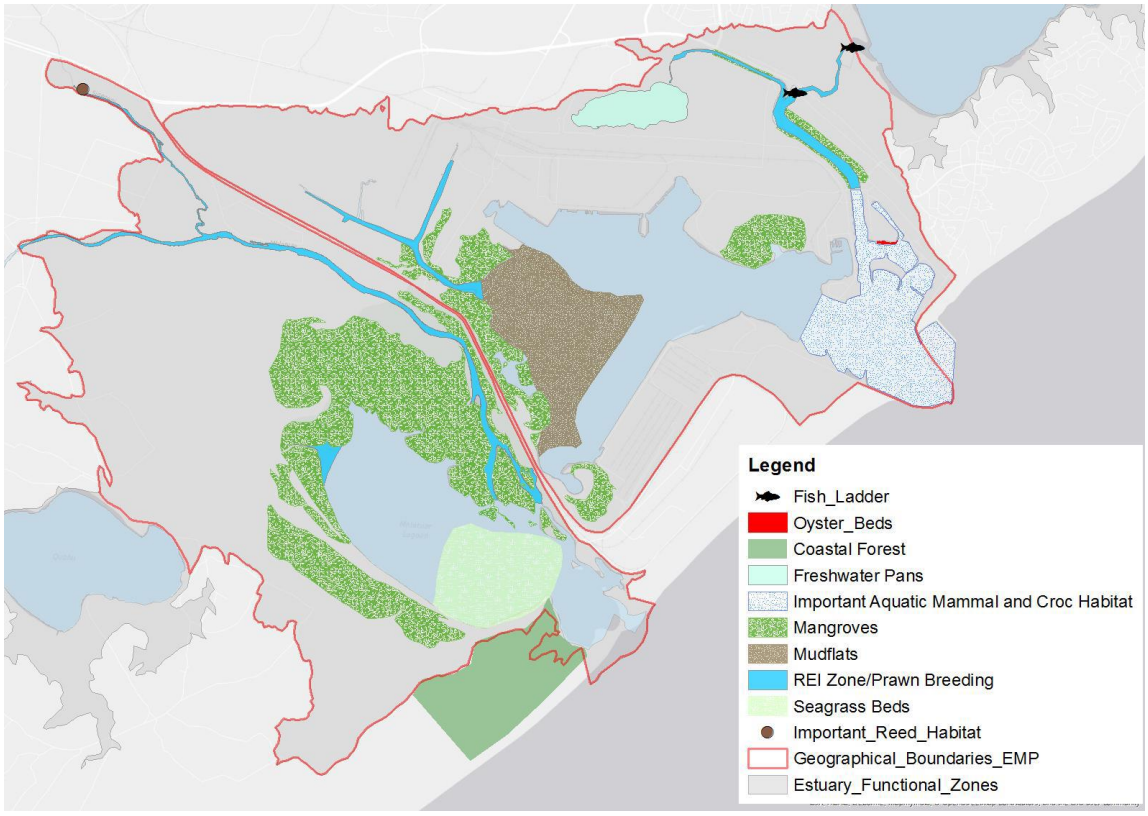


Figure 22: Zonation of sensitive and important estuarine habitats within geographical boundaries of the uMhlathuze/Richards Bay Estuarine Management Plan.

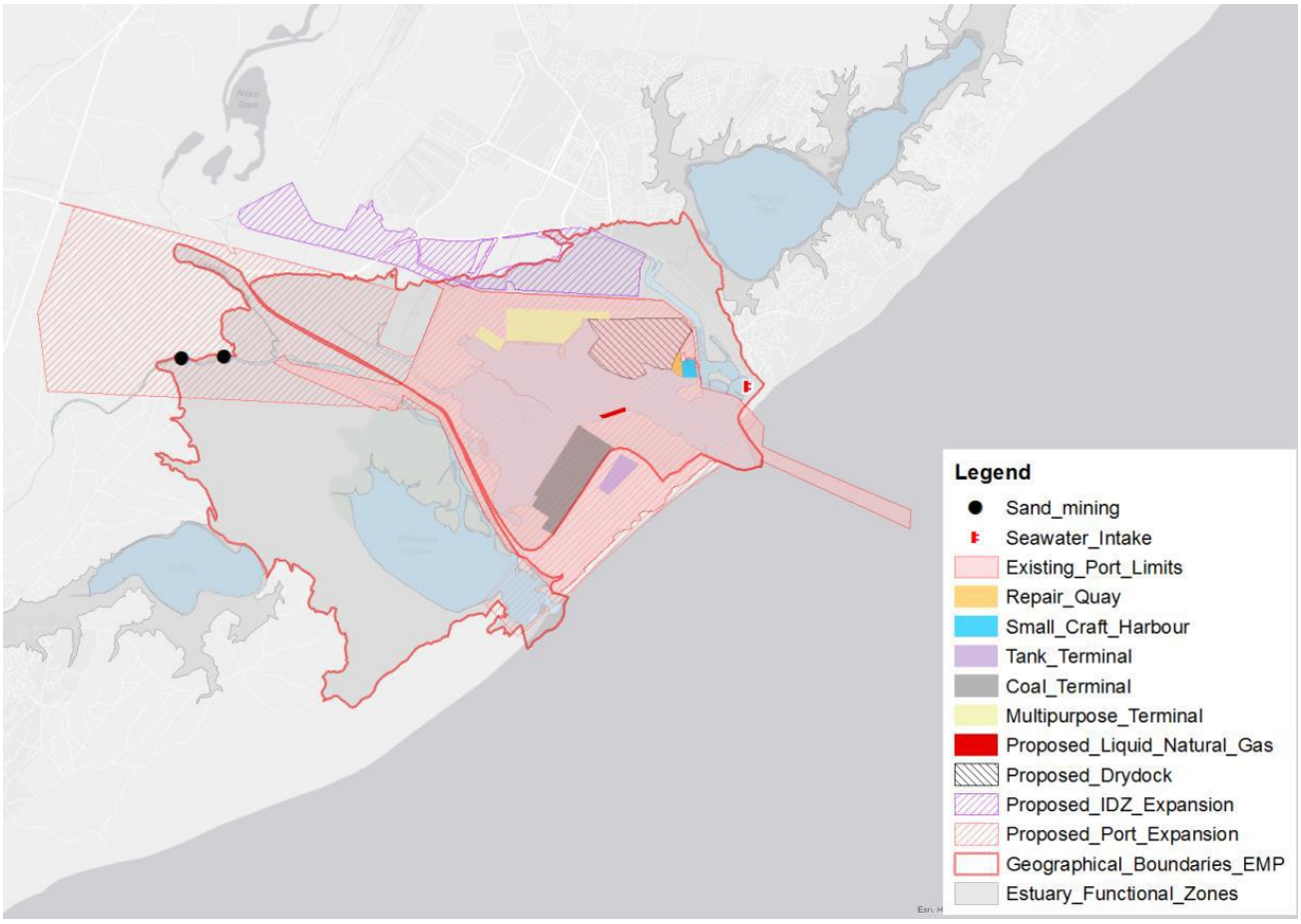


Figure 23: Industrial and mining facilities within the geographical boundaries of the uMhlathuze/Richards Bay Estuarine Management Plan.

Several proposed industrial facilities also are being planned for the area, specifically in the Richards Bay Estuary (Figure 23). These include a new dry dock and a LNG terminal. Major port expansions are also on the cards which will expand port limits further into the EFZ of both the uMhlathuze and Richards Bay estuaries. Of critical importance is that the environmental sustainability of these proposed developments be thoroughly investigated through dedicated environmental impact assessment (EIA) studies. Specifically, these assessments need to consider potential conflicts with existing zoned use, as well as proposed use, as well as the proposed waterfront expansions.

This EIA is designed to investigate and assess the potential positive and negative impacts on environmentally sensitive areas; socio-economic aspects related to increased economic development and its knock-on effects on social issues. The specialist studies to be undertaken will provide a description of sensitive receptors and propose mitigation to either enhance positive impacts and/or reduce negative impacts. The Estuarine Management Plan's vision and objectives will be taken into account to assist with the decision-making for this proposed project.

4.8.9 CITY OF UMHLATHUZE SPATIAL DEVELOPMENT FRAMEWORK 2017/2018 – 2021/2022 (MAY 2017)

There are a number of existing natural and man-made phenomenon that have shaped and continue to shape the uMhlathuze Municipality spatial landscape. The area to the east of the Municipality is inundated with a system of wetlands and natural water features such as Lakes Cubhu, Mzingazi, Nsezi and Nhlabane. Major rivers include the UMhlathuze and Nsezi. The main access into the municipal area is via the N2 in a north south direction and in an east west direction the R34. Other significant roads in the area include the MR431 (that provides a northerly entry into Richards Bay from the N2) as well as the Old Main Road that straddles the N2 on its inland. Railway lines are prevalent in the municipal area but do not provide a passenger service, only a commercial/ industrial service is provided. The

municipality has the benefit of about 45km of coastline of which about 80% is in its natural state. Linked to its coastal locality is the Richards Bay deep-water port that has been instrumental in the spatial development of the area in the past and will definitely impact on the areas the municipal area.

The vision of nodal area Richards Bay is provided as follows, “an urban centre poised for economic transformation and development opportunities based on a new ethos which aims at creating a unique high performance, unique sense of place, and belonging i.e. work-play-trade environment”.

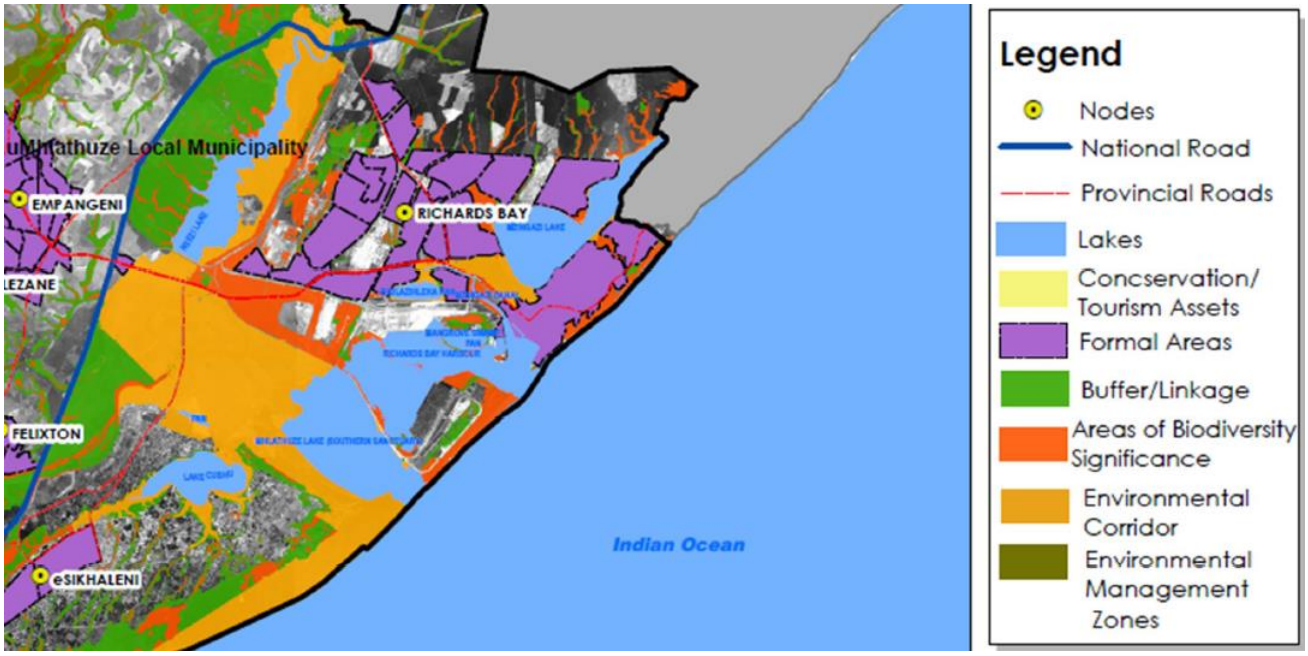


Figure 24: Extract from the Environmentally Sensitive Areas map within the uMhlathuze SDF (May 2017), depicting the area to the north-west of the port as “areas of biodiversity significance”.

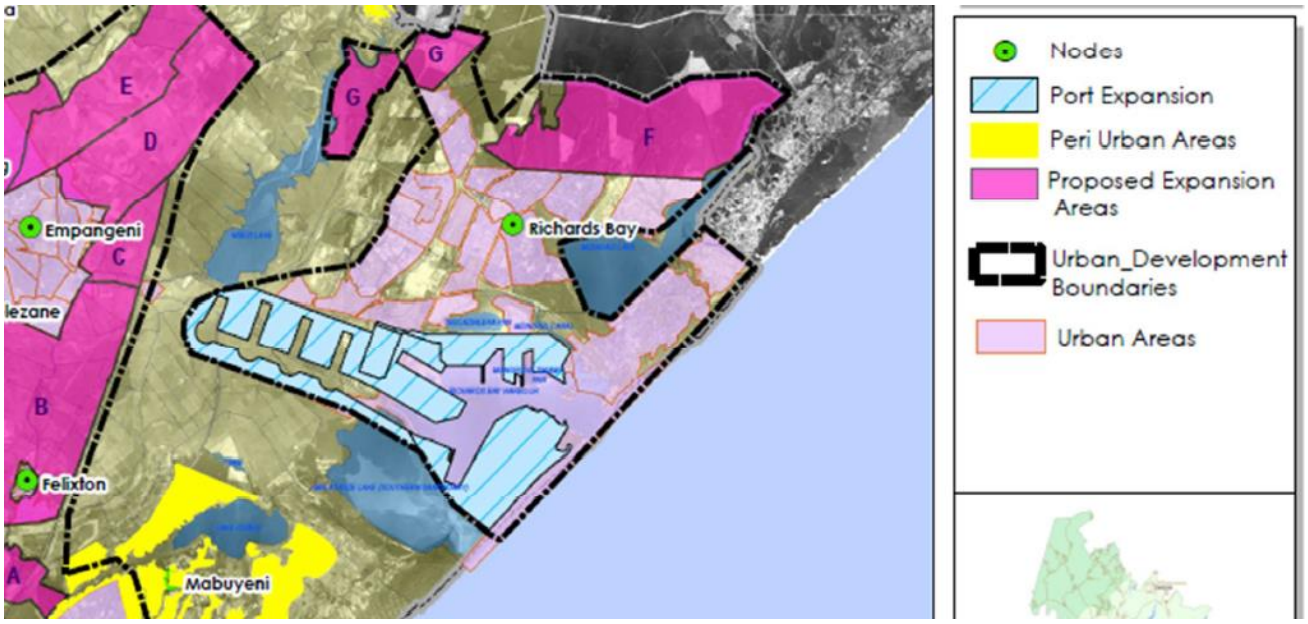


Figure 25: Extract from the Urban Development Plan map within the uMhlathuze SDF (May 2027), depicting the study are for this proposed development to be completely within the urban edge.

The SDF confirms that the proposed NIFPP and associated infrastructure falls within the urban development boundary of Richards Bay. There are identified areas of biodiversity significance that will be impacted on by the proposed project, however these impacts will be assessed through this EIA process as associated specialist studies. It must be noted that

the proposed Port Expansion largely impacts on the identified sensitive areas in any event; however, the proposed project may serve to protect or mitigate against some of the future negative impacts of Port Expansion.

4.9 INTERNATIONAL AGREEMENTS AND CONVENTIONS

South Africa is signatory to a number of international agreements and conventions relating to environmental management. These are listed in Table 10 below.

Table 10: International agreements and conventions to which South Africa is a signatory

Environmental Aspect	Agreement/ Convention
Climate change/air quality.	• United Nations Framework Convention on Climate Change, 1994.* • Kyoto Protocol, 1997.* • Vienna Convention for the Protection of the Ozone Layer, 1985. • Montreal Protocol on Substances that Deplete the Ozone Layer, 1989.
Biodiversity and protected areas.	• Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar/Wetlands Convention), 1971. • Convention on the International Trade of Endangered Species of Wild Fauna and Flora, 1973. • United Nations Convention on Biological Diversity, 1992. • Cartagena Protocol on Biosafety. • United Nations Convention to Combat Desertification, 1994. • Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. • Rotterdam Convention on the Prior Informed Consent Procedure on Certain Hazardous Chemicals and Pesticides in International Trade, 1998. • Stockholm Convention on Persistent Organic Pollutants. • United Nation's Forum on Forests. • Treaty on Central African Forests Commission, 2004. • Algiers Convention. • Bonn Convention on Migratory Species.
Cultural heritage.	• United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property, 1970. • UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972 (World Heritage Convention).
Human rights.	• International Convention on the Prevention and Punishment of the Crime of Genocide. • International Convention on the Elimination of All Forms of Racial Discrimination. • International Covenant on Civil and Political Rights. • International Covenant on Economic, Social and Cultural Rights. • International Convention on the Elimination of All Forms of Discrimination Against Women. • Convention on the Rights of the Child.
Labour, health and safety.	• Elimination of all forms of forced and compulsory labour – Convention 29 and 105. • Elimination of discrimination in respect of employment and occupation – Convention 100 & 111. • Effective Abolition of Child Labour – Convention 138 and 182.

* In 1992, countries joined an international treaty, the United Nations Framework Convention on Climate Change, as a framework for international cooperation to combat climate change by limiting average global temperature increases and the resulting climate change, and coping with impacts that were, by then, inevitable. By 1995, countries launched negotiations to strengthen the global response to climate change, and, two years later, adopted the Kyoto Protocol. The Kyoto Protocol legally binds developed country Parties to emission reduction targets. The Protocol's first commitment period started in 2008 and ended in 2012. The second commitment period began on 1 January 2013 and will end in 2020. There are now 197 Parties to the Convention and 192 Parties to the Kyoto Protocol. The 2015 Paris Agreement, adopted in Paris on 12 December 2015, marks the latest step in the evolution of the UN climate change regime and builds on the work undertaken under the Convention. The Paris Agreement charts a new course in the global effort to combat climate change. The Paris Agreement seeks to accelerate and intensify the actions and investment needed for a sustainable low carbon future. Its central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. The Agreement also aims to strengthen the ability of countries to deal with the impacts of climate change (UNFCCC, 2017).

4.10 INTERNATIONAL LENDER REQUIREMENTS

4.10.1 INTERNATIONAL FINANCE CORPORATION (IFC)

The International Finance Corporation (IFC) is a part of the World Bank Group, but has its own Policy on Environmental and Social Sustainability. The Policy defines principles and approaches to the investment activities by the IFC premised on compliance with Performance Standards (PS), which serve to give effect to the policy. The PS are listed below and briefly described:

PS 1: Assessment and Management of Environmental and Social Risks and Impacts
The client should conduct an environmental and social assessment and establish and maintain an environmental and social management system together with on-going consultation with and disclosure to, stakeholders during the entire project life cycle.

PS 2: Labour and Working Conditions
The client should ensure safe and non-discriminatory conditions based on the equal opportunity, for both permanent and temporary personnel. Occupational health and safety is a core element of the PS and applies to all workers in the supply chain (e.g. contractors, and suppliers)

PS 3: Resource Efficiency and Pollution Prevention
The client's activities must be geared towards resource efficiency and pollution prevention. Performance benchmarks are detailed in a series of EHS guidelines including both general and industry specific (sectoral) guidelines.

PS 4: Community Health, Safety, and Security
The client must ensure that their activities do not invoke public health and safety risks through off-site pollution or other risks and develop and implement Emergency Preparedness and Response Plans to deal with emergency conditions. The maintenance of human rights also falls under this PS.

PS 5: Land Acquisition and Involuntary Resettlement
The PS stipulates requirements for involuntary resettlement, which includes both physical and economic displacement. It should be noted that this PS would not be invoked for this project because no involuntary resettlement will be required.

PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
The objectives of this PS are to protect and conserve biodiversity, maintain the benefits from ecosystem services; and promote the sustainable use of living natural resources. Again it seems highly unlikely that this PS would be invoked by the proposed project.

PS 7: Indigenous Peoples
This PS serves to protect indigenous people leading a traditional lifestyle. Only very limited groups of people are recognized by the IFC as indigenous peoples and these do not include the people living in and around the project area. As such the PS would not be invoked by the proposed project.

PS 8: Cultural Heritage
This PS serves to ensure the protection of both tangible and intangible forms of cultural heritage from the adverse impacts of project activities and the preservation of such cultural heritage.

4.10.2 WORLD BANK GROUP ENVIRONMENT, HEALTH AND SAFETY GUIDELINES

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP) applicable to Performance Standard 3 (Resource Efficiency and Pollution Prevention). The EHS Guidelines provide a series of performance benchmarks that can be used during the assessment process. The performance benchmarks and mitigation defined in the EHS Guidelines represent performance that is typically acceptable to the IFC. Importantly, the EHS Guidelines are generally considered to be achievable in new facilities at reasonable costs with existing technology. The environmental assessment process may recommend alternative (higher or lower) levels or measures as a function of the state of the receiving environment, which, if acceptable to IFC, become project- or site-specific requirements.

In the event that host country regulations do not exist then the EHS guidelines serve to define acceptable performance, where host country regulations differ from the EHS Guidelines, then it is expected that the project will assume the more stringent of the two. Less stringent performance measures can be adopted provided that there is a clear justification for doing so rooted in the environmental and social assessment and demonstrating consistency with the objectives of Performance Standard 3. The following EHS Guidelines are relevant to the proposed NIFPP CCGT Project.

4.10.2.1 General EHS Guidelines

The General EHS Guidelines are potentially applicable to all industry sectors containing as they do, information on cross-cutting environmental, health, and safety issues. The General EHS Guidelines should be used in conjunction with the relevant industry sector guidelines listed below.

4.10.2.2 Environmental, Health, and Safety Guidelines for Liquefied Natural Gas (LNG) Facilities

The EHS Guidelines for Liquefied Natural Gas (LNG) Facilities include information relevant to LNG base load liquefaction plants, transport by sea, and regasification and peak shaving terminals. For coastal LNG facilities including harbours, jetties and in general coastal facilities (e.g. coastal terminals marine supply bases, loading / offloading terminals), additional guidance is provided in the EHS Guidelines for Ports, Harbours, and Terminals. For EHS issues related to vessels, guidance is provided in the EHS Guidelines for Shipping.

4.10.2.3 Environmental, Health, and Safety Guidelines for Thermal Power Plants

This document includes information relevant to combustion processes fuelled by gaseous, liquid and solid fossil fuels and biomass and designed to deliver electrical or mechanical power, steam, heat, or any combination of these, regardless of the fuel type (except for solid waste which is covered under a separate Guideline for Waste Management Facilities), with a total rated heat input capacity above 50 Megawatt thermal input on Higher Heating Value basis. It applies to boilers, reciprocating engines, and combustion turbines in new and existing facilities.

4.10.3 EQUATOR PRINCIPLES

The Equator Principles (EPs) is a risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects. The EPs serve to provide a minimum standard for due diligence assessments to support responsible decision-making for financial institutions. The EPs have been adopted by 84 financial institutions in 35 countries and includes some 70% of international project finance in emerging markets. Financial Institutions that have adopted the EP are referred to as Equator Principles Financial Institutions (EPFIs). The EPFI's commit to implementing the EP and will not finance clients that are unwilling or unable to comply with the EP. The principles themselves are listed below and briefly described.

Principle 1: Review and Categorisation

Projects proposed for financing are categorised as a function of potential environmental and social risks and impacts using the categorisation process of the International Finance Corporation (IFC), namely:

- Category A – Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented;
- Category B – Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and
- Category C – Projects with minimal or no adverse environmental and social risks and/or impacts.

Principle 2: Environmental and Social Assessment

The client must conduct an environmental and social assessment commensurate with the risks posed by the proposed projects including an Environmental and Social Impact Assessment (ESIA). The ESIA must be an adequate, accurate and objective assessment and should propose measures to minimise, mitigate, and offset adverse impacts. All projects that would emit greenhouse gases (GHG) of more than 100,000 tonnes of CO_2 equivalent annually require an analysis to evaluate less intensive GHG alternatives.

Principle 3: Applicable Environmental and Social Standards

The Assessment process should address compliance with relevant host country environmental and social laws, regulations and permits and compliance with IFC Performance Standards on Environmental and Social Sustainability (Performance Standards) and the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) which represent the minimum standards adopted by the EPFI.

Principle 4: Environmental and Social Management System and Equator Principles Action Plan

The client must develop and maintain an Environmental and Social Management System (ESMS) and an Environmental and Social Management Plan (ESMP) that serves to detail the actions that are required for compliance with the applicable standards. In addition an Equator Principles Action Plan may also be developed to highlight compliance gaps and commitments to address such gaps.

Principle 5: Stakeholder Engagement

Effective Stakeholder Engagement must be established and maintained in a structured and culturally appropriate manner with stakeholders. The consultation process must be tailored to project risks and impacts and the development phase; language preference, decision-making processes and the needs of disadvantaged and vulnerable groups. Consultation should be free from external manipulation, interference, coercion and intimidation. Appropriate Assessment documentation will be readily available to stakeholders in the local language and a culturally appropriate manner. The results of the Stakeholder Engagement process will be documented and addressed, occur early in the Assessment process and be maintained.

Principle 6: Grievance Mechanism

The client will establish a grievance mechanism designed to receive and facilitate resolution of project concerns and grievances. The mechanism should not impede access to judicial or administrative remedies and stakeholders informed about the mechanism during the Stakeholder Engagement process.

Principle 7: Independent Review

An Independent Environmental and Social Consultant will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation to assess Equator Principles compliance.

Principle 8: Covenants

The client will covenant in the financing documentation to comply with all relevant host country environmental and social laws to comply with the ESMPs and Equator Principles Action Plan (where applicable) during the construction and operation of the Project in all material respects, to provide periodic reports in a suitable format and to decommission the facilities in accordance with an agreed decommissioning plan. The EPFI is required to intervene as necessary to ensure compliance with the covenants.

Principle 9: Independent Monitoring and Reporting

The client is required to appoint an Independent Environmental and Social Consultant, to verify monitoring information shared with the EPFI.

Principle 10: Reporting and Transparency

The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online and will publicly report GHG emission levels where emissions exceed 100,000 tonnes of CO_2 equivalent annually.

5 ENVIRONMENTAL, SOCIAL AND ECONOMIC CONTEXT

This section provides a brief overview of the existing environment within the area of influence of the NIFPP and associated infrastructure. It is important to have an understanding of the receiving environment, as this will determine how possible impacts will manifest. Kindly refer to the Appendix 2B for a draft map where known environmental sensitivities (at a scoping level) have been overlaid with the proposed development footprint (also draft at scoping level).

5.1 BIOPHYSICAL ENVIRONMENT

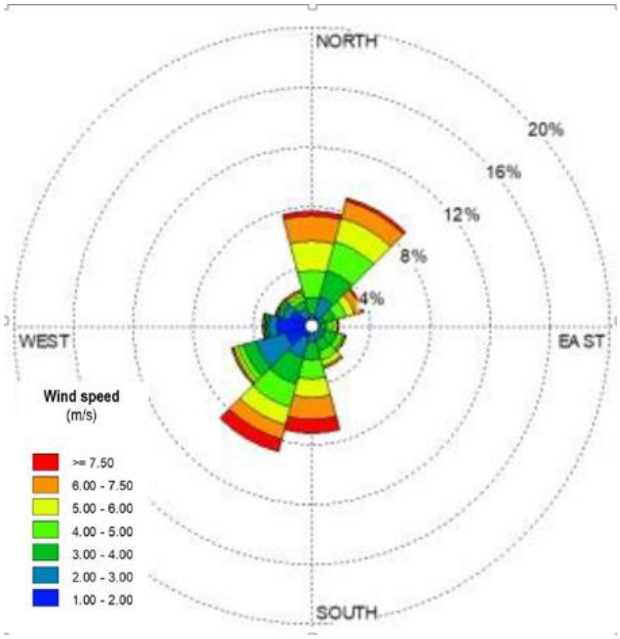
5.1.1 CLIMATE

Richards Bay has a humid subtropical climate, with a particularly warm and humid summer season typical of the coastal region of Kwazulu-Natal. The average temperatures range from 23 - 29 ^{o}C in summer, to 15-18 ^{o}C during winter. However, maximum temperatures in excess of 40 ^{o}C have been recorded in the past[4].

Regional mean annual precipitation is 1 349 mm per annum (source, Department of Water Affairs Station W1E009) with mean annual evaporation of 1 459 mm/year and an implied annual moisture deficit of 110 mm. Rain falls during the summer months (60%) from November to March with the maximum falling in January and February. Winter rainfall (May to September) is usually associated with frontal weather systems and cool weather. Cyclones and cut off-lows bring about abnormal rainfall events with high rainfall intensity and flooding (South African Weather Bureau). Summary rainfall and evaporation statistics are given in Table 11.

Table 11: Summary rainfall and evaporation statistics from station W1E009

Statistics	Rainfall (mm/year)	Evaporation (mm/year)
Average	1 349,4	1 459,2
Minimum	638,4	1 192,5
Maximum	2 043,7	1 739,1
5 percentile	895,0	1 272,0
95 percentile	1 895,6	1 704,2



The prevailing winds in the study region are north-easterly and south-westerly (Figure 26). The north-easterly winds are associated with high atmospheric pressure and fine weather systems whilst the south-westerly winds are associated with the passage of coastal low pressure systems and cold fronts and, therefore, inclement weather. In the Richards Bay area, winds originate predominantly from the north-northeast, northeast, southwest and south-southwest (Figure 26). Wind speeds range from gentle (<2 m/s) to strong (>8 m/s), with the strongest winds originating from the south-westerly sector.

Figure 26: Surface wind rose plot for Richards Bay for the January 2016 to December 2019 period (from the Harbour West station) - the colour of the bar indicates wind speed whilst the length represents the frequency of winds blowing from a certain direction (as a percentage)

[4]uMhlathuze Local Municipality: Final IDP Review 2019/2020.

5.1.2 TERRESTRIAL ECOLOGY

The majority of the information presented is taken from the GroundTruth Biodiversity Assessments undertaken in support of the Environmental Authorisation (EA) applications for the decommissioning of the Bayside Aluminium smelter.

5.1.2.1 Regional Context

Four biomes, namely, Forest, Indian Ocean Coastal Belt, Azonal Vegetation and Waterbodies are present within the region. The vegetation that dominates the area is associated with the Indian Ocean Coastal Belt biomes, notably the Maputaland Coastal Belt, which makes up approximately 77% of the study area (Figure 27). Forest vegetation makes up a much smaller (9%) proportion of the area and comprises mostly of Northern Coastal Forest (5%) and Swamp Forest (3%). Aquatic habitats in the form of Subtropical Freshwater Wetlands and Freshwater Lakes make up the remaining 10% of the study area (Figure 27).

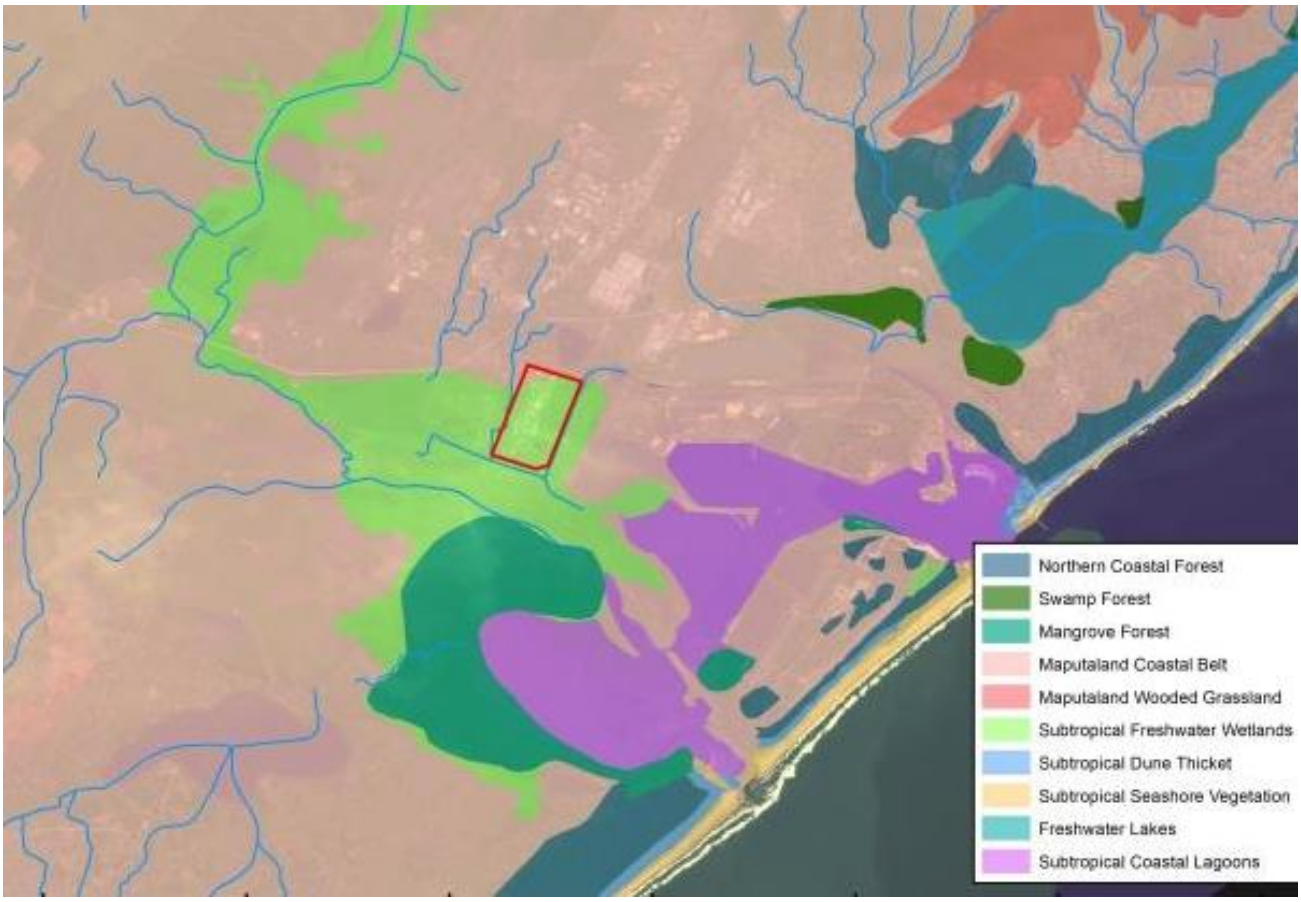


Figure 27: Map of reference vegetation that defines the greater landscape (the Bayside site is highlighted as a reference point).

Approximately 54% of the broader study area comprises transformed land, dominated by commercial agriculture and plantations (38%) followed by urban and industrial developments (15%). The remaining 46% of the study area supports a mosaic of terrestrial (25%) and aquatic habitats (21%). Terrestrial habitats are dominated by bush/thicket (13%), followed by forest (7%) and grassland (5%). Aquatic habitats are mostly made up of estuarine ecosystems (15%) with freshwater aquatic ecosystems making up the remaining 6% of the study area. The natural habitats that remain within the broader study area is generally confined to small, isolated patches amongst urban/industrial development, forestry plantations and sugarcane cultivation. Furthermore, the majority of the remaining natural areas tend to be moderately to severely disturbed, particularly in terms of invasive alien plant infestations.

One “formal” protected area, the Richards Bay Nature Reserve, as listed in the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003), occurs within the broader study area, about one kilometre south of the

Bayside site. The reserve corresponds with the UMhlathuze Estuary and associated mangrove swamps. The area supports critical habitat for a variety of water birds and is considered an Important Bird Area (IBA) by Birdlife International.

Five threatened ecosystems occur within the study area (Figure 28). These include:

- **Kwambonambi Dune Forest** – originally covered 7 000 ha. At present about 50% remains and a very small proportion (<1% of the original extent) is protected. The area supports five species of conservation concern and is classified as Critically Endangered.
- **Kwambonambi Hygrophilous Grassland** – originally covered 34 000 ha. At present only about 21% remains and a small proportion (8% of the original extent) is protected. The area supports six species of conservation concern (i.e. threatened and/or endemic plants and animals) and is classified as Critically Endangered. Key biodiversity features are included, namely one amphibian (*Hyperolius pickersgilli*), four millipedes (*Centrobolus fulgidus*, *Centrobolus richardi, Centrobolus rugulosus* and *Doratogonus zuluensis*), one plant (*Kniphofia leucocephala*) and six vegetation types (KwaZulu-Natal Coastal Forest, KwaZulu-Natal Dune Forest, Mangrove Forest, Maputaland Wooded Grassland, Maputaland Coastal Belt and Swamp Forest).
- **Mangrove Forest** – original extent is not known, but at present only about 2 000 ha remains of which 73% is protected. The mangroves are considered "species poor", but nevertheless are productive ecosystems and provide important spawning habitat for various fish species. Mangrove Forest is currently classified as Endangered.
- **Maputaland Wooded Grassland** – originally covered 99 000 ha. At present about 53% remains of which 17% of the original extent is protected. The area supports five species of conservation concern and is classified as Vulnerable.
- **Swamp Forest** – original extent is not known, but at present only about 3 000 ha remains of which 67% is protected. The area supports one species of conservation concern and is classified as Vulnerable.

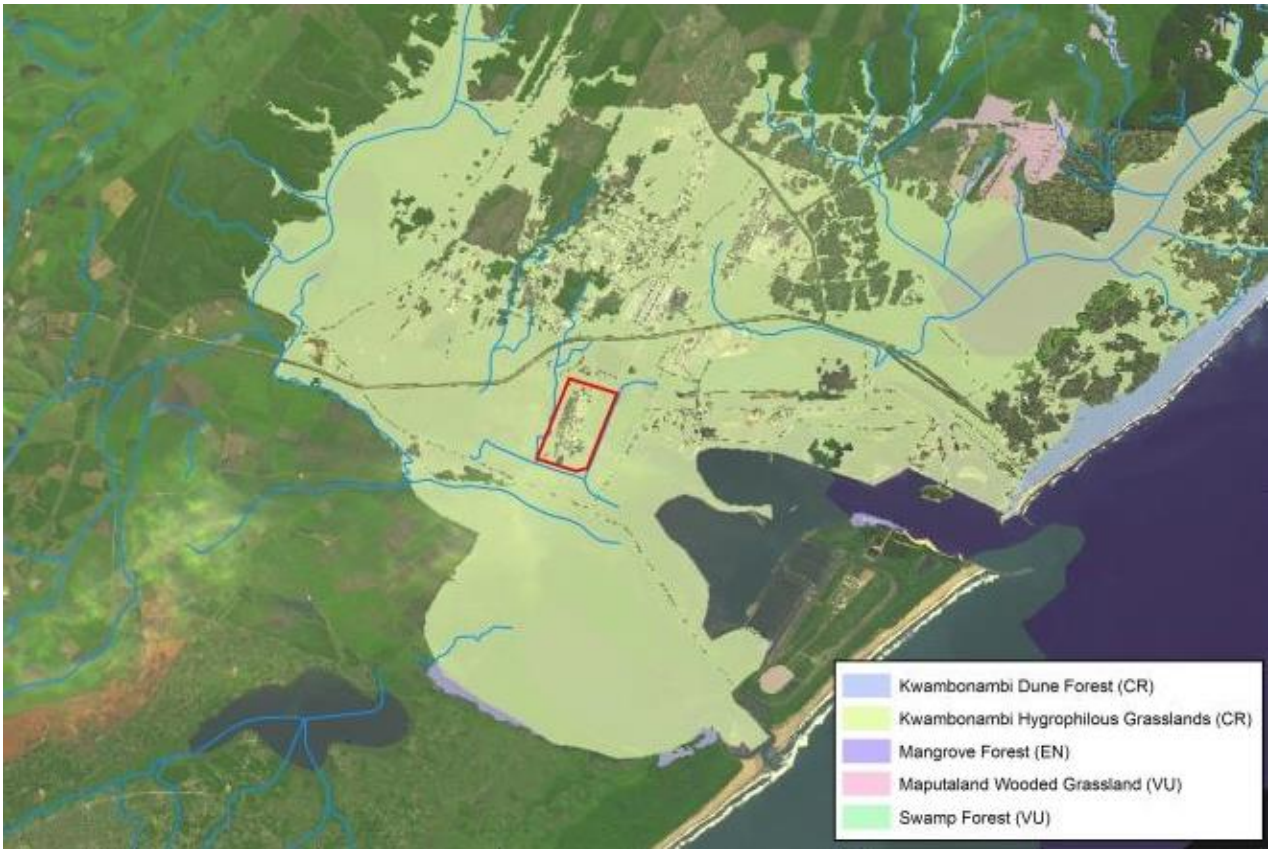


Figure 28: Overview of threatened ecosystems within the broader study area (after SANBI and DEAT, 2009). Bayside site is shown as a reference point.

5.1.2.2 Local context applicable to the study area for the proposed NIFPP

The area has Swamp Forest with affinities to Kwambonambi Hygrophilous Grassland (a Critically Endangered ecosystem listed as a threatened ecosystem in terms of NEMBA). Swamp Forest habitat form a key component of the aquatic ecosystems represented. It is a Critically Endangered vegetation type, and one of the rarest wetland types in Southern Africa (refer to Figure 29 for the spatial distribution of Swamp Forest habitat).

Of particular importance to the NIFPP is the significant wetland system to the west of the Bayside Aluminium smelter site, the area in which the proposed transmission line and substation associated with evacuating electricity from the NIFPP are to be located.

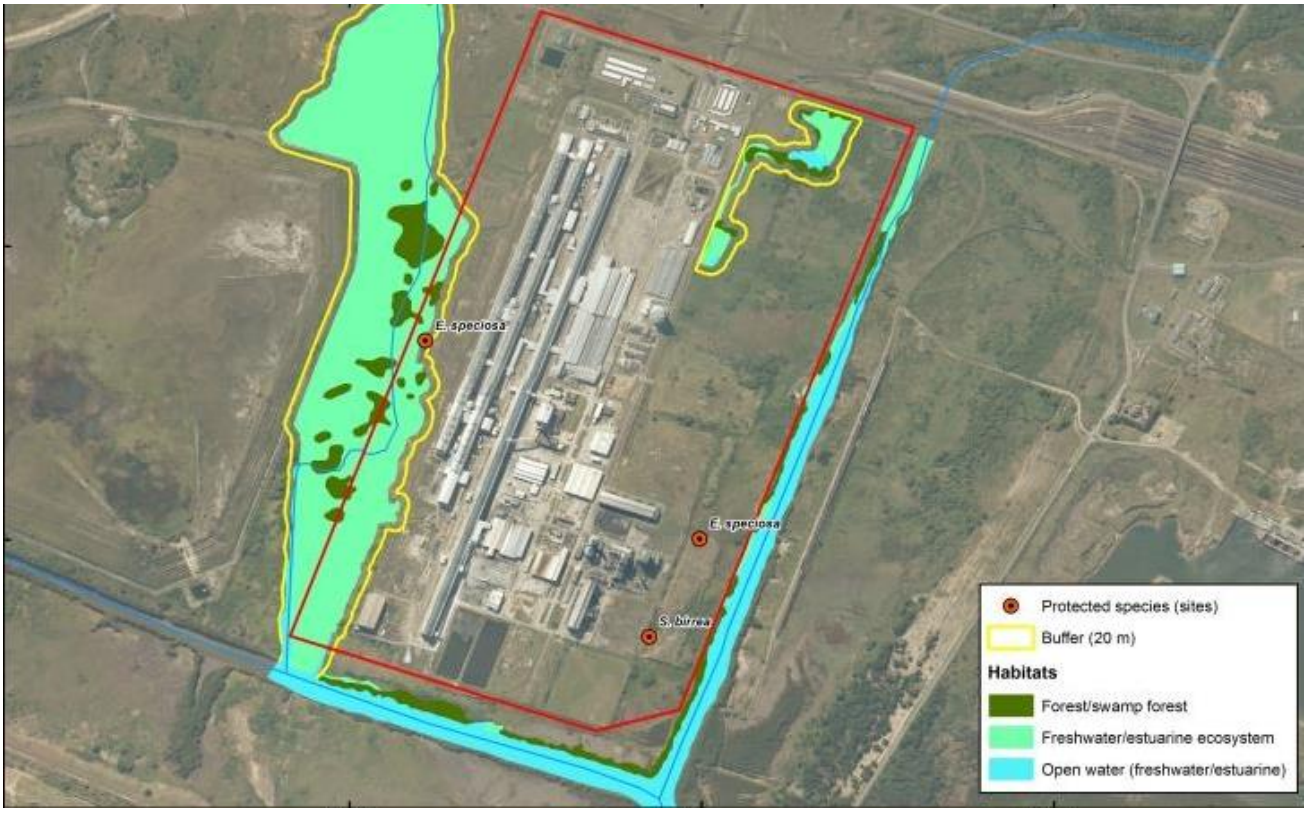


Figure 29: Sensitive ecological/biodiversity features associated with the Bayside site

Several conservation important plants were recorded in the area, these include:

- **Swamp Fig *Ficus trichopoda* (Protected Tree) –** a habitat specialist that has a restricted distribution, occurring in coastal areas in swamp forest habitat. It is a protected tree under the National Forests Act, 1998 (Act No. 84 of 1998) (NFA). They are predominantly concentrated in low-lying areas where the groundwater table is at or near the surface.
- **Large Yellow Eulophia *Eulophia speciosa* (Declining; Regionally Protected) –** occurs in various habitats including sand dunes, bushveld, thornveld and montane grasslands.
- **White Arum Lily *Zantedeschia aethiopica* (Regionally Protected) –** occurs in marshy habitats.
- **Mangrove Swamp (Black Mangrove – *Burguiera gymnorrhiza* (Protected Tree) and White Mangrove – *Avicennia marina*)** – Critically Endangered vegetation type in KwaZulu-Natal and is predominantly located along the edges of the Manzamnyama and Bhizolo canals.

5.1.3 ESTUARINE ECOLOGY

The extent of the estuarine functional zone in respect of the Port of Richards Bay and the UMhlathuze estuary is indicated on Figure 30. The greater site boundary for the proposed NIFPP and its associated infrastructure is located within the

estuarine functional zone of the Richards Bay/UMhlathuze estuary as defined in terms of the National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008) (NEMICMA). The following description of the existing estuarine ecological environment is taken from the November 2019 Draft uMhlathuze/ Richards Bay Estuarine Management Plan.

Richards Bay historically qualified as one of three estuarine bays in South Africa, along with Durban Bay and the Knysna estuary, on the basis of its size and strong marine influence. Five rivers flowed into the original system: the uMtantatweni (draining Lake Cubhu), the uMhlathuze (the major river that drained through a delta area of swamp vegetation into the western part of the basin), the Bhizolo and Manzamnyama (currently serving as drainage canals) and the Mzingazi (draining Lake Mzingazi) (Figure 31).

Radical transformation of the greater Richards Bay environment began in the 70s with port development, the splitting of the original bay into north and south sections and the redirection of the UMhlathuze River into the southern Sanctuary area as it was initially known (Figure 31). This was followed by all the activities associated with normal port development in the northern section including i.e. dredging, wharf construction, infilling, mouth widening and stabilisation, breakwater construction and terrestrial infrastructure, all of which have resulted in an environment different from that which existed previously.

Figure 30: Location of the Bayside site (orange polygon) in relation to the Richards Bay and UMhlathuze estuaries (yellow outline polygons).

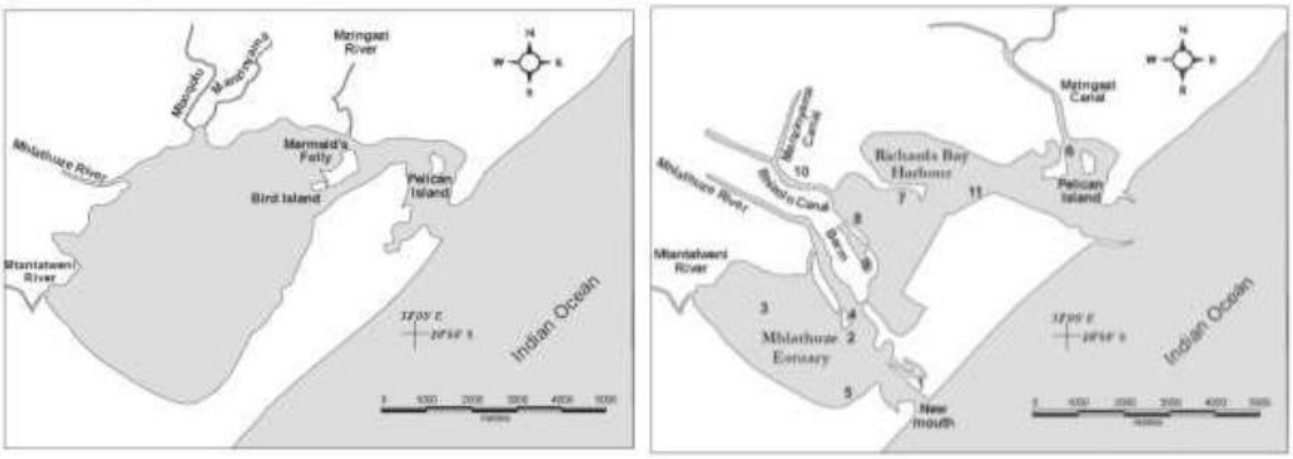


Figure 31: Historical configuration of the uMhlathuze estuarine lake system (left, prior to 1964) and its current configuration (right, post 1976) of an artificially divided system comprising the uMhlathuze and Richards Bay estuaries (Source: uMhlathuze/ Richards Bay Estuarine Management Plan, Draft November 2019)

Currently Lakes Cubhu and Mzingazi presently function as freshwater lakes as a result of their disconnection from the uMhlathuze/Richards Bay estuarine water bodies. The 2015 Reserve Determination Study conducted in the Usutu-uMhlathuze Water Management Area (WMA) by the Department of Water and Sanitation (DWS) in terms of their water resource protection strategy under the National Water Act (1998) also categorised the lakes as freshwater lakes/pans (DWS water resource: wetlands), separate from the uMhlathuze/Richards Bay systems which were classified as estuaries (DWS water resource: Estuaries) (DWS 2014).

An Ecological Freshwater Requirement Study (2000) adopted the following in terms of the Reference Condition (or Natural State) of these estuaries: "Prior to the creation of the harbour, the estuary was considered an estuarine lake. The present uMhlathuze Estuary is classified as an estuarine embayment. As harbour construction changed the fundamental character of the estuary, the reference state for the uMhlathuze Estuary was considered to be the pristine condition, as an estuarine embayment rather than the pristine condition of an estuarine lake. In other words, the "pristine state" of the estuary assumes that the harbour had always existed and considers the situation prior to any alteration in freshwater flow patterns or volumes"

The National Biodiversity Assessment of 2011 (Van Niekerk and Turpie 2012) included desktop Present Ecological Status (PES) assessments for all South African estuaries, including the uMhlathuze and Richards Bay estuaries (Table 12).

Table 12: Desktop Present Ecological Status, as well as preliminary Recommended Ecological Categories (REC) allocated to uMhlathuze and Richards Bay estuaries in NBA 2011 (Draft EMP, Nov 2019: adapted from Van Niekerk and Turpie 2012; Turpie et al. 2012)

COMPONENT	MHLATHUZE ESTUARY	RICHARDS BAY ESTUARY
Hydrology	80	80
Hydrodynamics	100	100
Water Quality	62	56
Physical habitat	30	30
Habitat Status	**68**	**67**
Microalgae	72	66
Macrophytes	40	20
Invertebrates	60	30
Fish	50	45
Birds	40	80
Biological Status	**52**	**48**
PRESENT ECOLOGICAL STATUS	**C/D**	**D**
RECOMMENDED ECOLOGICAL CATEGORY (REC)	**C**	**D**

The uMhlathuze Estuary is ranked in the top ten (10) most important estuaries in South Africa from a conservation perspective. This ranking was derived by a conservation classification system that takes into account surface area, biodiversity, zonal type rarity and estuarine type of some 250 functional estuaries along the South African coast. By comparison, the Richards Bay Estuary is ranked the 26th most important estuarine system. Collectively these two estuaries have the largest area of mangroves of all South African estuaries, even larger than at St Lucia. Also, the Richards Bay Estuary is known to have the oldest area of mangroves in the country (Van Niekerk and Turpie 2012). The Richards Bay Estuary also contains the Kabeljous Flats (refer to Figure 32) which is ecologically of great significance in terms of the Port of Richards Bay maintaining a functioning estuarine type ecosystem[5]. In addition, the Sand Spit which is a major intertidal area has in the past been identified as potentially being of significance in terms of the fauna present, this includes a bird component.

Figure 32: Location of the Kabeljou Flats and "sand-spit" within the Port of Richards Bay. Blue stippled line indicates the boundary of the flats.

Along the KZN coast the uMhlathuze and Richards Bay estuaries, together with St Lucia, provide the majority of the suitable nursery habitat for penaeid prawns. Based on expert opinion it can be assumed that these three estuaries each contribute about a third of the nursery function to inshore prawn species (DWA 2010). The NBA 2011 (Van Niekerk and Turpie 2012) lists both estuaries as very important estuarine nursery areas in South Africa both in terms of protecting biodiversity but also important fisheries. These two systems are viewed as important nurseries for various Cob species,

[5] CRUZ ENVIRONMENTAL: Report No. 18: Overall Findings & Assessment: Specific Abiotic & Biotic Components associated with Priority Habitats in Transnet Capital Projects Richards Bay Port Expansion Project: November 2014

and possibly also for Zambezi sharks. The NBA 2011, therefore, included the uMhlathuze/Richards Bay estuarine system on the list of national priority estuaries for biodiversity conservation. The greater system should, at a minimum, be partially protected with at least 50% of its margins kept undeveloped (Turpie *et al.* 2012). For this reason, its REC should be a Category A or if not, at least in a Best Attainable State. The uMhlathuze Estuary has already been declared a Marine Protected Area (MPA), managed by Ezemvelo KZN Wildlife (provincial conservation authority).

The ecosystem services provided by estuarine ecosystems, and their relevant importance in South African estuaries have been evaluated previously (Van Niekerk and Turpie 2012; DWA 2010). Specifically, the ecosystem service potential of the uMhlathuze/Richards Bay estuarine system is summarised in Table 13.

Table 13: Important ecosystem service potential of the uMhlathuze/Richards Bay estuaries (DWA 2010)

ECOSYSTEM SERVICE		DESCRIPTION/RELEVANCE	ESTIMATED ANNUAL VALUE in 2009)
Provisioning service	Water	-	
	Food and medicine	Small scale/subsistence fisheries	R 400 K
	Raw materials	Plant resources	R 100 K
Regulating services	Carbon sequestration	Support extensive areas of mangroves and other estuarine vegetation to taking up CO_2 from the atmosphere through photosynthesis, acting as carbon sinks	R 300 K
	Flood regulation	Harbour development, as well as	Expected loss in value (not
	Flow regulation	construction on new mouth largely reduced these regulatory services of system which relies on large undeveloped flood plains to enable water and sediment retention	quantified)
	Sediment erosion control/ retention		
	Ecological regulation	-	Not valued
	Water purification	Assimilation of contaminated stormwater runoff from harbours areas	Not valued
Supporting services	Biological refuge/Nursery areas	Important nursery and export function for, sediment and nutrient exports, and prawns	R13.5 million (fish) R1.6 million (sediment/nutrients) R4 million (prawn)
	Exporting function		
	Genetic resources	-	Not valued
Aesthetic/ cultural services	Nature-based tourism	Mostly linked to birding	R 2 million
	Property value	-	Not valued
	Recreational angling	-	Not valued
	Spiritual/cultural value	-	Not valued
	Scientific/educational value	Scientific value (based on research outputs)	R 100 K

Based on the above assessment in 2009, the estimated value of ecosystem services provided by the uMhlathuze/Richards Bay estuarine system comes to more than R22 million per annum (DWA 2010).

The main types of existing uses (or activities) within the geographical boundaries of the uMhlathuze/Richards Bay estuaries - many relying on the ecosystem service potential of the area include:

- Coastal reserves and conservations areas;
- Commercial and subsistence farming;
- Port of Richards Bay;
- Richards Bay Industrial Development Zone;
- Yacht Club Harbour and Sea Rescue;
- Marine aquaculture;
- Commercial and small-scale farming;
- Commercial and recreational areas;
- Recreational and subsistence fisheries; and,
- Mining.

5.1.3.1 Bhizolo and Manzamnyama Canals

Golder Associates in conjunction with the Coastal Research Unit of Zululand (CRUZ) conducted an aquatic receptor assessment in January 2012 to determine the current state of the Bhizolo (southern boundary of the Bayside site) and Manzamnyama (eastern boundary of the site) Canals. The study was commissioned to support the EA applications for the decommissioning of the Bayside Aluminium smelter site. The following provides a summary of their findings.

The 1.8 km long Manzamnyama Channel, which drains the wetland area around Hillside Aluminium, was dredged to run behind the port infrastructure towards the southern boundary of the port. The 4.1 km long Bhizolo Channel drains the extensive Papyrus swamp and industrialized wetland area north-west of the port. The two channels join at right angles south of Bayside and combine to form the 1.2 km long lower section of the Bhizolo Channel, which opens onto the Kabeljous Flats, the large sub- and intertidal mudflat area that is still a remnant of the muddy bay of the old Richards Bay. The channels and mangroves have a muddy substrate, are 45-60 m wide and range in depth from 1-2 m at mid-tide. The lower section of the Bhizolo Channel after the confluence of the two channels flows through the biggest stand of mangroves in the harbour, while the middle and upper sections of the Bhizolo and Manzamnyama Channels are lined by narrow strips of mangroves 15-30 m wide.

The mangrove fringed tidal channels, although being artificially created dredged channels, have been shown since port development to sustain a diverse biotic invertebrate and fish community and to be important nursery areas for juveniles of many marine fish and prawn species. The most important aquatic habitat types associated with the Channels are the intertidal and subtidal mudbanks and the intertidal mangrove areas.

5.1.4 WETLAND ECOLOGY

5.1.4.1 Regional Context

The types of wetlands that are expected to occur within the study area are typical of the wetland systems of the Indian Ocean Coastal Belt Bioregion (Group 2) which includes a variety of wetland hydrogeomorphic (HGM) units, namely channelled valley-bottoms, depressions, flats, floodplains, seeps, unchanneled valley-bottoms, and valley-head seeps. Of these, channelled valley-bottom wetlands are the dominant wetland type occurring in the surrounding landscape, followed by unchanneled valley-bottoms and flats. Based on the wetlands and vegetation types occurring in the study area, and the level of protection currently received, all wetland HGM units occurring within the bioregion are classified as Critically Endangered. This is mostly related to the fact that the wetlands are poorly protected and the highly significant levels of transformation that have occurred within the catchment areas. Historically, the wetland HGM units within the study area would have been classified as a combination of a floodplain and estuarine system due to the contribution of multiple tributaries that flow into a large flat expanse that is connected to the ocean. However, the modifications to the landscape have altered the characteristics and functioning of this system. Based on the present flow regime and hydraulic characteristics, the remaining wetland systems are viewed as valley-bottom wetlands, supplying ecosystems services typical of this type of wetland HGM unit.

National Freshwater Ecosystem Priority Areas (NFEPAs) are areas that have been classified to assist in the conservation and sustainable use of South Africa's freshwater ecosystems, including rivers, wetlands and estuaries. The freshwater ecosystems have been classified according to their PES. Wetlands are classified as 'AB', 'C', and 'DEF' or 'Z' categories, depending on whether the systems are considered to be in good, moderately modified or heavily modified condition, respectively. These categories have not been based on field data, as there is insufficient data at a national scale. Thus, the process modelled the ecological categories to serve as a guideline to inform the selection of NFEPAs. According to the available NFEPA coverage, there are no NFEPA river systems within the study area and the wetland habitats are classified as 'low priority'. Figure 33 illustrates the extent and distribution of the 'low priority' NEFPA wetlands relative to the Bayside site.

Figure 33: Overview of National Freshwater Ecosystem Priority Areas (NFEPAs) within the broader study area (after Nel *et al.*, 2011). Bayside site is highlighted as a reference.

5.1.5 GEOLOGY AND SOILS

The underlying physical geological foundation of the area gives rise to specific landscape features. It also controls the occurrence, distribution and type of water resources in the area, including the groundwater. The Richards Bay area lies on-top of the unconsolidated Cenzonic Era sediments of the Maputaland Lithological Group that stretch along the Maputaland coastal plain into Mozambique as illustrated in Figure 34.

As stated in the Richards Bay Port Expansion and IDZ Environmental Management Framework, the soils in the area are closely related to the geology and landforms and compromise three main land types, namely deep grey sands, deep alluvial soils and red and yellow adepal soils (Figure 35).

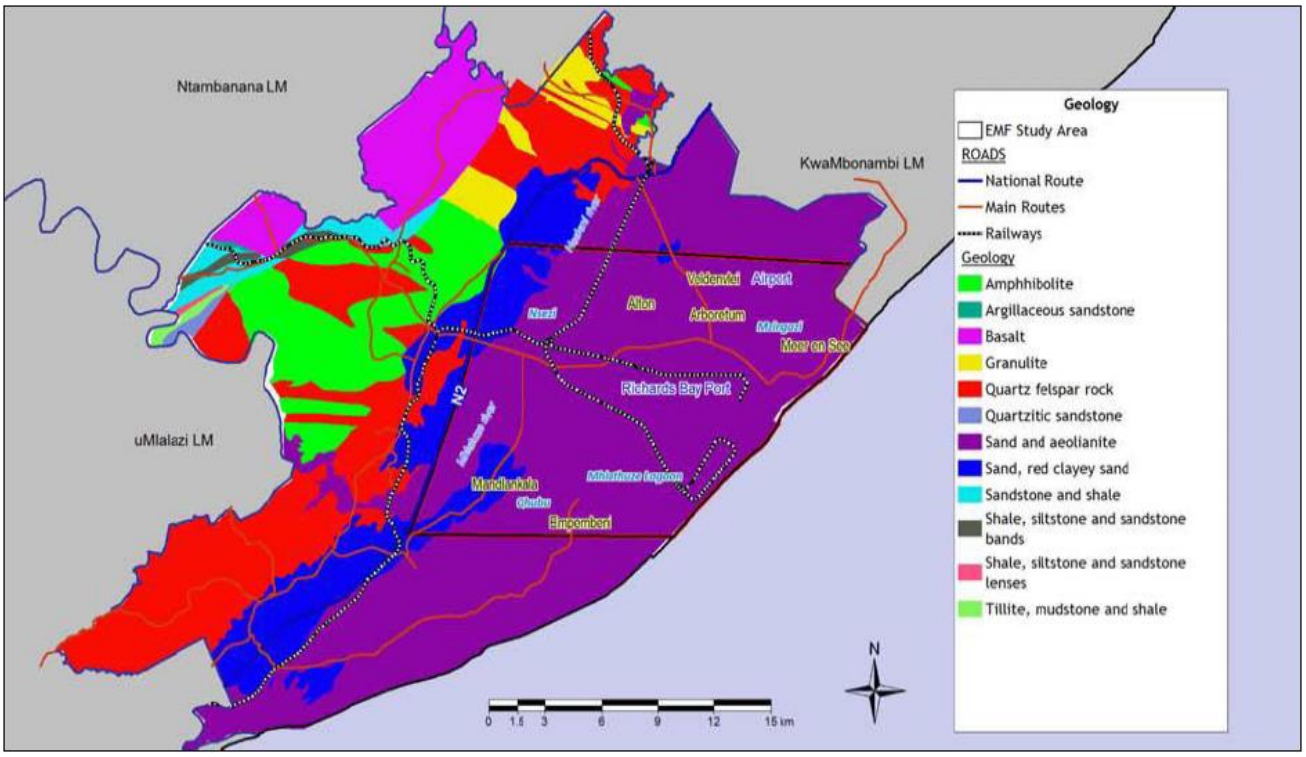


Figure 34: Geology of the greater area as per the Richards Bay Port Expansion and IDZ EMF.

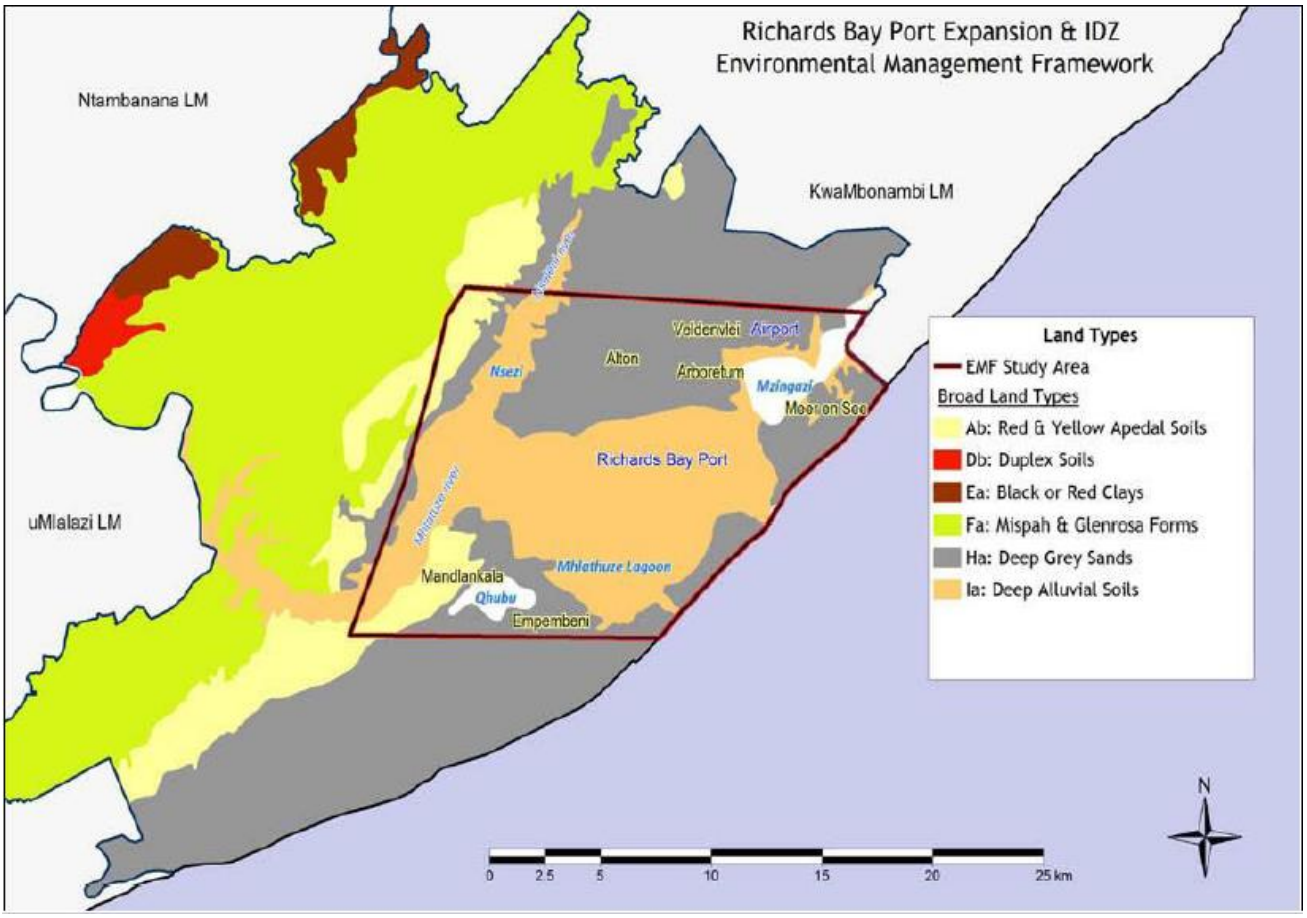


Figure 35: Soil types within the greater area as per the Richards Bay Port Expansion and IDZ EMF.

5.1.6 HYDROLOGY – SURFACE WATER

5.1.6.1 Regional Context

The region consists of the following rivers: The uMhlathuze River, the Nseleni River, the Nsezi Stream, and the Richards Bay Inner City Streams (Figure 36) and collectively make up the UMhlathuze catchment. A variety of lakes occur on the coastal plain. Lakes Mzingazi and Lake Cubhu, are supplied by surface runoff, rainfall, and by groundwater and are classified as coastal lakes. Lake Nsezi occurs at the edge of the coastal plain, bordering on hard rock geological features. As with the other lakes, Nsezi is supplied by surface water (from the Nseleni River), rainfall, and groundwater, but is characterised by different hydrological functions to that of the coastal lakes, and as such is classified as a 'combination' lake.[6]

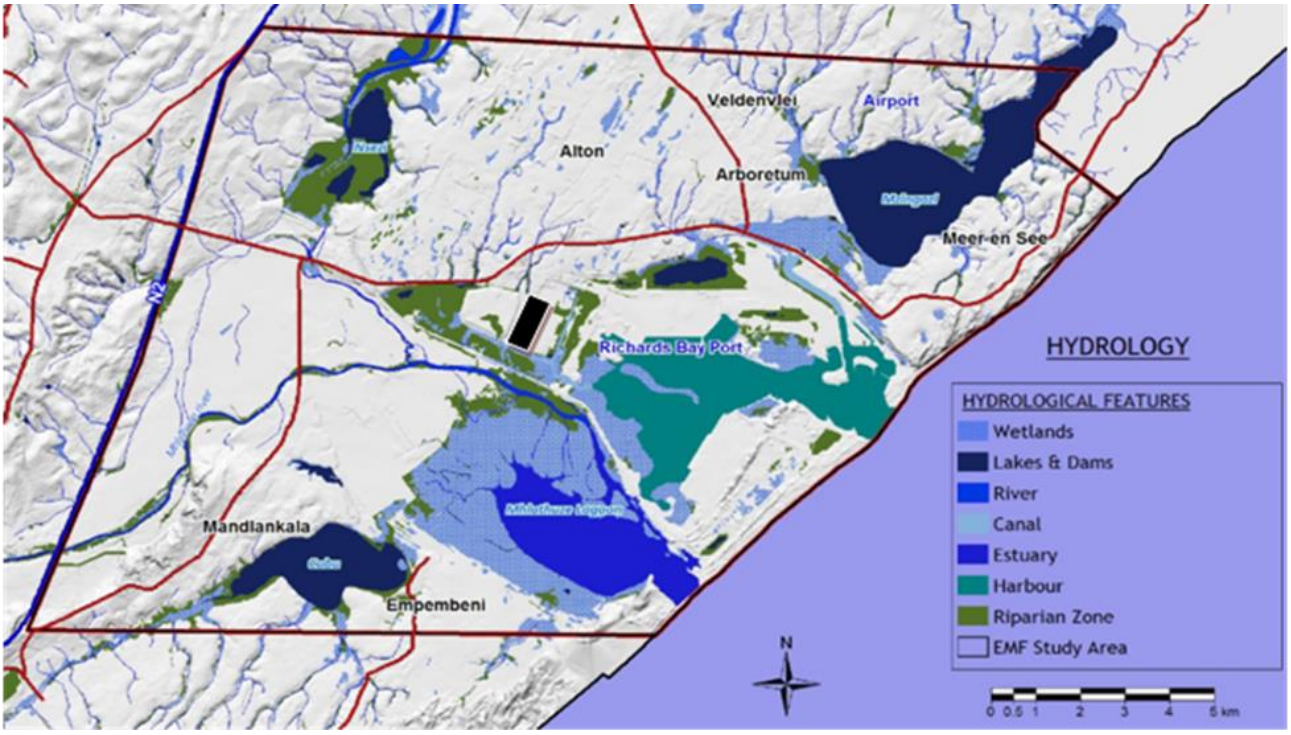


Figure 36: Surface Hydrology in the Richards Bay Area (Bayside site shown by black block, as reference point)[6]

The study area falls mostly within the quaternary catchment W12F of the historical UMhlathuze River floodplain (refer to Figure 37 for the 1:100 year floodline). The division of the floodplain and diversion of the uMhlathuze River to facilitate the construction of the Port of Richards Bay has resulted in the section of the floodplain containing the Bayside site to fall outside of the current UMhlathuze River catchment resulting in a reduced contributing catchment. The river systems that flow along the western and eastern boarders of the Bayside site enter the Bhizolo and Manzamnyama canals, respectively, which flow directly into the Port of Richards Bay. Both canals are characterised as estuarine habitat.

[6] DAERD (2011) Environmental Management Framework for the Richards Bay Port Expansion Area and Industrial Development Zone. Department of Agriculture, Environmental Affairs and Rural Development (DAERD), Pietermaritzburg, South Africa.

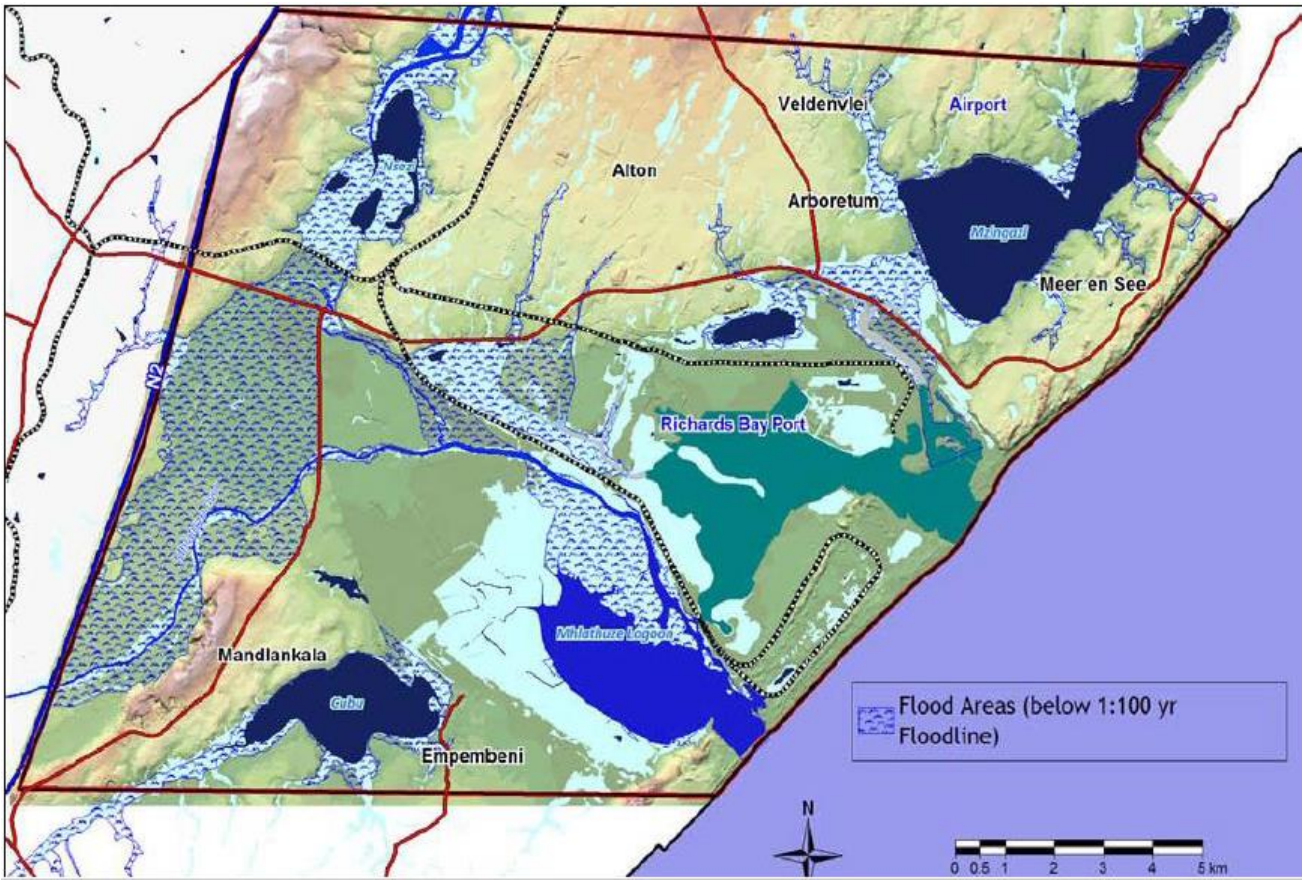


Figure 37: Flood areas defined by the 1:100 year floodline for the greater area.

According to the recent Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) study, commissioned by the then Department of Water Affairs (DWA), the lower UMhlathuze River has a seriously modified PES category. This is due to the extensive loss of natural habitat, biota and ecosystem functioning that has taken place in the catchment.

5.1.7 HYDROLOGY - GROUNDWATER

5.1.7.1 Regional Context

Groundwater can be separated into the primary aquifer in the unconsolidated sediments (Richards Bay and eSikhawini), and the secondary aquifers in the older fractured rock system (Empangeni). The primary aquifer provides vital replenishment of major water bodies in the region. Groundwater flow generally follows the main drainage lines and as such development can affect the direction in which groundwater flows. The general direction of groundwater flow is shown by the red arrows in Figure 38.[7]

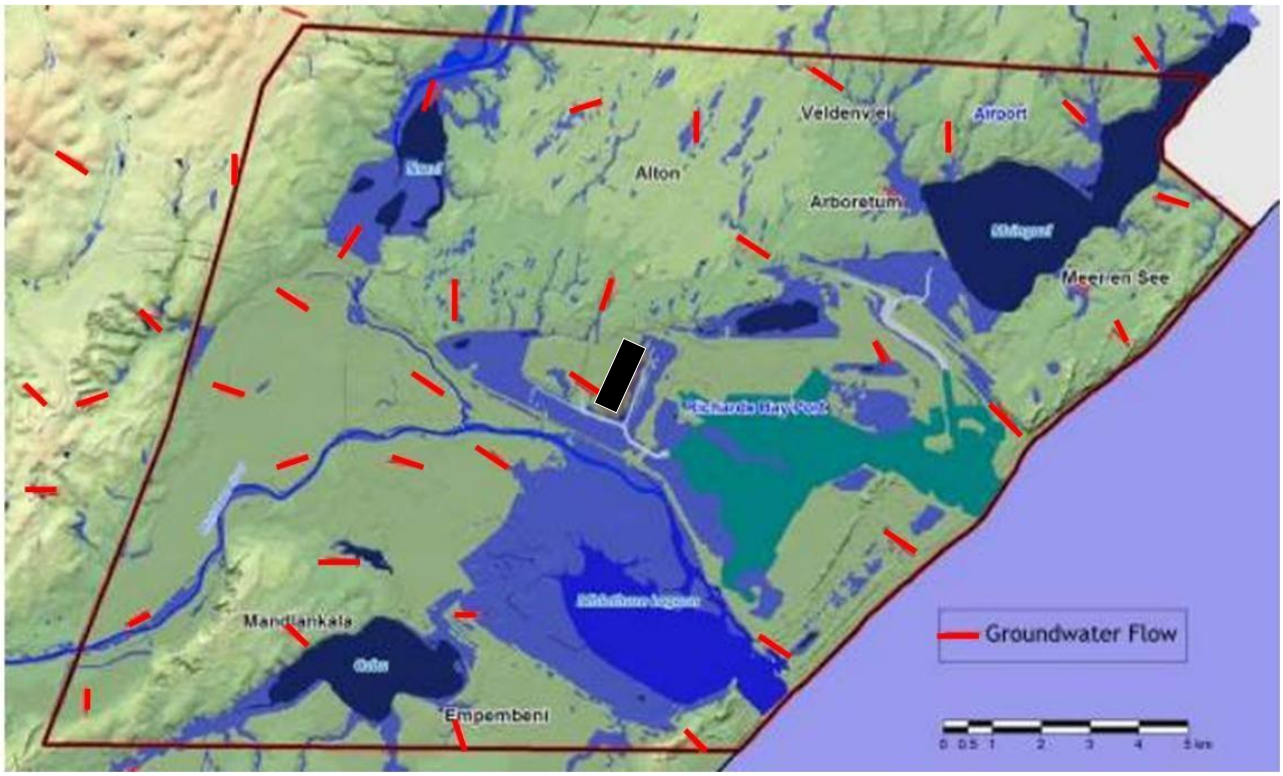


Figure 38: Groundwater Flow in the Richards Bay Area (Bayside Aluminium shown by black block)[7]

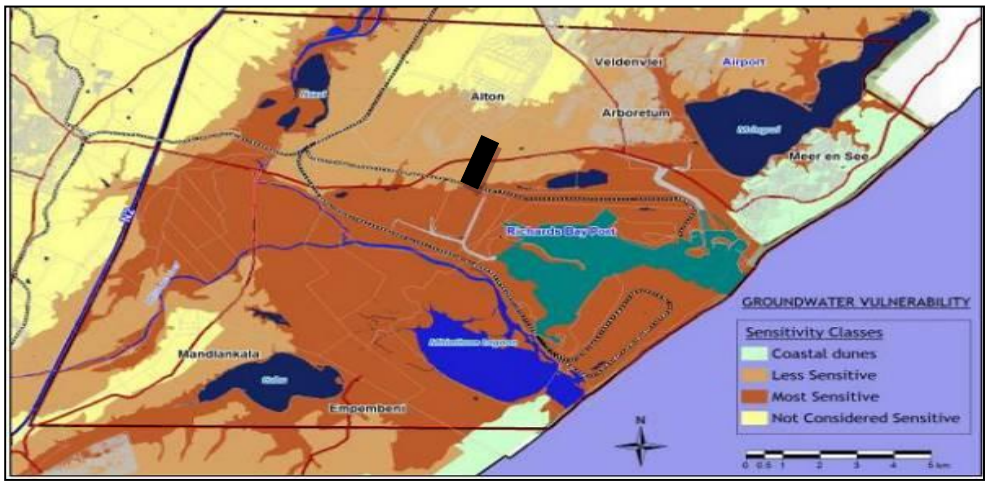


Figure 39: Sensitivity classes of groundwater in the Richards Bay region (Bayside Aluminium shown by black block)[7]

5.1.8 AMBIENT AIR QUALITY

The City of uMhlathuze Local Municipality contains an established industrial development zone that currently comprises two aluminium smelters (one of which no longer operates other than the Casthouse), chemical fertilizer plants, several woodchip plants, a paper mill, coal handling industries, and numerous other small scale industries. Many of the larger industries operate continuous combustion processes, which release significant quantities of air pollutants into the atmosphere, thus the region has very poor air quality, which potentially constrains future industrial and other development. The majority of these industries are located within the town of Richards Bay and hence potentially pose a

[7]DAERD (2011) Environmental Management Framework for the Richards Bay Port Expansion Area and Industrial Development Zone. Department of Agriculture, Environmental Affairs and Rural Development (DAERD), Pietermaritzburg, South Africa.

health risk to the surrounding community. An air quality assessment conducted in 2005 identified certain key areas, where air quality standards are currently exceeded, or where the standards could be exceeded (Figure 40).[8]

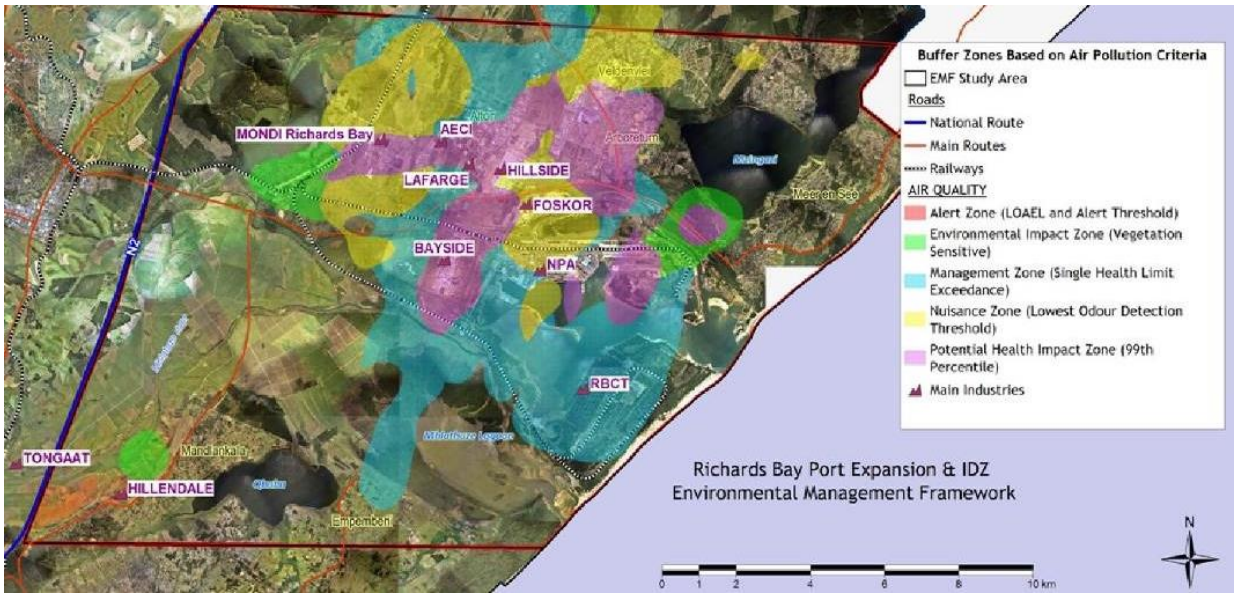


Figure 40: Regions in the Richards Bay area where air quality limits are in danger of being exceeded.[8]

Community concerns about the levels of air pollution in Richards Bay fuelled the development of the Richards Bay Clean Air Association (RBCAA), a local non-profit organisation that voices community concerns regarding air quality issues. The RBCAA comprises representatives from a number of local industries and successfully runs an independent air quality monitoring network (Figure 41). One of its aims is to ensure that ambient concentrations of airborne pollutants remain below the national ambient air quality standards. The organisation retains a register of community complaints regarding air quality, and when possible investigates these. The organisation does not possess any regulatory powers with respect to air quality in the municipality, as this remains the responsibility of the local government, but maintains pressure on the local authorities to fulfil their enforcement roles.

Figure 41: RBCCA Air Quality Monitoring Stations[9]

[8] Thornhill M and Thornhill H (2010) Environmental Risk Evaluation and Guidelines for the Richards Bay Industrial Development Zone. Status Quo Report prepared for the Richards Bay Industrial Development Zone (Pty) Ltd. Report No. TX2010/C015-5, Pietermaritzburg, South Africa.

[9] Airshed Planning Professionals: Air Quality Impact Assessment for the Proposed Development of the Richards Bay Combined Cycle Power Plant (CCPP) and associated Infrastructure on a site near Richards Bay, KwaZulu-Natal Province – Scoping Report

Annual average PM_{10} concentrations were compliant with the NAAQS at all stations, in particular the Richards Bay CBD station yielded concentrations between 25-30 µg/m^3 (estimated based on Figure 42).

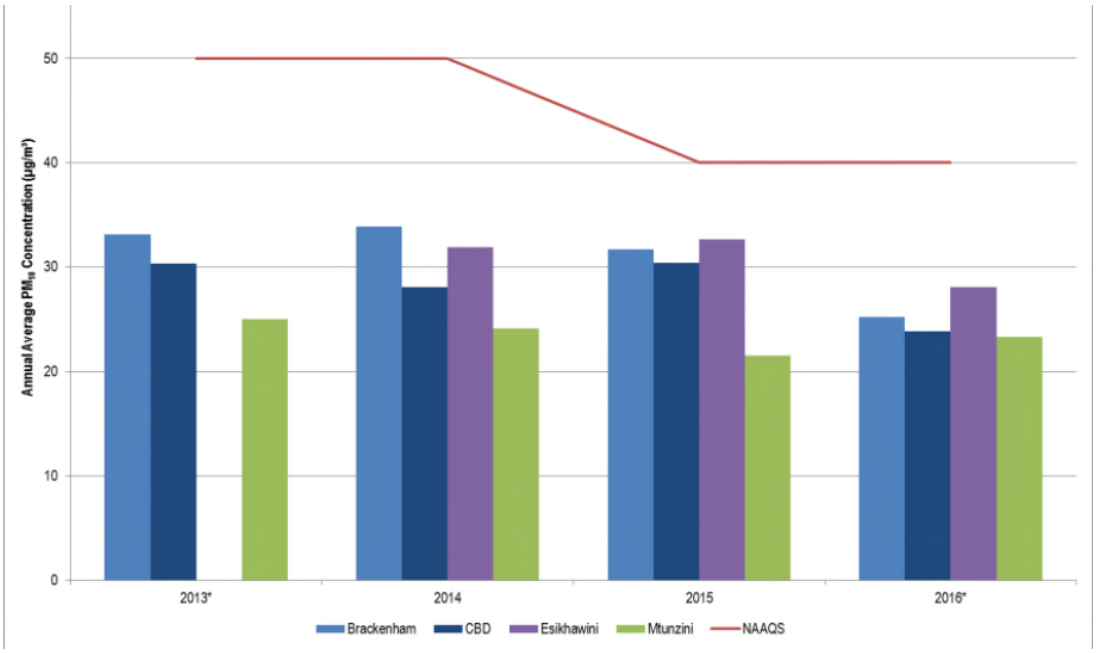


Figure 42: Annual average PM_{10} concentrations (June 2013 to June 2016) [*indicates incomplete dataset; calculated average may not be accurate based on 50% data availability or less][9]

Hourly SO_2 concentrations recorded at seven RBCAA stations complied with the hourly NAAQS for all years (June 2013 – July 2016). The Harbour West AQMS recorded 2 hours (in 2014) and CBD 1 hour (in 2016) exceeding the hourly limit concentration. Annual average SO_2 at all stations was compliant with the NAAQS with a slight trend towards improvement at all stations (Figure 43).

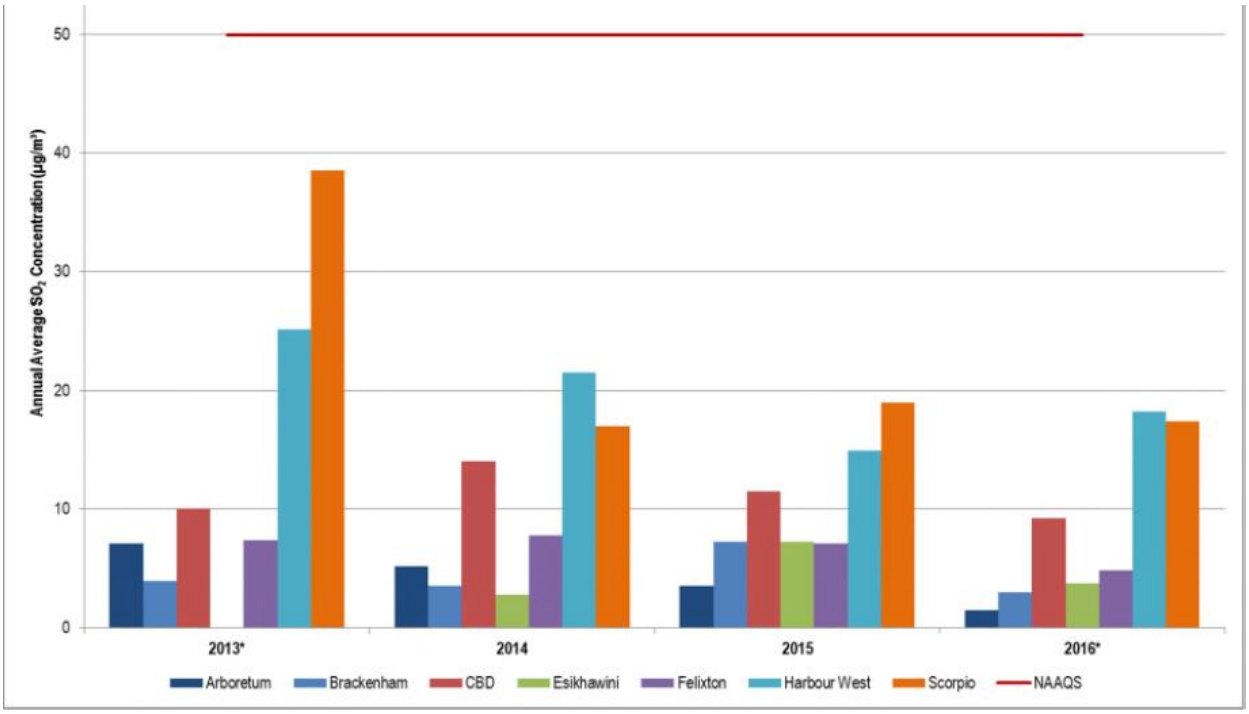


Figure 43: Annual average SO_2 concentrations (June 2013 to June 2016) [*indicates incomplete dataset; calculated average may not be accurate based on 50% data availability or less][9]

5.2 SOCIO-ECONOMIC ENVIRONMENT

The majority of information contained within this section is taken from the Socio-Economic Assessment conducted by ACER (Africa) Environmental Consultants and Urban-Econ Development Economists, undertaken to support the Environmental Authorisation (EA) applications for the decommissioning of the Bayside Aluminium smelter site.

5.2.1 DEMOGRAPHICS

5.2.1.1 Population

Data from the 2011 National Census states that the population within the uMhlathuze LM is 334,459 persons. This shows an annual increase of 1.5% between the 2001 and the 2011 National Census (StatsSA, 2011). This growth rate is higher than that experienced by the KCDM (0.2%) and the province (0.7%) (StatsSA, 2011).

In 2011, 67% of the population in the uMhlathuze LM were reported to be between the ages of 15 and 64, which is noticeably higher than the KCDM and the province which reported 61% and 63% in this age category, respectively. In addition, between 1996 and 2011 there has been a continuous increase in the percentage of the population within this age category while there has been a decrease in the population below the age of 15 (Table 14) (StatsSA, 2011).

Table 14: Breakdown of the population by age group

	KZN			KCDM			uMhlathuze		
	1996	2001	2011	1996	2001	2011	1996	2001	2011
0-14	36%	35%	32%	41%	39%	34%	34%	33%	29%
15-64	59%	60%	63%	55%	57%	61%	63%	64%	67%
65+	5%	5%	5%	4%	4%	5%	3%	3%	4%

An increase in the population within the ages of 15 – 64 can be seen as a positive development on a provincial, district and municipal level. This is because it indicates that there are a higher number of people within the potentially economically active sector of the population, which should reduce the level of dependency.

5.2.1.2 Education

Between 2001 and 2011, there has been a significant decrease in the percentage of the population over the age of 20 within the uMhlathuze LM reporting no access to formal education, with the figure dropping from 18% to 8% (Table 15). These figures are better than those reported for both the KCDM and KwaZulu-Natal, with 16% and 11%, respectively (StatsSA, 2011) (Table 15). The trend of better access to education within the uMhlathuze LM compared to the KCDM and province is also evident in the percentage of the population over the age of 20 reporting to have a Grade 12 level of education and some form of tertiary education, 39% and 15% in uMhlathuze, 30% and 9% in KCDM and 31% and 9% in KwaZulu-Natal, respectively (Stats SA, 2011) (Table 15).

Table 15: Highest level of education population over the age of 20, 2001 to 2011

	uMhlathuze		KCDM		KZN	
	2001	2011	2001	2011	2001	2011
No Schooling	18%	8%	32%	16%	22%	11%
Grade 12	25%	39%	17%	30%	20%	31%
Higher	11%	15%	6%	9%	7%	9%

Despite improvements to education levels, school attendance by females between the ages of five and twenty remains below that of males within the LM, KCDM and on a provincial level (despite school attendance improving between 2001 and 2011, there has been little improvement in the disparity between school attendance between males and females).

5.2.1.3 Unemployment

Unemployment levels are an important indicator of socio-economic well-being as formal employment indicates access to an income and the ability to provide for basic needs. Despite improvements between 2001 and 2011, unemployment within the uMhlathuze LM remains high at 31%; however this is below the level of unemployment reported for the KCDM (34.7%) and KwaZulu-Natal (33%) (StatsSA, 2011). The levels of unemployment reported within the LM, DM and province as a whole are all higher than the national average of 29.8% (StasSA, 2011a). Unemployment is reported to be highest in the municipal wards which encompass those areas which are developing on the urban periphery of Esikhaleni and Nseleni, while employment levels are highest in the urban areas of Richards Bay and Empangeni (uMhlathuze IDP, 2014-2015).

5.2.2 ECONOMIC INDICATORS

5.2.2.1 Income and expenditure patterns

There is a direct linkage between household expenditure and economic growth. Increase in household expenditure means a greater demand for goods and services, which implies an increase in production and a positive change in the size of an economy. Therefore, knowledge of the volume of the disposable income and the expenditure patterns of households can provide insight into the sectors that are most dependent on household income, thereby being most affected in the case of a change in household income. Household income levels are shown in Table 16.

Table 16: Household income distribution

Income category	South Africa	KwaZulu-Natal	KCDM	uMhlathuze LM	Richards Bay
No Income	14.9%	15.1%	13.5%	15.2%	11.9%
R 1 – R 4,800	4.5%	4.9%	4.8%	4.4%	1.4%
R 4,801 – R 9,600	7.4%	8.6%	9.2%	8.0%	2.8%
R 9,601 – R 19,200	17.1%	19.4%	20.2%	13.7%	5.6%
R 19,201 – R 38,400	19.0%	19.8%	21.1%	15.5%	6.6%
R 38,401 – R 76,801	13.1%	11.9%	11.5%	11.9%	9.1%
R 76,801 – R 153,600	9.3%	8.3%	8.0%	11.1%	13.9%
R 153,601 – R 307,200	7.2%	6.3%	6.0%	10.1%	20.9%
R 307,201 – R 614,400	4.7%	3.9%	4.1%	7.2%	18.8%
R 614,401 – R 1,228,800	1.9%	1.2%	1.2%	2.2%	7.0%
R 1,228,801 – R 2.457,600	0.6%	0.4%	0.3%	0.5%	1.2%
R 2,457,601 and above	0.3%	0.2%	0.2%	0.3%	0.8%
Average monthly income (2011)	R 8,696	R 7,100	R 6,935	R 10,502	R 23,130
Less than R3,200 pm.	62.9%	67.8%	68.8%	56.69%	28.2%

In South Africa, the average monthly household income was R 8,696 in 2011. Richards Bay had an average monthly income of R 23,130 with a significantly smaller portion of households living on less than R 3,200 per month compared to the rest of the study areas. The relatively high average income is likely attributable to the high level of industrialisation in Richards Bay. The highest number of households living on less than R 3,200 per month is observed in the uThungulu DM, with 69% of its households considered to be living in extreme poverty. This comparison with the district could be seen as an indication of the relative economic importance and the size of the development that has taken place in Richards Bay.

5.2.2.2 The economy and its structure

Analysis of the structure of the economy and the structure of its employment provides insight into the scale of reliance of an area on a specific sector(s) and, thus, the sensitivity of the area to changes in different sectors of global and regional markets.

Economic production and Gross Domestic product per Region

The Gross Domestic Product per Region (GDP-R) of the uMhlathuze LM was valued to be R 23,946 million in 2013 current prices (Table 17). This is equal to a per capita GDP-R of R 70,310, which is significantly higher than the national and provincial economies with a GDP-R per capita of R 57,160 and R 45,898, respectively (Table 17). The KCDM has the weakest economy in GDP terms with a per capita figure of R 40,340 (Table 17). In addition to signalling a weak economy, a lower GDP-R per capita is usually associated with a decreasing standard of living.

Table 17: GDP-R and GVA-R per capita (2013) (Source: Quantec, 2014)

	GDP-R (R' million)	GDP-R per capita (R)
South Africa	R 3,030,263	R 57,160
KwaZulu-Natal	R 480,382	R 45,898
uThungulu DM	R 37,245	R 40,340
uMhlathuze LM	R 23,946	R 70,310

Another important indicator of the well-being of a region's economy is the rate at which it is growing. Between 2003 and 2013, the uMhlathuze LM's economy grew on average 3% per year. This is lower than the national Compounded Annual Growth Rate (CAGR) of 3.4% per annum.

Considering the structure of the economy in nominal terms, it becomes evident that the national economy is predominantly a service economy. The tertiary sector comprised 70% of the national economy in 2013, and grew by 4%. The primary sector that includes agriculture and mining, contributes the smallest amount to the national economy. These sectors are, however, strategically important for food security and job creation. The mining and agricultural sectors experienced the lowest growth rates nationally. This could indicate potential job losses for individuals who are typically low to semi-skilled, with a specific skills set. The major drivers of the 3.4% national growth rate were the finance, insurance and business sectors and the trade, transport and communication industries.

In KwaZulu-Natal, the primary sector is significantly smaller than at national level, with agriculture comprising 4.4% of the province's primary economy as opposed to mining, which is the dominant primary sector at national level. Another notable difference between the province and the country is that the manufacturing industry is bigger within the provincial economy, suggesting that although the manufacturing industry grew by 2.6% in both regions, the impact is more significant in KwaZulu-Natal.

Within the primary study area, the importance of the manufacturing industry is evident in that this sector comprises more than 20% of the LM's economy. However, the manufacturing sector's growth in the LM (0.6% per annum) is below the growth recorded in the wider study area, 2.0% on a district level and 2.6% provincially and nationally per year between 2003 and 2013. The lower than average growth of this sector could be seen as an indication that the secondary sector within the uMhlathuze LM is experiencing pressure as a result of the relatively slow growth experienced by the local economy. A breakdown of the structure of the study areas' economies is show in Table 18.

Table 18: Structure of the study areas' economies (nominal 2013 prices) and Compound Annual Growth Rate (2003-2013)

Sectors	South Africa		KwaZulu-Natal		KCDM		uMhlathuze LM	
	Nominal 2013	CAGR ('03–'13)	Nominal 2013	CAGR ('03-'13)	Nominal 2013	CAGR ('03-'13)	Nominal 2013	CAGR ('03-'13)
Primary sector	**11.6%**	**0.2%**	**6.6%**	**1.3%**	**13.4%**	**-1.3%**	**11.4%**	**-1.9%**
Agriculture, forestry and fishing	2.4%	1.9%	4.4%	1.8%	6.5%	1.1%	3.4%	4.4%
Mining and quarrying	9.2%	-0.4%	2.2%	-0.2%	6.9%	-4.1%	8.0%	-4.7%
Secondary sector	**18.4%**	**3.0%**	**22.1%**	**2.9%**	**25.1%**	**2.3%**	**27.3%**	**0.9%**
Manufacturing	11.6%	2.6%	15.7%	2.6%	18.6%	2.0%	20.5%	0.6%
Electricity, gas and water	3.0%	1.6%	3.0%	0.9%	2.7%	0.3%	3.3%	0.8%
Construction	3.7%	6.8%	3.5%	6.8%	3.7%	6.7%	3.5%	4.8%
Tertiary sector	**70.0%**	**4.0%**	**71.3%**	**4.1%**	**61.5%**	**4.6%**	**61.3%**	**3.8%**
Trade	16.6%	3.7%	18.2%	4.0%	16.0%	5.8%	15.2%	4.9%
Transport and communication	8.9%	3.6%	13.2%	3.9%	14.4%	4.3%	14.1%	2.4%
Finance, insurance, and business	21.5%	5.1%	18.8%	5.5%	13.9%	6.7%	13.6%	6.1%
Community services	6.0%	2.6%	6.2%	2.7%	6.1%	2.0%	6.2%	2.4%
General government	17.1%	3.3%	14.8%	3.4%	11.2%	2.3%	12.1%	2.8%
Total	**100%**	**3.4%**	**100%**	**3.6%**	**100%**	**3.0%**	**100%**	**2.1%**

Sectoral employment structure

Sectoral employment patterns are similar across all study areas with the only difference being the relatively high importance of the agricultural sector in the DM; 7.19% compared with 3.89% and 4.3% in the LM and province, respectively. Within the uMhlathuze LM, the greatest contributor towards employment creation is the utilities sector, creating almost a quarter of employment opportunities within the local economy. The manufacturing sector; which comprises 20% of the economy, creates 7.74% of the employment opportunities within the LM's economy. However, this sector, on average, is growing at a rate below that of the other sectors, which is concerning considering that it makes up one fifth of the local economy. Loss of production and employment in the manufacturing sector could, therefore, further impact on the already below average growth rate of the uMhlathuze LM's local economy. The national, provincial, district and local employment structure are illustrated in Figure 44.

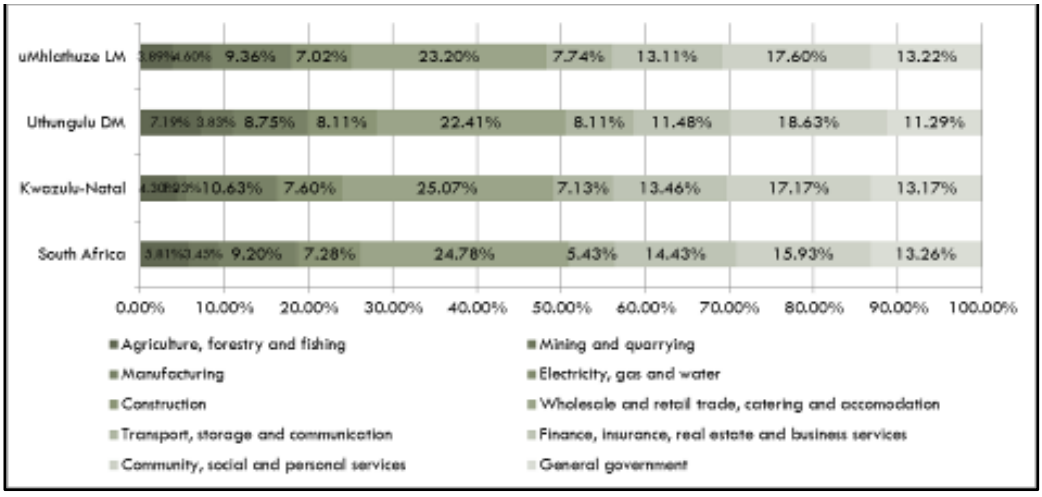


Figure 44: Employment structure 2013 (Quantec, 2014)

5.2.3 INFRASTRUCTURE AND SERVICES

5.2.3.1 Water Supply

The EMF for the Richards Bay Port and IDZ indicates that the available water resources within the Richards Bay are fully utilised. Water is supplied through a piped network to the various users, as well as through direct abstraction from boreholes. As the population grows within the region, as well as the expansion of economic and industrial activities, the water demand is likely to increase. Concern has been raised regarding the volumes of water that will be available to service natural ecological processes. In particular, water is required for recharge to maintain the lake and estuarial ecosystems. The fear is that there will not be enough water to flush out the estuaries in the area, and the subsequent maintaining of ecosystem balances.

Access to piped water improved significantly within the uMhlathuze LM between 2001 and 2011, with 92% of all households (Table 19) reported to have access to piped water either within their household or within their yard (StatsSA, 2011). The improvement in access to water is also seen in the reduction of people without access to piped water declining from 11% to 3% (Table 19) (StatsSA, 2011).

Table 19: Access to piped water

	uMhlathuze		KCDM		KZN	
	2001	2011	2001	2011	2001	2011
Piped water inside dwelling/yard	68	92	38	65	49	64
Communal standpipe	20	5	17	19	24	22
No access to piped water	12	3	45	16	27	14

5.2.3.2 Sewerage and Sanitation

Effluent emanating from the City of uMhlathuze is managed through different systems, the infrastructure network of the Richards Bay area is depicted in Figure 45:

- A sea outfall pumping scheme, which deals with sewerage that originates from the various urban areas, as well as industrial zones, within Richards Bay;
- Sludge sewerage treatment plants (particularly for urban areas effluent); and
- Pit latrines found in rural areas.

Improvements to sanitation have been experienced by households throughout KZN, within the KCDM and within the uMhlathuze LM. This is evident in the reduction in the number of households without access (16% to 7% (KZN), 30% to 13% (uThungulu) and 9% to 4% (uMhlathuze)) (StatsSA, 2011) (Table 20). As is the case with access to water, access to sanitation within the uMhlathuze LM is above both the district and provincial averages.

Access to flush/chemical toilets has also improved, with access in the uMhlathuze LM higher than in the district and province (Table 20). Of concern is that there has been an increase in the number of households reporting to make use of the bucket system (Table 20).

Table 20: Access to sanitation between 2001 and 2011

	uMhlathuze		KCDM		KZN	
	2001	2011	2001	2011	2001	2011
Flush or chemical toilet	53%	65%	32%	43%	46%	54%
Pit latrine	37%	28%	36%	41%	37%	36%
Bucket latrine	1%	3%	2%	3%	1%	3%
None	9%	4%	30%	13%	16%	7%

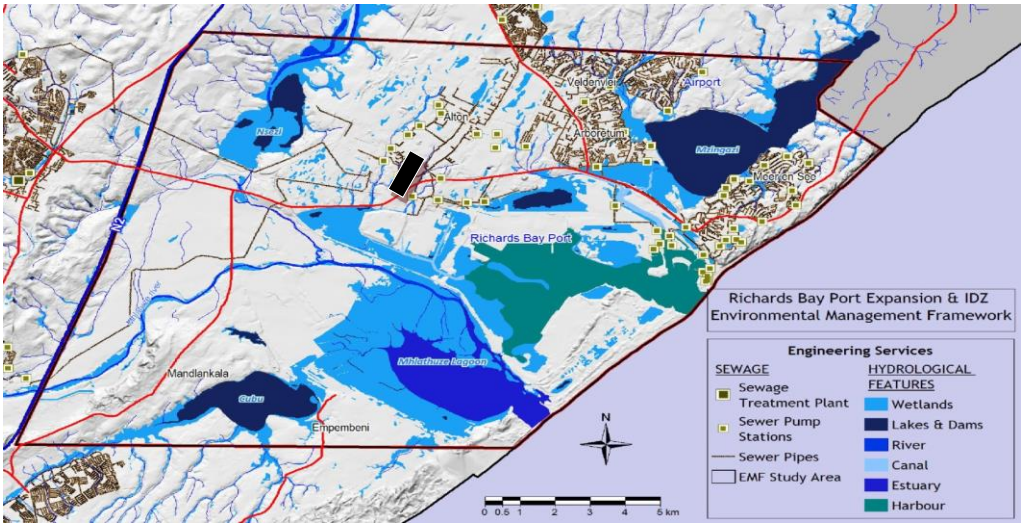


Figure 45: Sanitation Infrastructure in the Richards Bay Region (Bayside Aluminium shown by the black block)[10]

5.2.3.3 Electricity

Access to electricity for lighting (the most basic level of access) within the uMhlathuze LM is better than access on a district and provincial level (Table 21). However, noticeable improvements have been seen throughout KZN between 2001 and 2011 (Table 21) (StatsSA, 2011).

Table 21: Access to electricity for lighting

	Access to Electricity for Lighting	
	2001	**2011**
uMhlathuze LM	86%	94%
uThungulu DM	53%	76%
KZN	61%	78%

5.2.3.4 Healthcare

Primary healthcare within the LM is provided from two main clinics, one in Richards Bay and one in Empangeni, supported by satellite clinics. The main healthcare conditions reported are hypertension, diabetes and tuberculosis. Sexually transmitted infections are reported to remain a growing concern within the municipality (uMhlathuze IDP, 2014-2015).

5.2.3.5 Road Infrastructure

Road infrastructure in the region is dominated by the N2 National Highway, which runs in a north to south direction, to the far west of the Port of Richards Bay. The main feeder route from the N2 to the Port is the R34, which runs east to west, just to the north of the site.

5.2.4 HERITAGE AND SENSE OF PLACE

A baseline heritage study was conducted in 2013 in anticipation of the expansion of the Richards Bay Port. While the baseline study did recommend a full Heritage Impact Assessment, the following was identified in the report:

- No heritage resources with Grade I or Grade II status are situated within the Richards Bay Port expansion area;
- It is unlikely that buildings or structures older than sixty years are present (due to recent history and establishment of Richards Bay); and,

[10] DAERD (2011) Environmental Management Framework for the Richards Bay Port Expansion Area and Industrial Development Zone. Department of Agriculture, Environmental Affairs and Rural Development (DAERD), Pietermaritzburg, South Africa.

- It is unlikely that places associated with oral traditions or living heritage are present within the proposed development area. [11]

However, a survey conducted as part of the EMF for the Richards Bay Port and IDZ[12] identified the following cultural and historical features:

- Numerous archaeological and paleontological sites were identified (with 10km of the Port);
- Numerous archaeological sites of high significance have been discovered in the coastal dune area; and,
- Significant paleontological remains have been discovered in the area.

Sense of Place is a function of the visual quality within the area and Richards Bay has conflicting visual quality. On one hand, town planning has ensured (to some degree) the preservation of the character of Richards Bay but this must be seen against a backdrop of large scale development including large industries and the Port. The visual quality of the area is depicted in Figure 46.

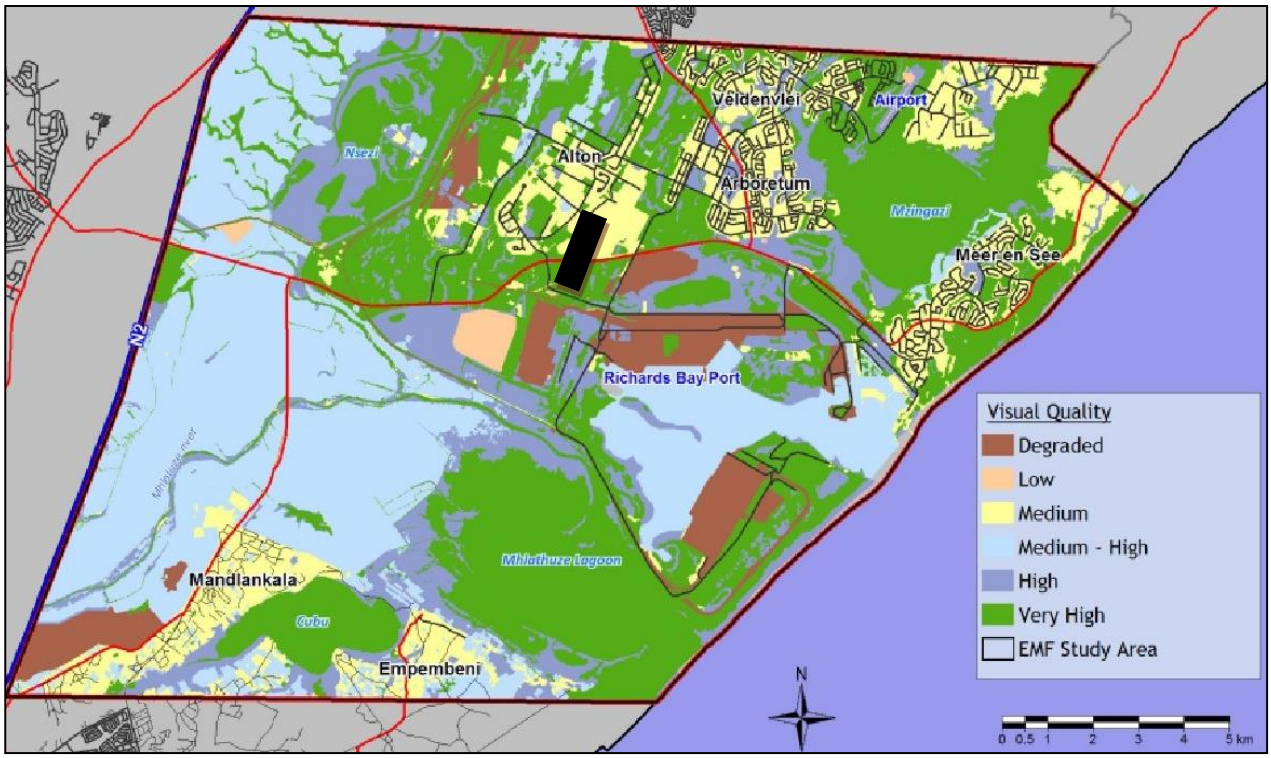


Figure 46: Visual Quality assessment of the Richards Bay Port and IDZ (Bayside Aluminium shown by black rectangle)

5.2.5 AMBIENT NOISE

A baseline acoustic study was conducted in 2013 in anticipation of the expansion of the Richards Bay Port. No significant noise impact on sensitive receptors was identified at a distance of 1500m and greater (from the existing Richards Bay and Transnet facilities). Sensitive receptors within 1000m of the study area include the Protea Waterfront Hotel, the Waterways Residential Estate and the Mzingazi Waterfront Village. Accordingly, it was concluded that the current activities that take place within the Richards Bay Port and IDZ do not impact significantly on surrounding sensitive receptors. [13]

[11] Baseline Heritage Study: Richards Bay Port Expansion, KwaZulu-Natal: AECOM, 2013

[12] DAERD (2011) Environmental Management Framework for the Richards Bay Port Expansion Area and Industrial Development Zone. Department of Agriculture, Environmental Affairs and Rural Development (DAERD), Pietermaritzburg, South Africa.

[13] Acoustical Baseline Report – Richards Bay Port Expansion: AECOM, 2013

6 PUBLIC PARTICIPATION PROCESS

The Public Participation guideline (DEA, 2017) provides the following introduction and legal background with regards to the public participation process within the EIA.

According to Section (2)(4)(f) and (o) of the Act,

- *the participation of all interested and affected parties (I&APs) in environmental governance must be promoted and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured, and*
- *the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.*

In order to give effect to the above sections, it is essential to ensure that there is adequate and appropriate opportunity for public participation (PP) in decisions that may affect the environment. Section 24(1A) (c) of the Act allows for this participation by requiring that the person conducting PP comply with any regulated procedure related to public consultation and information gathering through the public participation process (PPP).

The guideline further highlights the following characteristics of a comprehensive public participation process:

- It provides an opportunity for all role players (including potential and registered I&APs, EAPs, state departments, organs of state, and the Competent Authority) to obtain clear, accurate and understandable information about the environmental impacts of the proposed activity or implications of a decision;
- It provides role players with an opportunity to voice their support, concerns and questions regarding the project, application or decision;
- It provides role players with the opportunity of suggesting ways for reducing or mitigating any negative impacts of the project and for enhancing its positive impacts;
- It enables the person conducting the public participation process to incorporate the needs, preferences and values of potential or registered I&APs into its proposed development that becomes subject of an application for an EA;
- It provides opportunities for clearing up misunderstandings about technical issues, resolving disputes and reconciling conflicting interests;
- It encourages transparency and accountability in decision-making;
- It contributes towards maintaining a healthy, vibrant democracy; and,
- It gives effect to the requirement for procedural fairness of administrative action as contained in the Promotion of Administrative Justice Act, 2000 (Act No. 3 of 2000).

The following sections detail the methodology employed to ensure an effective and transparent public participation process as part of this S&EIR application process.

6.1 IDENTIFICATION OF I&APS

A database of all potential I&APs, including State Departments, was compiled (Appendix 3). The following categories of I&APs were included in the database:

- Landowners;
- All directly adjacent landowners;
- Community Organisations, such as: Rate Payers Associations, Home Owner Associations, Interest Groups, etc.;
- Relevant State Departments, such as:

  - Environmental, planning and other departments within Provincial Government, District and Local Municipalities;
  - Department of Water and Sanitation (DWS);
  - Department of Public Works; etc.
- Ward Councillors;
- Non-Governmental Organisations (NGOs) (such as Wildlife and Environmental Society of South Africa (WESSA));
- Various environmental protection agencies/ bodies (e.g. AMAFA and Ezemvelo KZN Wildlife); and
- Any other party perceived as playing a role within the community/ study area.

All I&APs requesting registration on the project's database and those who submitted comments (to-date) have been captured within the Registered I&APs database. The database will be maintained throughout the S&EIR application process. Those identified I&APs (other than state departments) who do not register during the registration period will not be carried over onto the Registered I&APs database, unless they participate in subsequent stakeholder engagement meetings and/or comment on documents placed within the public domain.

6.2 ANNOUNCE THE APPLICATION, CALL FOR I&AP REGISTRATIONS AND REVIEW OF THE DRAFT SCOPING REPORT

The following activities were undertaken to announce the S&EIR application, to request I&APs to register, to announce the availability of the Draft Scoping Report for review and comment (refer to Appendix 3 for details):

- Newspaper advertisements in the local Eyethu Baywatch (in Zulu) Zululand Observer (English) newspapers on 04 and 06 November 2020, respectively;
- Fixing of 4 site notices on 05 and 06 November 2020 at strategic locations on and around the site (at the Permit Office for TNPA – Port of Richards Bay access control; Richards Bay Public Library; City of uMhalthuze Local Municipal Offices; and at the entrance to the South32 Bayside Aluminium/ Isiszinda Aluminium site); and,
- Notification letters were sent via email on 05 November 2020 to all potential I&APs on the project database.

The Draft Scoping Report was available for review and comment for a period of **30 calendar days** (excluding public holidays) **from 06 November – 07 December 2020** on the SE Solutions website – www.sesolutions.co.za. Two public/ stakeholder online meetings where hosted on 23 and 24 November 2020 via Microsoft Teams. Comments and queries and responses issued where captured within a Comment and Response Report (CRR) which was circulated to all registered I&APs whether or not they participated within the meetings. In addition, all written comments received during the review and commenting period of the Draft Scoping Report, were included within a project CRR and is attached to this Final Scoping Report (Appendix 3).

6.3 FINAL SCOPING REPORT

This Scoping Report has been updated based on the comments and inputs received during the review and commenting period on the draft report. This report was submitted to DEFF on Friday, 11 December 2020 for review towards acceptance/rejection, with or without conditions. All registered I&APs were also notified of the Final Scoping Report and that it is available on the SE Solutions website for review and comment, should they chose to review it again.

7 IDENTIFICATION OF ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS

The following potential environmental impacts (both negative and positive) have been identified based on the ISO 14001 Environmental Management System (EMS) standard of firstly identifying activities, associated aspects and resultant potential impacts. Activities, aspects and impacts are defined as:

7.1 ACTIVITIES

Activities are the physical activities that typically unfold over the full product lifecycle. In the case of this application the activities are limited to decommissioning, which includes remediating the smelter site where this may be required.

7.2 ASPECTS

Environmental and social aspects are defined as 'an element of an organisation's activities, products or services that can interact with the environment.' For example, waste water discharge from washing buildings/ structures.

7.3 IMPACTS

Environmental and social impacts are defined as "any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services". For example, water quality changes that could occur as a result of the uncontrolled discharge of wash water.

The magnitude of the impact will be a function of the **receiving environment.** For example, the impacts of a water demanding activity in the south-eastern parts of KwaZulu-Natal would mean very different impacts to establishing the self-same activity in the Limpopo Province. As such, it is necessary to be able to provide an effective indication of the likely sensitivities or vulnerabilities of the receiving environment to provide for a proper assessment of the scale and severity of the impacts.

7.4 IDENTIFIED POTENTIAL IMPACTS

The process of identifying and characterising potential impacts is illustrated in Figure 47 and summarised below as a set of consecutive steps.

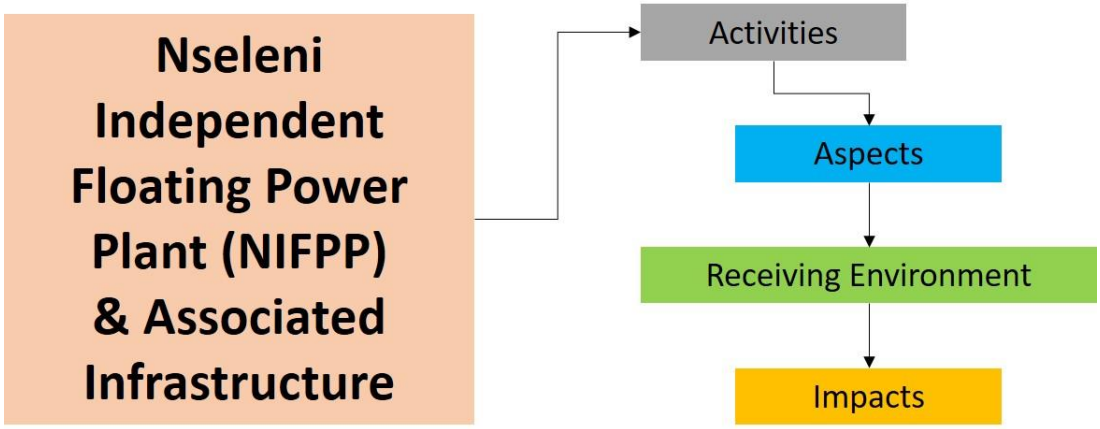


Figure 47: Schematic illustration of the process of identifying potential impacts that may occur as a result of the proposed development.

Step 1: Identifying activities

In order to identify potential impacts it is necessary to detail the activities that result from the construction and operational phases of the proposed development project. The following activities have been identified based on the detailed project description:

Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032

Construction Phase:

- Evacuation of Electricity (overhead gantry with GIL transmission line):
  - Clearing of vegetation (land-based) for overhead gantry pylon footprints;
  - Erection of gantry on land-based pylons;
  - Construction of the new substation and switching yard and connection to the local ESKOM grid;
  - Off-site transport of spoil material from vegetation clearing activities;
  - Excavation backfilling and compaction, as needed, and topsoil placement; and,
  - Re-vegetation with appropriate (indigenous) species (hydroseeding and/or manual planting).

Operational Phase:

- Floating Power Barges – power generation:
  - Operation of the CCGT power plants;
  - Abstraction of water from the Port environment;
  - Demineralisation/ desalination of water for the CCGT plants and for other potable water uses; and,
  - Discharge of treated wastewater into the Port environment.
- On site handling and temporary storage of waste materials; and,
- Off-site transport and disposal of waste materials.

Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033

Construction Phase:

- Construction vessels moving in and out of the Port.
- LNG & Power Barge Terminals:
  - Marine piling;
  - Construction of the concrete and steel quays/jetties;
  - Construction of the LNG docking/ mooring stations and other on-quay plants/ infrastructure; and,
  - Dredging.
- Evacuation of Electricity (overhead gantry with GIL transmission line):
  - Marine piling for overhead gantry platform; and,
  - Erection of gantry on marine piles.

Operational Phase:

- Delivery and storage of LNG:
  - LNG vessels entering the Port of Richards Bay & docking to the LNG docking/ mooring stations;
  - Offloading of LNG from the LNG vessels to the on-quay LNG bulk storage tanks;
  - Storage of LNG in bulk storage tanks; and,
  - Regasification of LNG for the CCGT plants.
- On site handling and temporary storage of waste materials;
- Off-site transport and disposal of waste materials;
- On site management of stormwater;
- On-going dredging to maintain the necessary draft for the Floating Power Barges; and,
- On-going maintenance of the quays/ jetty infrastructure.

Step 2: Identifying aspects

For each of the identified activities it is necessary to list the associated environmental and social aspects (Table 22). These environmental and social aspects can be identified as a function of the activity list developed in Step 1.

Table 22: Broadly stated environmental and social aspects that would be evoked by the activities listed in Step 1.

Resource Use	Energy	Liquid Fuels
		LNG
	Water (Estuarine)	
	Land Transformation	Vegetation
		Wetlands
		Estuary
		Heritage & Cultural Resources
Waste & Pollution	Waste (off-site disposal)	Hazardous solid/ liquid wastes
		Waste concrete
		Vegetation waste
	Effluent	Stormwater
		Wastewater
	Atmospheric emissions	Dust/ PM_{10}
		SO_2; NO_x; PM
		Greenhouse Gases (GHG)
	Radiation	Noise
		Temperature flux
	Spillage	Hydrocarbons
		LNG
	Aesthetics	Visual
Socio-Economic	Jobs	
	Spending	
	Skills/ Experience	

Step 3: Characterising the receiving environment (brief summary highlighting the main characteristics)

Importantly the environment and society can never be understood as a series of discrete, unrelated components, but rather should be viewed as a system. The receiving environment is now, and will always be a dynamic system where change is the only constant. 'Impact Mapping' is an approach to mapping the components of the receiving environment highlighting the key elements and how these are related to one another in cause-effect relationships. A proposed impact map for the NIFPP and associated infrastructure is shown in Figure 48. Thereafter, follows a brief summary highlighting the main characteristics of the receiving environment.

- Ambient Air Quality:
    - Annual average PM_{10} concentrations were compliant with the NAAQS at all RBCCA stations, in particular the Richards Bay CBD station yielded concentrations between 25-30 µg/m^3.
    - Annual average SO_2 at all RBCCA stations was compliant with the NAAQS with a slight trend towards improvement at all stations, in particular the Harbour West station yielded concentrations less than 25 µg/m^3.
- Residential areas to the north-east of the Port of Richards Bay.
- Ambient Noise Levels: SANS Industrial limit is 70 dB(A).

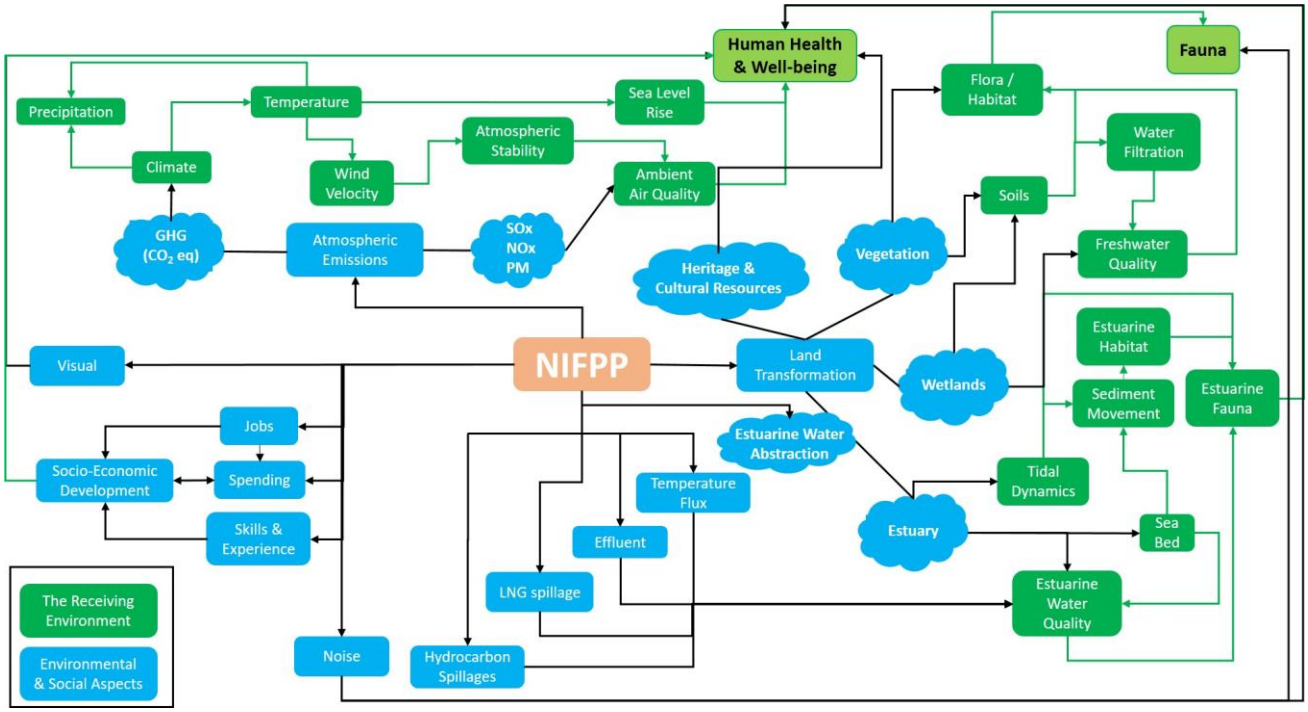


Figure 48: Characterisation of the receiving environment for the proposed development in the Port of Richards Bay.

- Sensitive flora (that may be present within the land-based study area):
    - Swamp Fig *Ficus trichopoda* (Protected Tree ito National Forests Act, 1998 (Act No. 84 of 1998) (NFA)). They are predominantly concentrated in low-lying areas where the groundwater table is at or near the surface.
    - Marula *Sclerocarya birrea subsp. caffra* (Protected Tree ito NFA).
    - Blue Waterlily *Nymphaea nouchali* (Regionally Protected) – occurs in freshwater habitats.
    - Large Yellow *Eulophia Eulophia speciosa* (Declining; Regionally Protected).
    - White Arum Lily *Zantedeschia aethiopica* (Regionally Protected) – occurs in marshy habitats.
    - Mangrove Swamp (Black Mangrove – *Burguiera gymnorrhiza* (Protected Tree) and White Mangrove – *Avicennia marina*) – Critically Endangered vegetation type in KwaZulu-Natal and is predominantly located along the edges of the Manzamnyama, Bhizolo and Lower Bhizolo channels, east and south of the Bayside site leading into the Port of Richards Bay.
- Estuarine ecology
    - Intertidal mangroves (Protected Trees);
    - Subtidal mudbanks/ mudflats within Manzamnyama, Bhizolo and Lower Bhizolo channels and the Port of Richards Bay.
    - Kabeljou Flats (sandspit) within the Port of Richards Bay is known to support numerous ecological functions and biodiversity within the Port Estuary.
    - Sediment/ bed of the Port Estuary is believed to be contaminated and mobilisation of sediments through marine piling and dredging activities may have negative impacts on the biodiversity and ecology of the Port Estuary.
    - Water quality is believed to be consistent with that of Port environments.
- Wetland ecology
    - Numerous wetlands are present within the greater area. A large wetland exists along the western boundary of the Bayside Aluminium smelter site.
    - Overall wetlands were considered to be important in terms of flood attenuation and enhancing water quality within the landscape.

- Groundwater: The underlying shallow aquifer is connected in places with the deep aquifer underlying the land-based study area. Elevated groundwater levels are present in the south-west relative to the Bayside Aluminium smelter site.
- Socio-Economic Environment:
    - Load shedding ito electricity supply is a reality within the KZN province and greater Country.
    - High levels of unemployment within the Local and District Municipalities at 31% and 34.7%, respectively.
    - Richards Bay had an average monthly income of R 23,130 with a significantly smaller portion of households living on less than R 3,200 per month. The relatively high average income is likely attributable to the high level of industrialisation in Richards Bay.

Step 4: Identifying potential impacts

The final step is then determining the impacts themselves. Key environmental and social impacts are summarised in Table 23 and Table 24 below. These impacts can be updated as and when needed, most especially during the EIA Phase once specialist studies have been completed.

7.5 IDENTIFIED CUMULATIVE IMPACTS

The 2014 EIA Regulations define "cumulative impact" in relation to an activity as: "*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 the existing and reasonably foreseeable impacts eventuating from similar or diverse activities*."

The following cumulative impacts were identified based on the activities to be undertaken on site as well as those known to be underway and/or present within the surrounding area.

- Additional dredging activities within the Port of Richards Bay, specifically in addition to the already authorised:
    - Construction of 2 new Panamax shipping berths at the 600 series berths, with associated dredging of a channel to a depth of 14m and 800m turning circle.
- Increased disturbance within the greater surrounding estuarine and wetland sensitive environments;
- Increase in air emissions and an overall potential decrease in air quality;
- Increase in wastewater discharge into the Port environment;
- Increased power generation capacity and supply of electricity into the local and national Grid (positive impact); and,
- Socio-economic impacts, such as an increase in local and regional economic activities.

Table 23: Construction Phase: Potential negative and positive impacts that could be invoked by the environmental and social aspects associated with the proposed development.

Environmental and Social Aspects			Activities										Potential Impacts (viz. potential changes in…)	Potentially Significant Impacts Requiring Assessment
			Construction Phase											
			Construction vessels moving in & out of the Port	Marine Piling	Construction of concrete & steel quays	Construction of docking/ mooring stations & other on-quay infrastructure	Dredging	Clearing of vegetation	Erection of land-based pylons to support overhead GIL gantry	Construction of the substation and switching yard	Excavation of soil	Backfilling & compaction & revegetation		
Resource Use	Energy	Liquid fuels	X	X	X	X	X	X	X	X	X	X	Resource use	No
		LNG												No
	Water (Estuarine)													-
	Land Transformation	Vegetation						X	X	X	X	X	Terrestrial biodiversity	Yes
		Wetlands						X	X	X	X	X	Wetland ecology	Yes
		Estuary		X	X		X						Estuarine ecology	Yes
		Heritage & Culture						X	X	X	X		Heritage Resources	No
Waste & Pollution	Waste (off-site disposal)	Hazardous solid/ liquid waste			X	X							Landfill airspace	No
		Waste concrete		X	X	X			X	X			Landfill airspace	No
		Vegetation waste						X	X	X	X		Landfill airspace	No
	Atmospheric emissions	Dust/ PM_{10}						X	X	X	X	X	Ambient air quality	Yes
		SO_2; NO_X; PM	X											No
		Greenhouse Gases											Climate	-
	Radiation	Noise	X	X	X	X	X	X	X	X	X	X	Ambient noise quality	No
		Temperature Flux											Ambient temperatures	-
	Effluent	Stormwater						X	X	X	X	X	Sedimentation	Yes
		Wastewater											Water quality	
	Spillage	Hydrocarbons	X	X	X	X	X	X	X	X	X	X	Water & soil quality	Yes
		LNG											Water quality	-
	Aesthetics	Visual						X	X	X	X		Aesthetics	No
Socio-Economic	Jobs (temporary)		X	X	X	X	X	X	X	X	X		Socio-economics	No
	Spending		X	X	X	X	X	X	X	X	X	X		No
	Skills/experience		X	X	X	X	X		X	X				No

Table 24: Operational Phase: Potential negative and positive impacts that could be invoked by the environmental and social aspects associated with the proposed development.

Environmental and Social Aspects			Activities – Operational Phase: LNG vessels entering Port & docking/ mooring with LNG Terminal	Off-loading of LNG into LNG bulk storage tanks	Storage of LNG	Operation of the CCGT Plants	Regasification of LNG	Abstraction of estuarine water	Demineralisation/ desalination of estuarine water	Discharge of treated wastewater	On-site handling & temporary storage of waste materials	Off-site transport & disposal of waste materials	Stormwater Management	Maintenance: dredging	Maintenance: quay/ jetty infrastructure	Potential Impacts (viz. potential changes in…)	Potentially Significant Impacts Requiring Assessment
Resource Use	Energy	Liquid fuels	X	X		X	X	X	X	X		X		X	X	Resource use	No
		LNG	X	X	X	X	X		X								No
	Water (Estuarine)							X	X	X							Yes
	Land Transformation	Vegetation														Terrestrial biodiversity	-
		Wetlands														Wetland ecology	-
		Estuary												X	X	Estuarine ecology	Yes
		Heritage & Culture														Heritage Resources	-
Waste & Pollution	Waste (off-site disposal)	Hazardous solid/ liquid waste	X	X	X	X	X	X	X	X	X	X		X	X	Landfill airspace	No
		Waste concrete													X	Landfill airspace	No
		Vegetation waste														Landfill airspace	-
	Atmospheric emissions	Dust/ PM_{10}										X				Ambient air quality	Yes
		SO_2; NO_X; PM	X			X											Yes
		Greenhouse Gases	X			X										Climate	Yes
	Radiation	Noise	X	X		X	X	X	X	X	X	X		X	X	Ambient noise quality	No
		Temperature Flux					X		X	X						Ambient temperatures	-
	Effluent	Stormwater														Sedimentation	-
		Wastewater				X	X		X	X			X			Water quality	Yes
	Spillage	Hydrocarbons	X	X		X	X	X	X	X	X	X		X	X	Water & soil quality	Yes
		LNG	X	X	X											Water quality	-
	Aesthetics	Visual	X	X	X	X	X		X							Aesthetics	No
Socio-Economic	Jobs (temporary)													X	X	Socio-economics	No
	Spending		X	X	X	X	X	X	X	X	X	X	X	X	X		No
	Skills/experience		X	X	X	X	X		X	X				X	X		No

8 APPROACH TO ASCRIBING SIGNIFICANCE FOR DECISION-MAKING

The best way of expressing the cost-benefit implications for decision-making is to present them as risks. Risk is defined as the consequence (implication) of an event multiplied by the probability (likelihood) of that event. Many risks are accepted or tolerated on a daily basis, because even if the consequence of the event is serious, the likelihood that the event will occur is low. A practical example is the consequence of a parachute not opening, which is potentially death, but the likelihood of such an event happening is so low that parachutists are prepared to take that risk. The risk is low because the likelihood of the consequence is low even if the consequence is potentially severe.

It is also necessary to distinguish between the event itself (as the cause) and the consequence. Again using the parachute example, the consequence of concern in the event that the parachute does not open is serious injury or death, but it does not necessarily follow that if a parachute does not open that the parachutist will die. Various contingencies are provided to minimise the likelihood of the consequence (serious injury or death) in the event of the parachute not opening, such as a reserve parachute. In risk terms, this means distinguishing between the **inherent risk** (the risk that a parachutist will die if the parachute does not open) and the **residual risk** (the risk that the parachutist will die if the parachute does not open, but with the contingency of a reserve parachute) i.e. the risk before and after mitigation.

8.1.1 CONSEQUENCE

The ascription of significance for decision-making becomes then relatively simple. It requires the consequences to be ranked (Table 25) and a likelihood to be defined of that consequence occurring. It should be noted that there is no equivalent 'high' score in respect of benefits as there is for the costs. This high negative score serves to give expression to the potential for a fatal flaw where a fatal flaw would be defined as an impact that cannot be mitigated effectively and where the associated risk is accordingly untenable. Stated differently, the high score on the costs, which is not matched on the benefits side, highlights that such a fatal flaw cannot be 'traded off' by a benefit and would render the proposed project to be unacceptable. Note that the EAP has defined the consequence descriptors, specialists are required to select the appropriate descriptor when ascribing significance to various impacts. This will allow for efficient comparing of significance across specialist assessments to allow for an integrated assessment of the project as a whole.

Table 25: Ranking of consequence

Environmental Costs	**Inherent Risk**
Human health – morbidity/mortality. Loss of species	High
Reduced faunal populations, loss of livelihoods, individual economic loss	Moderate-high
Reduction in environmental quality – air, soil, water. Loss of habitat, loss of heritage, amenity	Moderate
Nuisance	Moderate-low
Negative change – with no other consequences	Low
Environmental Benefits	**Inherent Benefit**
Net improvement in human welfare	Moderate-high
Improved environmental quality – air, soil, water. Improved individual livelihoods	Moderate
Economic development	Moderate-low
Positive change – with no other consequences	Low

8.1.2 LIKELIHOOD

Although the principle is one of probability, the term 'likelihood' is used to give expression to a qualitative rather than quantitative assessment, because the term 'probability' tends to denote a mathematical/empirical expression. A key point here is that likelihood of the consequence occurring must *de facto* take into account the good international industry best practice that is 'intrinsically built-in' to activities or methods. For example: an electricity transformer will never be constructed without bunding and stones to contain any oil spills due to potential failure of the transformer. To highlight bunding as a specific mitigation measure to reduce the consequence of a spill is simply inappropriate. Likelihood descriptors that can be used to characterise the likelihood of the costs and benefits occurring are presented in the table below.

Table 26: Likelihood descriptors and definitions

Likelihood Descriptors	Definition
Highly unlikely	The possibility of the consequence occurring is negligible
Unlikely but possible	The possibility of the consequence occurring is low but cannot be discounted entirely
Likely	The consequence may not occur but a balance of probability suggests it will
Highly likely	The consequence may still not occur but it is most likely that it will
Definite	The consequence will definitely occur

8.1.3 RESIDUAL RISK

The residual risk is then determined as a function of the consequence together with the likelihood of that consequence. The residual risk categories are shown in Table 27 where consequence scoring is shown in the rows and likelihood in the columns. The implications for decision-making of the different residual risk categories are shown in Table 28. Additional mitigation to manage (and potentially further reduce) and monitor the residual risk may also be defined. All mitigation is then prescribed in the Environmental Management Programme (EMPr). What is important is that the residual risk is what decision-makers must accept if they decide to authorise the proposed activity even if that residual risk is 'high'. The residual risk cannot and will not be artificially reduced within the assessment to 'low' to facilitate decision-making.

Table 27: Residual risk categories

		Residual risk				
Consequence	High	Moderate	High	High	Fatally flawed	
	Moderate – high	Low	Moderate	High	High	High
	Moderate	Low	Moderate	Moderate	Moderate	Moderate
	Moderate – low	Low	Low	Low	Low	Moderate
	Low	Low	Low	Low	Low	Low
		Highly unlikely	Unlikely but possible	Likely	Highly likely	Definite
		Likelihood				

Table 28: Implications for decision-making of the different residual risk categories shown in Table 27

Rating	Nature of implication for Decision – Making
Low	Project can be authorised with low risk of environmental degradation
Moderate	Project can be authorised but with conditions and routine inspections
High	Project can be authorised but with strict conditions and high levels of compliance and enforcement
Fatally Flawed	The project cannot be authorised

8.1.4 A NOTE ON CUMULATIVE IMPACTS

Impacts cannot be assessed in isolation and an integrated approach requires that cumulative impacts will be included in the assessment of individual impacts. The nature of the impact will be described in such a way as to detail the potential cumulative impact of the activity, if there is indeed a cumulative impact. For example, dust and air emissions cannot be assessed in isolation of the potential cumulative impact of increased emissions into the atmosphere. Similarly, if water quality is improved within the immediate surroundings of the proposed activities, this will most certainly have a ripple effect/ cumulative impact on the greater water quality in the area.

Once all the impacts have been assessed and significance ratings allocated, the EAP will assess the project on a holistic basis to determine the overall project impact on the receiving environment. This will be a function of the individual impacts as well as the cumulative nature of combining all those impacts within a single context/ project.

8.1.5 DESCRIBING THE IMPACT

The EIA Regulations also require, in addition to consequence, likelihood and significance (as described above), that the nature, extent, duration, reversibility and irreplaceable loss of a resource also be highlighted for identified impacts. These additional impact attributes are defined as follows:

8.1.5.1 Nature of the impact

The nature of an impact refers to a description of the inherent features, characteristics and/or qualities of the impact.

8.1.5.2 Scale/extent of the impact

Extent refers to the impact footprint or stated differently the spatial area over which the impact would manifest. Note that if a species were to be lost then the extent would be global because that species would be lost to the world.

Table 29: Listing of descriptors and associated definitions to determine the extent of an impact

Extent Descriptors	Definitions
Site	The impact footprint remains within the cadastral boundary of the site
Local	The impact footprint extends beyond the cadastral boundary of the site, to include the immediately adjacent and surrounding areas
Regional	The impact footprint includes the greater surrounding area within which the site is located
National	The scale/ extent of the impact is applicable to the Republic of South Africa
Global	The scale / extent of the impact is global (or world-wide)

8.1.5.3 Duration of the impact

Duration is the period of time for which the impact would be manifest. Importantly the concept of reversibility is reflected in the duration scoring. In other words, the longer the impact endures the less likely is the ***reversibility*** of the impact.

Table 30: Listing of descriptors and associated definitions to determine the duration of an impact.

Duration Descriptors	Definitions
Construction period only	The impact endures for only as long as the construction period of the proposed activity. This implies the impact is fully reversible. Like noise and dust.
Short term	The impact continues to manifest for a period of between 3 – 10 years. The impact is reversible.
Medium term	The impact continues to manifest for a period of 10-30 years. The impact is reversible with relevant and applicable mitigation and management actions.
Long term	The impact continues for a period in excess of 30 years. However, the impact is still reversible with relevant and applicable mitigation and management actions.
Permanent	The impact will continue indefinitely and is irreversible.

8.1.5.4 Irreplaceable loss of resources

Irreplaceable loss of resources refers to the degree to which the impact will result in the loss of a resource that is impossible to replace.

Table 31: Listing of descriptors and associated definitions to determine the irreplaceable loss of resources due to an impact.

Extent Descriptors	Definitions
High	The impact is most likely to or will result in the irreplaceable loss of a resource/s.
Medium	The impact may result in the irreplaceable loss of a resource/s, however applicable mitigation or management interventions may prevent complete loss or provide a suitable substitute/"offset".
Low	The impact will not result in the irreplaceable loss of a resource/s.

8.1.6 AN EXAMPLE OF THE ASSESSMENT OF THE SIGNIFICANCE OF IMPACTS

The following serves to highlight, by way of an example, how the significance of the impact will be presented, taking into account the methodology provided above.

Example: Operational Phase: Atmospheric Emissions:

Atmospheric emissions as a result of the proposed project were modelled to determine the impact on ambient air quality, with a view to understanding the human health and environmental risks posed by such emissions as illustrated in the impact map for this aspect (Figure 49).

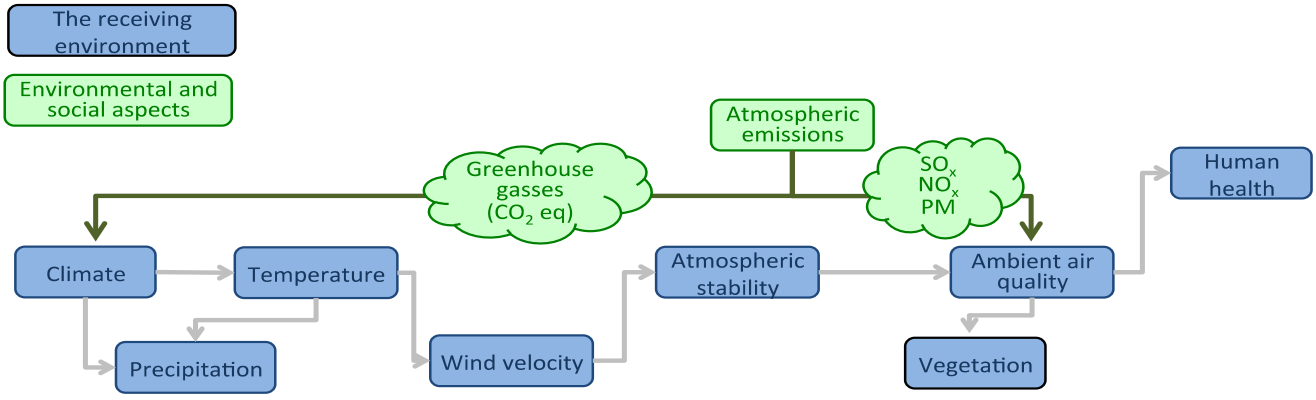


Figure 49: Example: Systems depiction of the components of the receiving environment that would be affected by atmospheric emissions from the proposed project.

The inherent risk of human health effects is high, but the likelihood of these manifesting as a result of atmospheric emissions from the proposed project is highly unlikely implying an impact significance of 'low'. Similarly, the inherent risk of vegetation damage and habitat loss as a result of atmospheric emissions from the proposed project is moderate-high, but the risk of that consequence manifesting is considered highly unlikely, resulting in an impact significance of low.

Table 32: Example: Impact significance for possible adverse human health risks as a result of atmospheric emissions from the proposed project.

Activity	Power Generation by way of Combined Cycle Gas Turbine (CCGT) technology
Environmental/ Social Aspect	Atmospheric Emissions (NO_x and PM)
Nature of the Impact	Adverse human health effects brought about by a change (deterioration) in the ambient air quality from atmospheric emissions of the power plant.
Extent/ Scale	Regional
Duration & Reversibility	Long-term & reversible
Irreplaceable loss of a resource	Low
Consequence Inherent risk	High
Causes of impacts / Event	**Likelihood of the consequence:**
Emissions of NOx result in ambient concentrations that exceed defined health based limits (i.e. NAAQS)	Definite both on and off-site for short term averaging periods, but very limited in extent within the project footprint for longer term averaging periods. Highly unlikely for the sensitive receptors identified given the prevailing wind direction and the distance of the proposed project to the residential areas.
Emissions of PM (TSP, PM_{30}, PM_{10}, $PM_{2.5}$) result in ambient concentrations that exceed defined health based limits (i.e. NAAQS)	Definite both on and off-site for short term averaging periods, but limited to within the project footprint for longer term averaging periods. Also likely that the predicted concentrations in the Hills area are exaggerated by the modelling, which treats hills and ridges as transparent. Highly unlikely for the sensitive receptor given the prevailing wind direction and the distance of the proposed project to the residential areas.
Presence of communities within the 'exposure area/ zone' that may be exposed to ambient concentrations that exceed health based limits (i.e. NAAQS)	Highly unlikely given that there are no communities within a 10 km radius of the proposed project, and as such there would be no exposure to ambient concentrations that exceed health based limits (i.e. NAAQS).
Residual risk	Low
Extrinsic/ additional mitigation measures	None required.
Residual risk after mitigation	Low

Table 33: Example: Impact significance for possible damage to vegetation and reduced habitat risks as a result of atmospheric emissions from the proposed project.

Activity	Power Generation by way of Combined Cycle Gas Turbine (CCGT) technology
Environmental/ Social Aspect	Atmospheric Emissions (NOx and PM)
Nature of the Impact	Damage to vegetation and reduced habitat brought about by a change (deterioration) in the ambient air quality from atmospheric emissions of the power plant.
Extent/ Scale	Regional
Duration & Reversibility	Long-term & reversible
Irreplaceable loss of a resource	Low
Consequence Inherent risk	Moderate - High
Causes of impacts / Event	**Likelihood of the consequence:**
Emissions of NOx result in ambient concentrations that exceed defined environmental damage based limits	Unlikely as vegetation damage would typically only occur with longer term exposure to elevated pollution concentrations which is not predicted by the dispersion model.
Emissions of PM (TSP, PM30, PM10, PM2.5) result in ambient concentrations that exceed defined environmental damage based limits	Unlikely as vegetation damage would typically only occur with longer term exposure to elevated pollution concentrations which is not predicted by the dispersion model.
Presence of sensitive vegetation/ habitat that may be exposed to ambient concentrations that exceed defined environmental damage based limits	Highly unlikely given the generally small, longer term averaging period ambient concentrations even over the immediate project area. No sensitive vegetation/ habitat exists within the broader study area.
Residual risk	Low
Extrinsic/ additional mitigation measures	None required.
Residual risk after mitigation	Low

9 ALTERNATIVES CONSIDERED

The 2017 EIA Regulations require the identification and assessment of feasible alternatives to the proposed activity. The following definition of alternatives is provided by the EIA Regulations:

"Alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the -

a) Property on which or location where it is proposed to undertake the activity;
b) Type of activity to be undertaken;
c) Design or layout of the activity;
d) Technology to be used in the activity;
e) Operational aspects of the activity;

and includes the option of not implementing the activity.

Based on the above it is important to note that alternatives do not only refer to locality alternatives, but also to a variety of technical alternatives including not proceeding with the proposed activity. Thus, alternatives that are relevant, feasible and reasonable (with the primary purpose being ways to reduce negative or enhance positive impacts) in terms of the proposed activities must be identified and assessed in the S&EIR process. In the discussion that follows, environmental aspects (identified in Section 7, Table 22) will be presented with a discussion on what can be done in implementing the project to reduce negative or enhance positive environmental and social impacts of the proposed project through the use of alternatives.

9.1 RESOURCE USE: ENERGY

9.1.1 ENERGY USE EFFICIENCY

A key issue in respect of electricity generation is the efficiency of the conversion of the ***energy source*** into electricity. Coal-fired power plants typically operate at about 35 to 38% efficiency with modern coal-fired plants in Japan exceeding 41%. Natural gas in a simply cycle plant (viz. just the turbine) has an efficiency of some 42% but if that is used in a combined cycle, where the waste heat from the gas combustion is used to convert water into steam to drive an additional turbine, then that efficiency can be raised to some 60% (Figure 50).

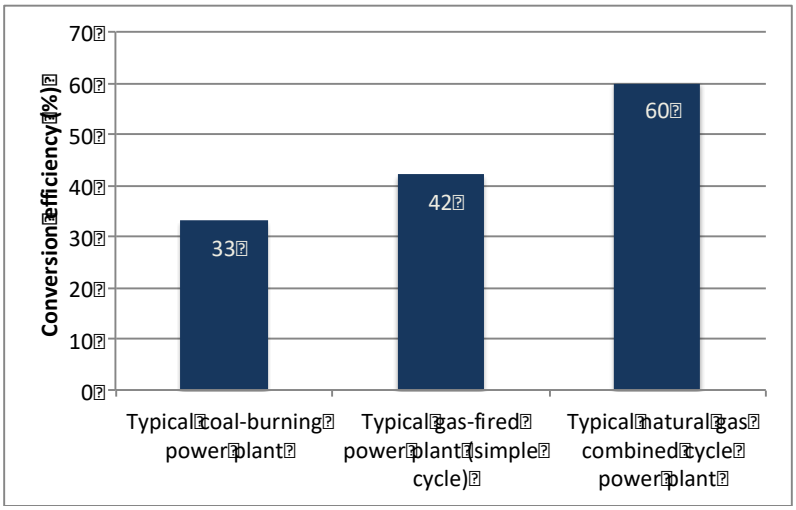


Figure 50: Relative fuel source to conversion efficiencies for different types of power plants[14].

[14] http://needtoknow.nas.edu/energy/energy-sources/fossil-fuels/natural-gas/

As was described in the project description (Section 2.3.4.2) the technology presented here (which is a CCGT) optimises the heat balance (heating requirements) for the NIFPP in the following ways, which ultimately serve to decrease the use of alternative energy sources:

- Heat generated from the combustion of natural gas (i.e. hot exhaust gas/air) provides the warming needed to generate steam for the steam turbines;
- The residual heat (after the above process) in the exhaust gas/ air is used to regasify the LNG in the regasification plants; and,
- The exhaust gas/ air is released to atmosphere (with minimal heat energy).

In addition to the heating required in the heat balance, cooling is also required within the closed-loop steam turbine circuit to condense the steam back into water phase. The following alternatives are proposed for the NIFPP (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032):

- Air cooling system, using ambient air, where heated air will then be released to atmosphere;
- Water cooling system, either closed loop or flow through, using ambient estuarine water abstracted from the Port/ Estuary, and where heated water is then re-integrated back into the Port/ Estuary or cooled using a refrigerant or possibly even the LNG; or possibly a system where;
- LNG (at -162^{o}C) is used through a suitable heat exchange medium to condense the steam into liquid form (the LNG will then be heated to a gas phase and sent to the regasification plants for further heating in the gaseous form).

In addition, there are three steam turbines proposed as part of the steam circuit; one driven by high-pressure steam, one by medium pressure steam and one by low-pressure steam; further maximising the use of available heat energy within the system. The NIFPP is targeting an overall efficiency of greater than 62% for the facility. The engineering design will optimise the heat balance and reveal the preferred alternative for the various heating and cooling requirements of the NIFPP. As such, the assessment of the above mentioned alternatives will be undertaken during the EIA and definitive engineering Phase of the ESIA and based on specialist input.

9.1.2 DIRECT USE OF BOG

In some circumstances where LNG is imported via a LNG Terminal it is necessary to flare BOG for safety reasons, resulting in a waste of an energy source. Due to the proximity of the CCGT Power Barges to the LNG Terminal at the proposed NIFPP, it will be possible to use BOG that is generated in the LNG bulk storage tanks and feed that directly into the turbines gas circuit thus eliminating any wastage of energy. It is for this reason therefore that no alternatives are assessed in this regard, as the “in-house” management of BOG constitutes Good International Industry Practice (GIIP).

9.1.3 TRANSPORT COSTS

LNG by virtue of the fact that it is transported by bulk ocean freight has a decided advantage over coal fired power stations as the freight rates for shipping are decidedly lower than either rail or road. In addition, by virtue of the fact that there is no waste by-product from gas combustion such as the ash in a coal fired power station, the overall transport and re-handling costs are significantly lower. There is also no requirement for a waste storage facility to handle ash.

9.2 RESOURCE USE: ESTUARINE WATER

The possible abstraction and use of water from the Richards Bay Estuary would be twofold. One use would be for cooling or heating (bearing in mind the relative temperature difference of the LNG), while the second would be makeup process water for the CCGT steam circuits and potable water for the NIFPP facility.

9.2.1 HEAT FLUX EXCHANGE FOR COOLING

As highlighted in Section 9.1.1 above, the cooling medium required for the CCGT Power Barges is required to condense steam back into a liquid phase. Seawater is often used for such cooling because of its availability and large thermal inertia. The downside of such a cooling system is two-fold; the first being the re-introduction of relatively warmer water back into the environment, which may result in negative impacts within the receiving environment, and the second being the volume required and concomitantly the physical size of the heat exchanger. If a closed-loop water cooling circuit is implemented, then water is abstracted as input water for the system, with minimal makeup water required on an *ad hoc* basis, and no discharge of heated water back into the receiving environment occurs. This closed-loop circuit would then facilitate the use of the latent heat characteristics of refrigerant gasses through an appropriate heat exchange medium to condense the steam back into liquid phase. The assessment of the above mentioned alternatives (seawater cooling vs closed-loop water cooling with refrigerant) will be undertaken during the EIA Phase of the ESIA and based on specialist input.

9.2.2 DEMINERALISATION/ DESALINATION OF ESTUARINE WATER

The inherent energy contained within the LNG (at -162^{o}C) could also be used for the demineralisation/ desalination of estuarine water (i.e. preferred alternative), the responsibility of Nseleni Power Corporation (Pty) Ltd [14/12/16/3/3/2/2032]. Frozen seawater is completely devoid of the salts which occur in normal seawater. It is proposed to demineralise/ desalinate cryogenically rather than using the more conventional Reverse Osmosis or similar processes which require large additional energy sources. The demineralisation/ desalination plants are required to provide enough "pure" water to make-up the demineralised water requirements of the steam circuits within the CCGT power plants and to supply potable water to the various personnel facilities at the NIFPP facility. The alternatives for desalination of estuarine water will be assessed within the EIA phase of the EA application process.

9.3 RESOURCE USE: LAND TRANSFORMATION

The NIFPP will primarily be a floating facility, hence it would not have the land take requirements of an equivalent power generation facility established on land. That is not to say that the NIFPP will not have any land take requirements, as there is a need to establish the LNG and Power Barge Terminals on quays (fixed structures on marine piles) (Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033) as well as a transmission line from the NIFPP to the on-land transmission substation (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032). Dredging to ensure the maintenance of the draught needed for the Floating Power Barges would also be needed. These requirements would see potential disruption to the seabed and estuarine habitats as well as land-based vegetation and wetland habitats.

9.3.1 SITE ALTERNATIVES (NSELENI POWER CORPORATION (PTY) LTD: 14/12/16/3/3/2/2032)

The rationale for the proposed activity, (power generation from LNG), with the Port of Richards Bay the preferred site and location within the RSA is provided within the Need and Desirability Section of this report (Section 3). Within the Port of Richards Bay various alternative development footprint sites were assessed, as described below, to determine the preferred development footprint site to be carried forward into the EIA Phase of the S&EIR application process.

9.3.1.1 Sand-spit area

The Applicant initially identified the sand-spit area within the Port of Richards Bay as the preferred location within the Port for the proposed NIFPP. This area falls outside the main Port activities and deep water channels and also outside the Port's future expansion plans.

9.3.1.2 Site 1 and 6 of ERM 2015 Scoping Assessment

A Draft Scoping Report compiled by Environmental Resource Management (ERM) in November 2015 on behalf of the Department of Energy and Transnet entitled: *Independent Power Producers Programme: EIA for a Floating Power Plant, Port of Richards Bay* was brought to the attention of the project development team by the estuarine ecological specialist. This ERM Scoping Report highlighted various sites within the Port of Richards Bay suitable for possible floating power plants (Figure 51). Of the six sites identified, sites 1 and 6 were flagged as possible alternative development footprint sites feasible for the proposed NIFPP.

Figure 51: Proposed site locations within the Port of Richards Bay as presented within the ERM November 2015 Draft Scoping Report: Independent Power Producers Programme: EIA for a Floating Power Plant, Port of Richards Bay.

Site 1: Opposite the 606-608 Berths

This site was indicated by the ecological specialist as the land areas to the south and west of the site could be dredged to increase the water surface area for the NIFPP in order to accommodate it at Site 1 without interfering with the existing TNPA activities at Berths 606-608. The land areas are largely degraded with limited ecological sensitivity. The evacuation of power would then also be much simpler with a short powerline (around 3km) to the Bayside substation or Eskom powerlines west of Bayside.

Site 6: Southern site opposite the Coal Terminal

This site was indicated by the ecological specialist as the site is easily accessed via the deep water channel of the Port and has limited ecological sensitivity, as it does not encroach into the Kabeljou Flats nor impacts on the sensitive Sand-spit.

9.3.1.3 Comparative assessment and identification of the preferred development footprint site

The table below highlights, at an appropriate high-level scoping assessment, the socio-economic and environmental advantages and disadvantages for each alternative development footprint site.

Table 34: Comparison of key considerations for each alternative development footprint site at Scoping Phase

	Site 1	Site 6	Sand-spit
Impacts on existing Port activities	High	Low	Low
Interfering with future Port expansion plans	High	Low	Low
Implementation of required safety buffers	No	Yes	Yes
Dredging of known sensitive estuarine habitat & associated knock-on impacts	Low negative	Very high negative	Moderate negative
Noise impacts on estuarine fauna (particularly avifauna)	Low negative	Low negative	Moderate – High negative
Power evacuation options (engineering perspective)	Excellent	Good	Challenging
Power evacuation options (ecological perspective)	Low negative	Moderate negative	Moderate – High negative

The originally identified development footprint site at the Sand-spit within the Port of Richards Bay remains the preferred site location due largely to the fact that Site 1 would clash with TNPA's proposed future port expansion plans and the required safety buffers cannot be met. Site 6 would similarly require extensive dredging of the highly ecologically sensitive Kabeljou Flats (as the development footprint cannot be accommodated at Site 6 without impacting on the Kabeljou Flats – refer to Figure 52 below for the development superimposed into the area at Site 6). The NIFPP cannot be reconfigured in a north-south orientation as it would then cut off the future deep water channel (just south of the Sand-spit – refer to Figure 32) proposed by TNPA as part of their future port expansion plans. The reconfiguration would also not negate the significant dredging of the Kabeljou Flats.

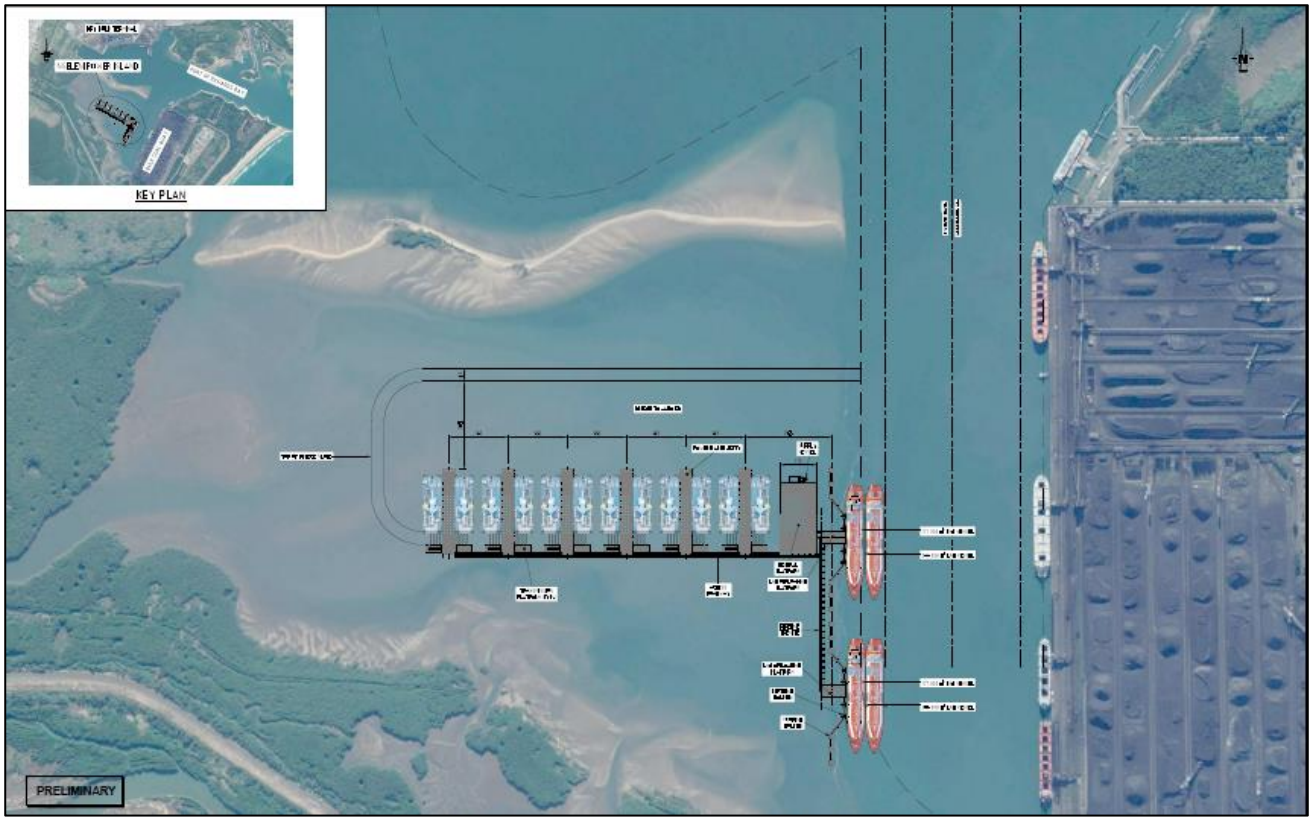


Figure 52: Proposed location of the NIFPP within the area of Site 6 (refer to Figure 51).

9.3.2 LAYOUT ALTERNATIVES (NSELENI POWER CORPORATION (PTY) LTD: 14/12/16/3/3/2/2032)

9.3.2.1 Layout 1 – On Sand-spit

This 1st proposed layout as presented by the Applicant has the NIFPP located directly over the Sand-spit (Figure 53). The rationale behind this layout was to ensure that the NIFPP was located south of existing Port activities and also took into account the proposed future Port Expansion project.

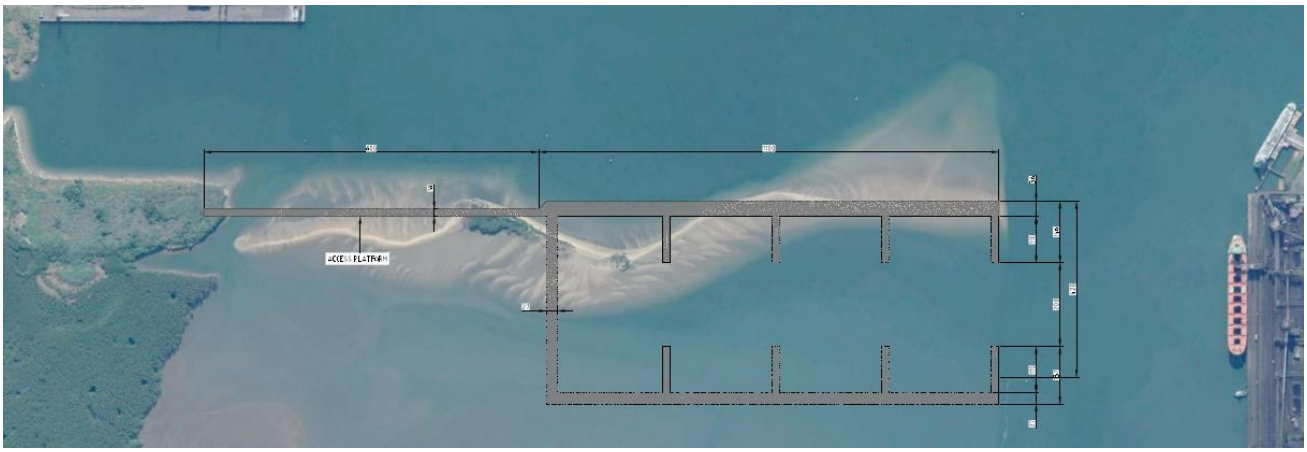


Figure 53: Layout 1: NIFPP is located directly over the Sand-spit within the Port of Richards Bay.

9.3.2.2 Layout 2 – Enclosing the Sand-spit

The initial layout (Figure 53) was refined based on the ecological sensitivity of the sand-spit based on initial inputs from specialists as well as existing data/ GIS layers on environmental sensitivity. Layout 2 was principally based on the fact that the proposed NIFPP and associated infrastructure would need to be established with the least direct impact on the environmentally sensitive sand-spit (Figure 21; Figure 32) and still remain outside of existing and proposed future Port activities (Figure 54).

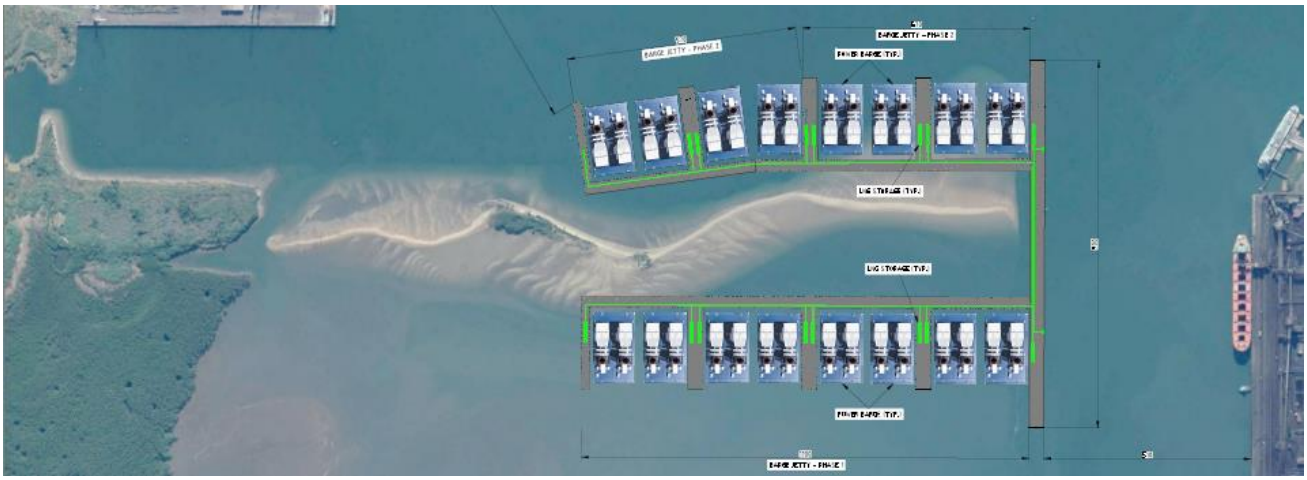


Figure 54: Layout 2 for the NIFPP within the Port of Richards Bay, essentially enclosing the Sand-spit

9.3.2.3 Layout 3 – North and east of the Sand-spit

Layout 3 (Figure 55) was then principally based on the fact that the Eskom National Grid in the area is constrained and cannot accept the originally proposed generation capacity of the project (in excess of 15 000MW). Accordingly it was decided to only use the northern portion of the proposed development layout to further minimise the impact on the sensitive Kabeljou Flats (south of the sand-spit) and to limit the volume of dredging required to create sufficient draft for the LNG vessels/ FSUs and Floating Power Barges.

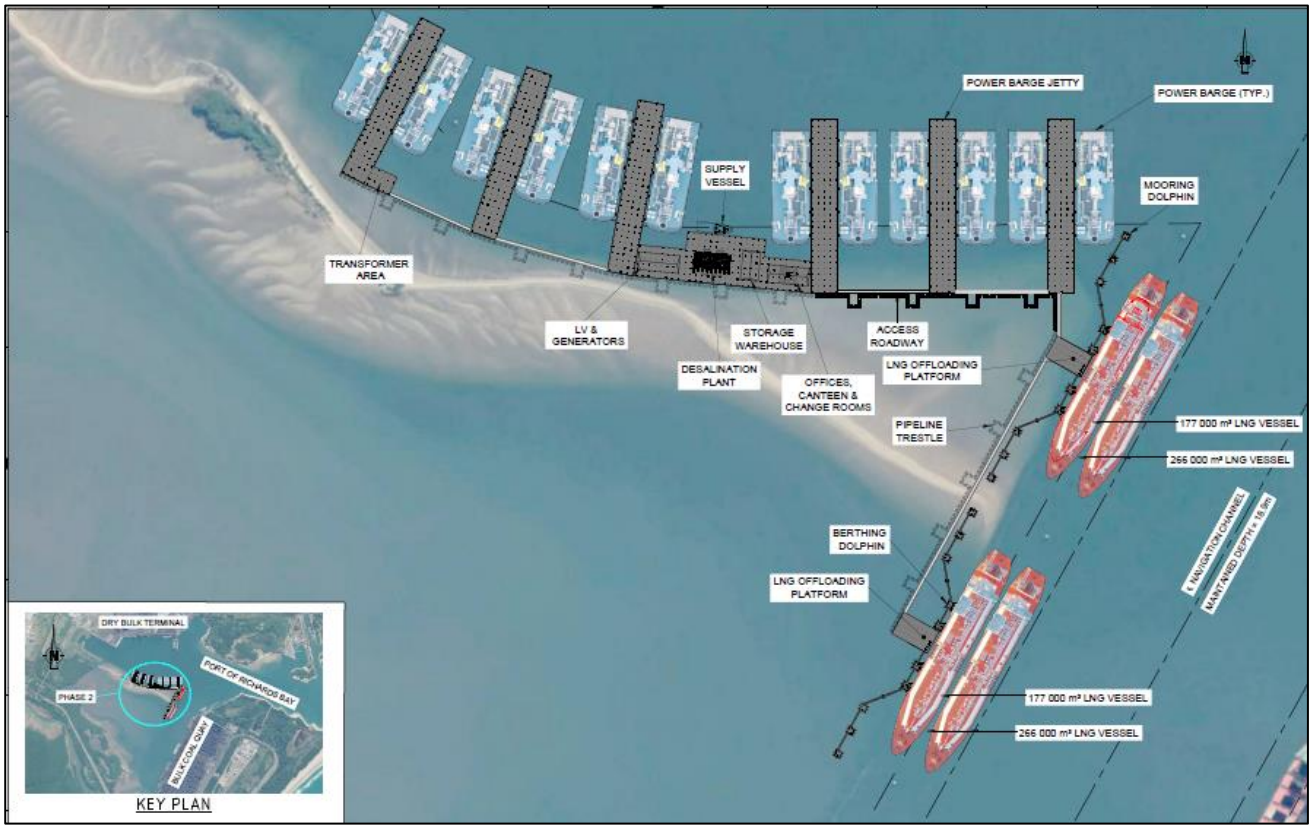


Figure 55: Preferred Layout for the NIFPP within the Port of Richards Bay.

9.3.2.4 Comparative assessment of the NIFPP layout alternatives

A high-level comparative assessment is presented in Table 35 of the risk factors associated with each of the possible layout alternatives.

Table 35: High-level impact assessment of the key consideration for each layout alternative at Scoping Phase

Nature of the Impact	Dredging of Sand-spit & destruction of estuarine habitat			Dredging of the Kabeljou Flats and destruction of estuarine habitat			Avifaunal impacts		
Scale/ Extent	National			National			Global		
Duration	Long-term			Long-term			Long-term		
	Layout 1	Layout 2	Layout 3	Layout 1	Layout 2	Layout 3	Layout 1	Layout 2	Layout 3
Irreplaceable Loss of a Resource	High	Medium	Medium	High	High	Low	High	Medium	Medium
Consequence (Inherent Risk)	M-H	M-H	M	M-H	M-H	M-L	M-H	M-H	M
Likelihood	Definite	Highly-Likely	Highly-likely	Definite	Highly-Likely	Highly Unlikely	Definite	Likely	Likely
Residual Risk	High	High	Moderate	High	High	Low	High	High	Moderate

M = Moderate; M-H = Moderate-High

Layout 3 will be carried through to the EIA Phase and the exact siting of the LNG and Power Barge Terminals assessed in detail and a preferred layout confirmed once the Bathometric Survey of the estuary bed as well as the Estuarine Ecological Impact Assessment have been completed during the EIA Phase of the ESIA. Mitigation measures to potentially reduce the Moderate residual risk identified at Scoping will be highlighted within the Draft EIR and prescribed within the Environmental Management Programme (EMPr).

9.3.3 DISPOSAL OF DREDGED MATERIAL (ANCHOR ENERGY (PTY) LTD: 14/12/16/3/3/2/2033)

9.3.3.1 Disposal at Sea

The Port of Richards Bay has an active dredging maintenance programme with dedicated sea disposal sites. It is understood that dredged material for sea disposal would comply with existing Port standards and that the existing disposal sites could be used. The need for a new NEMICMA "Dumping at Sea Permit" will be discussed with the relevant Competent Authority and the Port.

9.3.3.2 Beach nourishment at Alkantstrand

Due to the development of the Port, the beach at Alkantstrand is actively eroded and efforts are needed to nourish the beach with appropriate sediment to protect the coastline from washing away. Coarser sands dredged could be considered for beach nourishment in line with the principles of the NEMICMA which is to first minimise the waste to be dumped, through re-use.

Other alternatives to the disposal of dredged material may arise during consultation with TNPA as well as other stakeholders during the S&EIR application process and will be considered based on merit and environmental impact. An assessment of the suitability of the alternatives will be presented with the EIA Report.

9.3.4 TRANSMISSION LINE ALTERNATIVES FOR THE EVACUATION OF POWER FROM THE NIFPP INTO THE GRID (NSELENI POWER CORPORATION (PTY) LTD: 14/12/16/3/3/2/2032)

9.3.4.1 Gas-Insulated Transmission Lines (GIL)[15]

Gas-insulated transmission lines consist of two concentric aluminium tubes. The inner conductor rests on cast-resin insulators, which centre it within the outer sheath. This casing is formed from a stable aluminium tube, which ensures a solid mechanical and electro-technical encapsulation for the system (Figure 56). To satisfy the latest environmental and technical aspects, GIL systems are filled with an insulating gas mixture consisting mainly of nitrogen and a smaller proportion of SF_6 (sulphur hexafluoride). The tubes are made of a corrosion-resistant aluminium alloy, and are provided with an additional coating if they are laid directly in the ground.

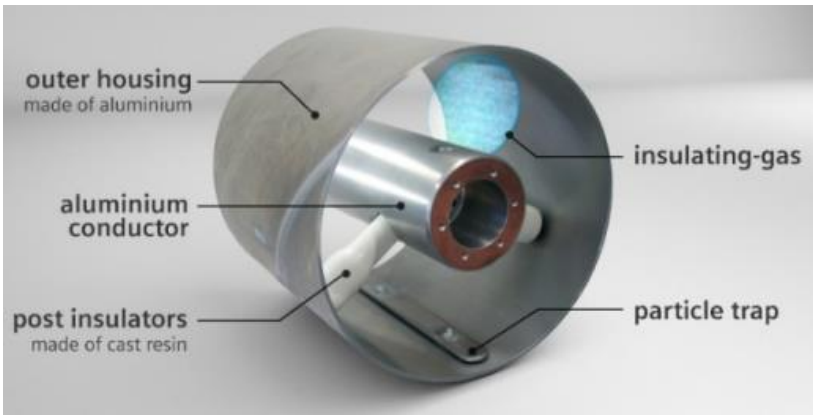


Figure 56: Typical GIL Structure

GIL provide safe and flexible alternative to overhead lines and require less space for equivalent power transmission. Since GIL have a small footprint, and minimal electromagnetic radiation they can also be used close to, or even within buildings. GIL are suitable for providing a continuation for overhead lines underground, connecting power stations to the power network, or as a space-saving way to connect major industrial plants to the public grid.

[15] Information sourced from: https://new.siemens.com/global/en/products/energy/high-voltage/power-transmission-lines/gas-insulated-lines.html. Accessed: 10 February 2020.

Reported advantages of GIL include:

- Low losses: Resistance losses with GIL are lower than with cables or overhead lines. The dielectric losses with GIL are negligible, reducing operating costs. Heat emissions are better than with cables, because of the larger external diameter. With GIL, there is normally no need for highly refined cooling systems.
- No electrical compensation: The low capacitance of GIL systems means that they only need phase angle compensation devices (complex facilities) once the system length exceeds about 70 kilometres.
- Low electromagnetic fields: The phase current induces an almost identical reverse current in the enclosure. This means the magnetic field outside the GIL is negligible. Even in EMC-sensitive areas (such as close to residential areas or hospitals), there is generally no need for special shielding.
- Greater safety: With an internal insulation failure, the internal arc would be safely enclosed within the outer housing minimising fire risk
- High reliability: GIL technology has proven its reliability in more than 40 years of operation, with no failures to date.
- No aging: The GIL insulation system is not prone to either electrical or thermal aging. GIL systems are almost maintenance-free.
- Used in the same way as overhead lines: GIL systems can complement overhead lines. The high transmission capacity offered by GIL makes it possible to provide a continuation for overhead lines underground, with one GIL tube per phase, which minimizes space consumption. GILs allow automatic reclosure, hence do not require major changes of operation and protection schemes of the grid.
- Maintenance-free design: The physical properties and the use of high-quality materials make this an almost maintenance-free product. Routine maintenance is limited to an external inspection, and the line can remain in operation during inspection activities.

The alternatives proposed are either to lay the GIL on the ground or bury it underground from the NIFPP to the on-land substation, or to construct and overhead gantry supported by marine piles (over water) and land-based pylons onto which the GIL is laid. The gantry would be wide enough to facilitate a walkway for future maintenance of the GIL.

9.3.4.2 Transmission Line Support Structures/ Towers

One alternative to the GIL is the existing technology of an overhead transmission powerline from the NIFPP transformer area located on the Power Barge Terminal to the new on-land transmission substation located adjacent to the Bayside Aluminium smelter site. These powerlines are typically supported by structures in accordance with ESKOM standard designs. Each structure must be individually designed, depending on the line angle and the underlying soil and rock conditions, to withstand the pull of the wires in different directions. The routing of the powerline within the Port would be confirmed during the EIA Phase and applicable specialist assessments, however, the tower structures would be erected on dedicated marine piles within the estuary and then as per Figure 57 when on land.

Figure 57: Typical transmission powerline support structure/ tower.

9.3.4.3 Aluminium armoured insulated cables

Another alternative to GIL is the existing technology of aluminium armoured insulated transmission cables within an overhead roofed/ covered gantry structure, with sufficient space for a walkway, supported by marine piles (over water) and land-based pylons.

The above mentioned, alternatives to reduce land transformation will be carried through for assessment during the EIA Phase. The optimum siting of the LNG and Power Barge Terminals (in terms of minimising the dredging required as well as the most suitable means of disposing of the dredge material) as well as the optimal means of evacuating power from the NIFPP in respect of minimising the potential disturbance/ transformation of the seabed will be assessed in detail in the EIA Phase of the ESIA, and specifically within the Estuarine Ecological and Bathometry Survey assessments that will be carried out. With regards to on-land disturbances, the exact routing of the transmission powerline and the exact siting of the new transmission substation will be informed by the Biodiversity, Wetland and Heritage assessments to be undertaken.

9.4 WASTE & POLLUTION: WASTE (OFF-SITE DISPOSAL)

Compared to coal-fired power plants, natural gas combustion does not result in the generation of solid waste. In addition, the off-site fabrication of the Floating Power Barges (i.e. CCGT power plants) means that the waste that would typically be produced during construction would be far less than if constructed locally.

9.5 WASTE & POLLUTION: EFFLUENT

There are potentially three types of effluent from the proposed facility, namely:

- Potentially contaminated stormwater (from hydrocarbon spills on the LNG and Power Barge Terminals/ Quays);
- Wastewater from heat flux exchanges (as described in Section 9.1.1 and 9.2.1); and,
- Wastewater from the demineralisation/ desalination plants.

For the Anchor Energy (Pty) Ltd (14/12/16/3/3/2/2033) LNG and Power Barge terminal infrastructure it is intended to bund all quays so that rainwater can be captured in a sump, tested and treated (if necessary) before being discharged into the receiving environment (i.e. Port Estuary). Such an approach would constitute Good International Industrial Practice (GIIP) and there are no real options or a need in fact to better that practice. On the potential effluent from the NIFPP (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032) cooling circuits the process of optimising the heat balance has already been described, highlighting that it is intended not to discharge effluent that is either hotter or colder than the ambient temperature of the seawater. Again it is argued that this constitutes GIIP. Wastewater from the demineralisation/ desalination plants (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032) will also be treated in accordance with GIIP, prior to discharge into the receiving environment. Based on the above and the implementation of GIIPs, no alternatives are presented that will result in a material reduction in potentially negative impacts on the receiving environment.

9.6 WASTE & POLLUTION: ATMOSPHERIC EMISSIONS (NSELENI POWER CORPORATION (PTY) LTD: 14/12/16/3/3/2/2032)

9.6.1 LOCALISED AIR QUALITY IMPACTS FROM SO_2, NO_X AND PARTICULATE MATTER (PM)

LNG is the cleanest burning fossil fuel and certainly cleaner than burning coal or liquid fuels as the primary energy source. The fact remains though, that LNG is a fossil fuel and does result in emissions to atmosphere. The proposed NIFPP will meet the Minimum Emissions Standards (MES) promulgated in terms of the NEMAQA (refer to Section 4.5) and would also be well positioned to ensure that those emissions do not impact on residential areas given the prevailing wind direction. As detailed earlier, the NIFPP turbines would be fitted with low NO_x burners and should it emerge in the Air

Quality Impact Assessment that NOx emissions require further reduction then Selective Catalytic Reduction (SCR) would be implemented. With the implementation of GIIP through the selection of the most advanced CCGT technology, technology alternatives will not serve reduce the potential negative impacts of atmospheric emissions and thus none are listed.

9.6.2 GREENHOUSE GAS (GHG) EMISSIONS

In respect of GHG emissions LNG combustion is still a source, but as can be seen from Figure 58, CO_2 emissions are almost half of those associated with coal-fired power per Btu of energy produced. The question that then arises is, given that LNG combustion still results in GHG emissions should it not also be disqualified as a fuel source? The response to that question is that power on demand is still a requirement in South Africa to supplement electricity generated by renewables. In other words, the benefit of the electricity technology being proposed for the NIFPP is that it can be brought on-line at short notice to provide electricity in response to demand should there be a reduction in generation from renewable sources (night time for solar or lower wind speeds for wind turbines). With the implementation of GIIP through the selection of the most advanced CCGT technology, technology alternatives will not serve reduce the potential negative impacts of GHG emissions and thus none are listed.

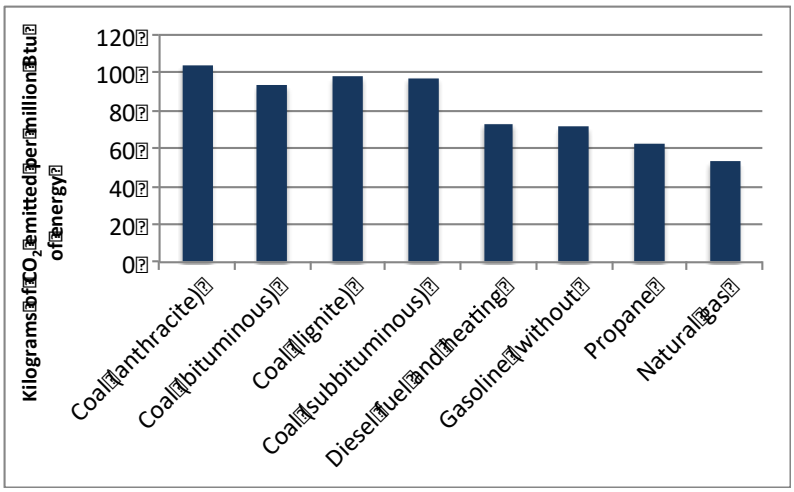


Figure 58: Kilograms of CO_2 emitted per million British thermal units (Btu) of energy for various fuel sources[16].

9.7 WASTE & POLLUTION: RADIATION: NOISE (NSELENI POWER CORPORATION (PTY) LTD: 14/12/16/3/3/2/2032)

The CCGT power plants proposed for the NIFPP would be of the most modern available with GIIP noise attenuation built into the plants. As such, no alternatives are proposed in respect of noise generation. However, should the qualitative Noise Impact Statement highlight potentially significant noise impacts then additional mitigation would be proposed to further reduce noise from the proposed development.

9.8 WASTE & POLLUTION: AESTHETICS: VISUAL

The visual impact of the project cannot be reduced significantly through alternative siting of the plant nor through the adoption of a different gas burning technology or indeed alternative electricity generating technology. The siting of the project within the harbour area will mean, that to some extent at least, the plant would be within the visual context of a large industrial port. What can be done to reduce the visual impact though is to use GILs (refer to Section 9.3.2.1) as an alternative to overhead Eskom-type transmission lines.

[16] https://www.eia.gov/tools/faqs/faq.php?id=73&t=11.

9.9 WASTE & POLLUTION: SPILLAGE: LNG (ANCHOR ENERGY (PTY) LTD: 14/12/16/3/3/2/2033)

9.9.1 ALTERNATIVES FOR LNG BULK STORAGE TANK DESIGNS

There are a number of alternate containment methodologies for the storage of LNG on land. The methodology chosen is normally a function of the quantity of LNG to be stored, the duration for which it is to be stored, length of time to construct and the trade-off between cost of containment and rate of BOG of the LNG. In this instance, the following are some of the alternatives considered:

- Double containment cylindrical metal inner tank and metal or concrete outer tank;
- Full containment cylindrical metal inner tank and metal or concrete outer tank;
- Pre-stressed cylindrical concrete tank with an internal metal membrane;
- Cryogenic cylindrical concrete tank: internal concrete tank and pre-stressed concrete outer tank;
- Spherical tank;
- Cryogenic Vacuum Insulated Pipe steel fabricated horizontal skid mounted tanks; and,
- Cryogenic Vacuum Insulated Pipe steel fabricated vertical foot mounted tanks.

All tank designs and construction should comply with the BS EN 1473:2007 standard or internationally acceptable equivalent. Cylindrical cryogenic vertical Vacuum Insulated Pipe steel fabricated spherical tanks for the storage of LNG are the design of choice in this instance for a number reasons:

- They represent the quickest construction period;
- They are internationally recognised as being of the safest designs and are integral in the design of LNG marine vessels;
- They require the least ground earthworks and foundations and thus represent the least surface disturbance during installation;
- They are fully removable and thus may be replaced at a later stage by an alternative design should this be shown to be advantageous;
- They are manufactured in internationally approved and certified engineering workshops and delivered by barge to the site;
- Safely contain the liquid at cryogenic temperature;
- Permit the safe filling and removal of LNG;
- Permit the BOG to be safely removed;
- Prevent the ingress of air and moisture (except as a last resort) to prevent unacceptable vacuum conditions in the vapour space;
- Withstand the damage leading to loss of containment;
- Operate safely between the design maximum and minimum (vacuum) pressures; and,
- Withstand the number of filling and emptying cycles and the number of cool down and warming operations which are planned during its design life.

Due to the GIIP inherent designs of LNG bulk storage tanks, alternatives will not significantly reduce the environmental aspect of LNG spillages and as such as not assessed.

10 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT PHASE

During the EIA Phase the potentially significant impacts identified during the Scoping Phase (refer to Section 6) will be further investigated and assessed. This Plan of Study details the approach and methodology for the detailed assessment of potential impacts in order to ensure that the Competent Authority (i.e. DEFF) will have sufficient information on which to base the decision of whether or not the proposed development and associated activities may proceed.

10.1 ALTERNATIVES TO BE ASSESSED

Based on the scoping phase assessment of the risks and impacts associated with each of the alternatives considered (refer to Section 9 above), the following alternatives will be further assessed by means of specialist investigations and assessment within the EIA phase to further augment and detail the potential positive and negative impacts associated with the proposed development project.

- Heat flux exchange method for cooling within the CCGT power plants to maximise energy efficiency within the NIFPP (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032);
- Exact siting of marine piles and quays for the construction of the LNG and Power Barge Terminals within the ambit of layout 3 (Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033);
- Disposal of dredged material (Anchor Energy (Pty) Ltd: 14/12/16/3/3/2/2033);
- Routing and type of the transmission powerline from the NIFPP to the on-land transmission substation (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032);
- Exact siting of the land-based transmission substation within the proposed study area, north-west of the Bayside Aluminium smelter site, for easy connection to the existing electrical Grid (Nseleni Power Corporation (Pty) Ltd: 14/12/16/3/3/2/2032); and,
- No-Development (no-go) option for the proposed development as a whole.

10.2 SPECIALIST STUDIES

On the basis of the potential impacts identified during the Scoping Phase as well as concerns raised by I&APs, experts in the relevant fields will be commissioned to conduct specialist investigations. These investigations are aimed at assessing the significance of potential impacts identified, this will be a function of the sensitivity and vulnerabilities of the receiving environment which will also be characterised by the specialists, as well as identifying further aspects and impacts that may have been overlooked during the Scoping Phase. Specialists will also provide feasible and appropriate mitigation measures to either reduce the significance of negative impacts or enhance positive impacts. The table below highlights the specialist assessments to be undertaken as well as the environmental, socio-economic and/or cultural aspects they will assess. Kindly refer to Appendix 4 for specialist Terms of Reference.

Table 36: Specialist assessments to be undertaken in support of the EIA of the proposed development

Specialist Assessment	Appointed Specialist Company	Aspect to be Assessed
Air Quality Impact Assessment	Airshed Planning Professionals	Atmospheric emissions: Dust, PM, SO_2 and NO_x
Qualitative Noise Impact Statement	Airshed Planning Professionals	Noise
Terrestrial Biodiversity Assessment	GroundTruth: Water, Wetlands and Environmental Engineering	Land transformation: terrestrial fauna & flora
Wetland Delineation, Functional Assessment and Impact Assessment		Land transformation: wetlands
Heritage Impact Assessment	Heritage Contracts and Archaeological Consulting cc	Heritage & cultural resources

Quantitative Risk Assessment for Major Hazard Installations	Riscom	Waste & pollution: spillage of LNG
Socio-economic Impact Assessment	ACER Africa and Urban Econ	Social: employment; skills transfer; spending; impact on the local and regional economy
Estuarine Ecological Assessment	CRUZ Environmental & Associates	Seabed transformation
Hydrodynamic Modelling	WSP Africa	Seabed transformation/ disturbance Waste & pollutions: effluent discharge
Climate Change Impact Assessment	Climate Neutral Group	Atmospheric emissions: GHG emissions

10.3 PROJECT IMPACT MAP

Once the specialist studies have been completed, the project impact map (Figure 48) will be updated to address any additional information and/or amend or add relevant linkages or interactions between different system components. Thereafter, the activities identified can be added to the system and their "impacts mapped" through the system. This process often identifies additional impacts that may have been missed during the Scoping Phase and/or by specialist investigations.

10.4 APPROACH TO ASCRIBING SIGNIFICANCE FOR DECISION-MAKING

Refer to Section 8 of this report.

10.5 PUBLIC PARTICIPATION DURING THE EIA PHASE

The database of registered I&APs opened and maintained throughout the Scoping Phase will be utilised as the foundation for stakeholder engagement during the EIA Phase. All I&APs will be kept abreast of progress and invited to participate at various stages as detailed below.

10.5.1 DRAFT ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT

The Draft Environmental Impact Assessment (EIA) Report will summarise the findings of the EIA Phase of the S&EIR process. The Report will highlight and discuss the findings of various specialist assessments as well as the detailed assessment of significant negative and positive impacts associated with the proposed development. All registered I&APs will be notified of the availability of the Draft EIA Report for review and comment for a period of 30 calendar days (excluding public holidays and the period between 15 Dec and 05 January) via individual notification letters. The Report will be made available on the SE Solutions website.

An online **public stakeholder meeting** will be held during the review and commenting period of the Draft EIA Report. All registered I&APs will be timeously notified of this meeting and the public will be informed by way of additional local newspaper advertisement/s advertising the availability of the Draft EIA Report for review and comment as well as registration for the online publics stakeholder meeting. The purpose of the public stakeholder meeting is to present the findings and recommendations of the Draft EIA Report in order to obtain comments and inputs from I&APs. The meeting proceedings will be documented by way of a Comment and Response Report (CRR) which will be included within the Final EIA Report.

10.5.2 FINAL EIA REPORT

All the comments received on the Draft EIA Report will be incorporated into the overall project's CRR which will be included in the Final Report. The Final EIA Report will be submitted to the DEFF for review and consideration towards a decision.

10.5.3 ENVIRONMENTAL AUTHORISATION

After review, the DEFF will issue their decision in the form of two Environmental Authorisations (EAs). The EAs are formal statements of decision and typically includes a range of conditions that will need to be met during project implementation, should it be positive EAs. All registered I&AP's will be notified of the EAs. This is to provide I&AP's with the opportunity to review the EAs and its conditions and to exercise their right of appeal, should they feel the decision or components thereof is or are incorrect. The EIA Regulations stipulate that a Notice of Intent to Appeal must be lodged within 20 days from the date of the EAs. During this 20 day period any party (including the Applicant) has the right to appeal the decision.

10.6 CONSULTATION WITH THE COMPETENT AUTHORITY

It is proposed that the Competent Authority (i.e. DEFF) will be consulted during the 30 day review period of the Draft EIA Report. A full copy of the Draft EIA Report will be submitted to the DEFF case officer for review and comment. The Applicant and EAP will present the findings of the EIA and associated specialist studies as well as the EAPs proposed mitigation measures and conditions of authorisation (should it be decided that the proposed development is supported). This will enable the team to address any outstanding issues and/or comments from the DEFF prior to the submission of the Final EIA Report for review towards a decision.

11 CONCLUSION OF SCOPING

This report serves to detail the outcome of scoping the assessment requirements for the proposed development as a whole. A range of alternatives have been identified and, where applicable, assessed in terms of their impact significance for decision-making at the Scoping level. A number of alternatives identified will need to be investigated in detail in the EIA Phase of the S&EIR process, due to the need for specialist assessment and input. Further investigations are required to fully characterise the receiving environment well as to investigate the potential negative and positive impacts associated with the proposed development. These investigations will be part of the overall assessment that is used to decide on the acceptability of the proposed development within the Port of Richards Bay. The Draft Scoping report was placed in the public domain for review and comment and this Final Scoping Report represents an updated version of the Draft Report addressing all comments received during the review period and public meetings hosted. The Final Report was submitted to the authorities (in this case the National DEFF) on Friday, 11 December 2020, for a decision. The Final Report was also uploaded to the SE Solutions website and all registered I&APs notified that of the submission and an additional opportunity to review and comment.

12 EAP DECLARATION AND UNDERTAKING

I, Victoria Napier, hereby confirm that the information provided in this report is correct at the time of compilation and the report was compiled with inputs provided by the applicant and some of the specialists appointed for the project. I hereby also confirm that:

- all relevant information pertaining to the project will be submitted to potential interested and affected parties;
- all comments received from I&APs and communications to and from I&APs are included in this Final Scoping Report, in the form of a Comments and Response Report (CRR) submitted to DEFF;
- A record will be kept of any subsequent comments and/or communications and submitted with the Draft EIA Report; and,
- The Plan of Study for the EIA will be implemented as presented within this Scoping Report (which was available for review and comment), and the findings of specialist studies will be presented in the Draft and Final EIA Reports.

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Signature of EAP

10 December 2020

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Date

Kindly refer to the Declaration of Interests and Undertaking under Oath attached in Appendix 5.