Draft Scoping Report for a Proposed Chlor-Alkali Plant in Richards Bay, KwaZulu-Natal

Report Prepared for

Elegant Afro Chemicals

Report Number 492425/DSR

Report Prepared by

srk consulting

March 2018

Draft Scoping Report for a Proposed Chlor-Alkali Plant in Richards Bay, KwaZulu-Natal

Elegant Afro Chemicals

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SRK Project Number 492425/DSR

March 2018

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Executive Summary

Elegant Afro Chemicals proposes to construct and operate a chlor-alkali plant in the Richards Bay Industrial Development Zone Phase 1F for the production of caustic soda and chlorine, as well as other secondary products.

Elegant Afro Chemicals is a new company formed by the founder of Elegant Line Chemicals (Pty) Ltd, which is an established Qualifying Small Enterprise - as defined in the Broad Based Black Economic Empowerment Codes of Good Practice of 2015 - in the cleaning and industrial chemicals manufacturing sector. Elegant Line Chemicals currently distributes water treatment chemicals and provides water and waste treatment solutions within southern Africa.

SRK Consulting (South Africa) (Pty) Ltd has been appointed as the Environmental Assessment Practitioner to undertake the required environmental applications on behalf of Elegant Afro Chemicals for the proposed project.

In terms of the latest amendments to the 2014 Environmental Impact Assessment Regulations, as published on 07 April 2017, an application for Environmental Authorisation via a Scoping and Environmental Impact Reporting process is required. This process consists of two phases, a Scoping Phase and an Environmental Impact Assessment Phase.

This document constitutes the Draft Scoping Report, which contains the information applicable to the Scoping Phase. This report is to be distributed to relevant authorities and key stakeholders and made available to the general public for review and comment. All comments received on the draft report, along with the responses, will be incorporated into the Final Scoping Report to be submitted to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs for a decision as to whether the application may proceed to the next phase.

This report includes the following:

- Introduction, the objectives of the scoping process and the legislated requirements for the content of a Scoping Report (Chapters 1 -3).
- Details regarding the Environmental Assessment Practitioner (Chapter 4).
- Project location and description (Chapters 5 -6).
- The legislative context (Chapter 7).
- Project need and desirability (Chapter 8).
- Alternatives (Chapter 9).
- The environmental attributes of the project site (Chapter 10).
- The public participation process and identified issues (Chapters 11- 12).
- The assessment methodology and preliminary assessment (Chapters 13 – 14).
- A Plan of Study for the Environmental Impact Assessment Phase (Chapter 15).
- The Environmental Assessment Practitioner affirmation and other requirements (Chapters 16–17).
- Conclusions and recommendations (Chapter 18).

Based on the investigations undertaken during Scoping, SRK Consulting is of the opinion that the proposed activity is not in conflict with any prohibition contained in legislation. Furthermore, the Scoping Report complies substantially with Appendix 2 of Government Notice 362 (07 April 2017) and all identified applicable protocols and minimum information requirements. The applicant is willing and able to ensure compliance with these requirements within the prescribed timeframe.

SRK Consulting therefore recommends that the Scoping Report be accepted, with or without conditions, and that the applicant be allowed to continue with the tasks contemplated in the Plan of Study for the Impact Assessment Phase.

Table of Contents

List of Abbreviations

AEL	Atmospheric Emissions Licence
AQIA	Air Quality Impact Assessment
BA	Basic Assessment
BBBEE	Broad Based Black Economic Empowerment
CAPEX	Capital Expenditure
CV	Curriculum Vitae
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEIAR	Draft Environmental Impact Assessment Report
DSR	Draft Scoping Report
dti	Department of Trade and Industry
DWS	Department of Water and Sanitation
EAC	Elegant Afro Lines (Pty) Ltd trading as Elegant Afro Chemicals
EAP	Environmental Assessment Practitioner
EDTEA	KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs
EIA	Environmental Impact Assessment
ELC	Elegant Line Chemicals (Pty) Ltd
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
FEIAR	Final Environmental Impact Assessment Report
FSR	Final Scoping Report
GN	Government Notice
HVAC	Heating, Ventilation and Air Conditioning
I&AP	Interested and Affected Party
ICT	Information Communication Technology
IDP	Integrated Development Plan
IDZ	Industrial Development Zone
ISO	International Standards Organisation
LED	Light Emitting Diode
MES	Minimum Emission Standard
MHI	Major Hazard Installation
NEMA	National Environmental Management Act 107 of 1998
NEM:AQA	National Environmental Management: Air Quality Act 39 of 2004
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NEM:CMA	National Environmental Management: Coastal Management Act 24 of 2008
NEM:WA	National Environmental Management: Waste Act 59 of 2008
NHRA	National Heritage Resources Act 25 of 1999
NWA	National Water Act 36 of 1998
OHSA	Occupational Health and Safety Act 85 of 1993
OPEX	Operational Expenditure
PLC	Programmable Logic Controller
QSE	Qualifying Small Enterprise
RBCAA	Richards Bay Clean Air Association

RBIDZ	Richards Bay Industrial Development Zone
RBIDZ SOC	Richards Bay Industrial Development Zone State Owned Company
RBIDZ 1F	Richards Bay Industrial Development Zone Phase 1F
S&EIR	Scoping and Environmental Impact Report
SDF	Spatial Development Framework
SEZ	Special Economic Zone
SG	Surveyor General
SMME	Small, Medium and Micro-sized Enterprise
SRK	SRK Consulting (South Africa) (Pty) Ltd
tkUCE	thyssenkrupp Uhde Chlorine Engineers
tkISSA	thyssenkrupp Industrial Solutions South Africa
WML	Waste Management Licence
WUL	Water Use Licence

Units

%	percent
>	greater than
<	smaller than
^{o}C	degrees Celsius
dB	decibel
DMT	dry metric tonne
DMT pa	dry metric tonnes per annum
DMT pd	dry metric tonnes per day
ha	hectare
kg	kilogram
kg/h	kilograms per hour
kV	kilovolt
kW	kilowatt
l/s	litres per second
m	metre
m^2	square metre
m^3	cubic metre
m^3/d	cubic metres per day
m^3/h	cubic metres per hour
m/s	metres per second
mamsl	metres above mean sea level
mg/m^3	milligrams per cubic metre
Ml	megalitre
mm	millimetre
MVA	megavolt ampere
MW	megawatt
MWh	megawatt hour
Nm^3/hr	normal cubic metres per hour
No.	number

pH	measure of the acidity or alkalinity of a solution
t	metric tonne, 1 000 kg
tpa	tonnes per annum
tpd	tonnes per day
tph	tonnes per hour
tpm	tonnes per month
% w/w	mass of a substance as a percentage of the total mass of the solution or mixture
ZAR	South African Rand

Chemical Symbols

$BaCO_3$	Barium carbonate
Ca	Cadmium
Cl_2	Chlorine
Cr	Chromium
Cu	Copper
Fe	Iron
H_2	Hydrogen gas
H_2O	Water
H_2O_2	Hydrogen peroxide
HCl	Hydrochloric acid
H_2SO_4	Sulfuric acid
Mn	Manganese
Na+	Sodium ion
NaCl	Sodium chloride (salt)
NaClO	Sodium hypochlorite
NaOH	Sodium hydroxide (caustic soda)
Na_2CO_3	Sodium carbonate
Ni	Nickel
NO_2	Nitrogen dioxide
O_3	Ozone
OH^-	Hydroxide ion
Pb	Lead
PM	Particulate matter
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 microns
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 microns
SO_2	Sulfur dioxide
TRS	Total reduced sulfur
Zn	Zinc

Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by Elegant Afro Chemicals (Pty) Ltd (EAC). The opinions in this Report are provided in response to a specific request from EAC to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

1 Introduction

Elegant Afro Chemicals (EAC) proposes to construct and operate a chlor-alkali plant in the Richards Bay Industrial Development Zone (RBIDZ) for the production of caustic soda and chlorine, as well as other secondary products. **Figure 1-1** on the following page, provides a locality map of the proposed project within Alton Phase 1F of the RBIDZ (RBIDZ 1F).

EAC is a new company formed by the founder of Elegant Line Chemicals (Pty) Ltd (ELC) which is an established Qualifying Small Enterprise (QSE) - as defined in the Broad Based Black Economic Empowerment (BBBEE) Codes of Good Practice of 2015 - in the cleaning and industrial chemicals manufacturing sector. ELC also distributes water treatment chemicals and provides water and waste treatment solutions within southern Africa.

SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed as the Environmental Assessment Practitioner (EAP) to undertake the required environmental applications on behalf of EAC for the proposed project.

In terms of the latest amendments to the 2014 Environmental Impact Assessment (EIA) Regulations, as published on 07 April 2017, an application for Environmental Authorisation via a Scoping and Environmental Impact Reporting (S&EIR) process is required. The S&EIR process consists of two phases, a Scoping Phase and an EIA Phase.

This document constitutes the Draft Scoping Report (DSR) that contains the information applicable to the Scoping Phase. The DSR is to be distributed to relevant authorities and key stakeholders and made available to the general public for review and comment. All comments received on this draft report, along with the responses, will be incorporated into the Final Scoping Report (FSR) to be submitted to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (EDTEA) for a decision as to whether the application may proceed to the EIA Phase.

This report includes the following:

- Introduction, the objectives of the scoping process and the legislated requirements for the content of a Scoping Report (Chapters 1 -3).
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- The EAP affirmation and other requirements (Chapters 16 – 17).
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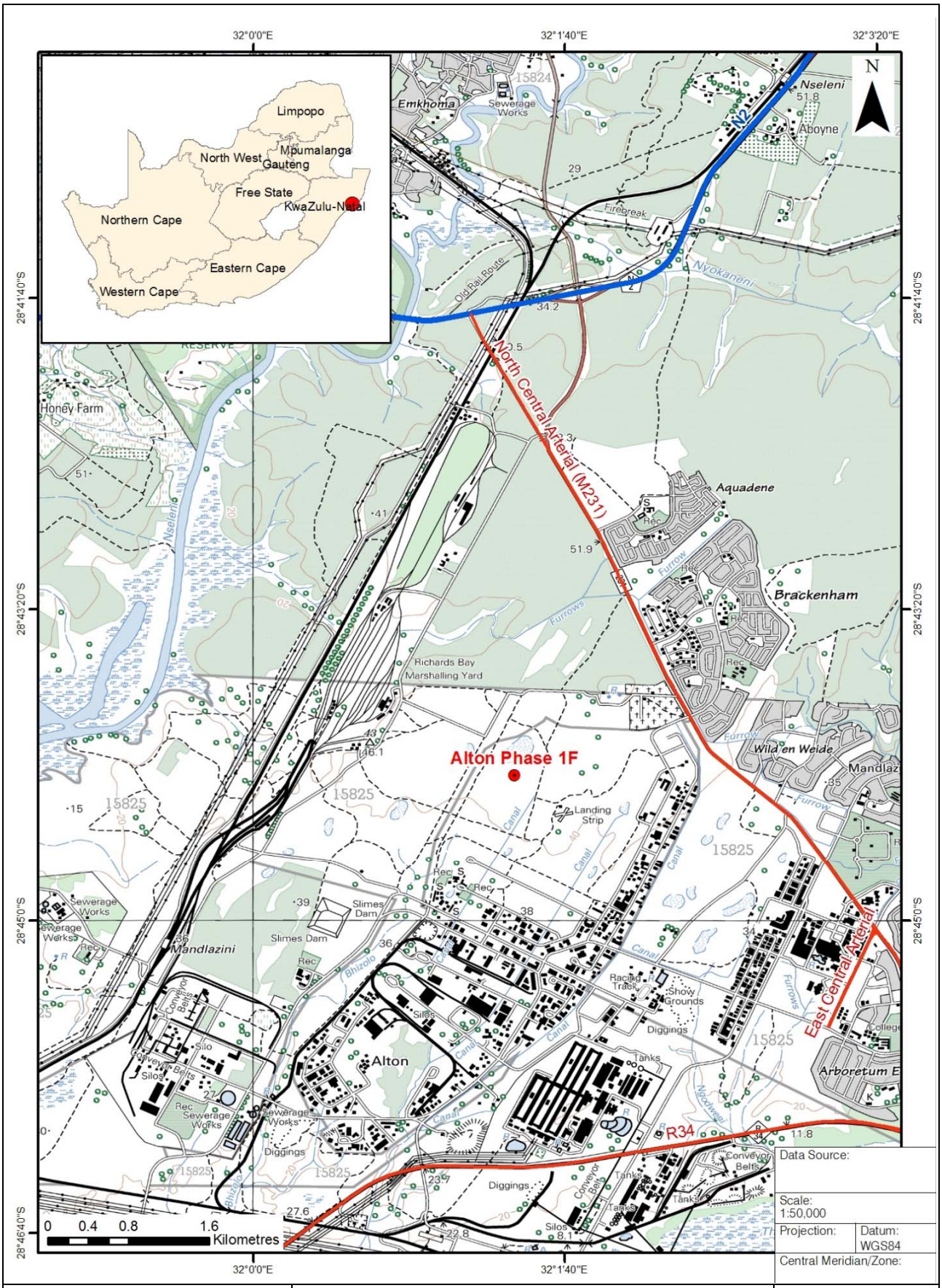

srk consulting	**Proposed EAC Chlor-Alkali Plant** Locality Map	Project No. 492425

Figure 1-1 Locality Map

2 Objectives

The objectives of the scoping process are specified in Appendix 2 of the Amendments to the 2014 EIA Regulations, as published by the Department of Environmental Affairs (DEA) in Government Notice (GN) 326 on 07 April 2017.

Table 2-1 lists the scoping objectives from GN 326 and provides a reference to the applicable chapter of this document where each objective is addressed.

Table 2-1 Objectives of the Scoping Process

Scoping Objectives (Appendix 2 of GN 326, 07 April 2017)	Reference in this Document
1. The objective of the scoping process is to, through a consultative process-	Chapter 2: Objectives Chapter 11: Public Participation Process
(a) Identify the relevant policies and legislation relevant to the activity.	Chapter 7: Legislative Context
(b) Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location.	Chapter 8: Project Need and Desirability
(c) Identify and confirm the preferred activity and technology alternative through an identification of impacts and risks and ranking process of such impacts and risks.	Chapter 6: Project Description Chapter 9: Alternatives
(d) 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 a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment.	Chapter 5: Project Location Chapter 10: Environmental Attributes
(e) Identify the key issues to be addressed in the assessment phase.	Chapter 12: Issues
(f) 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.	Chapter 13: Assessment Methodology Chapter 15: Plan of Study for EIA
(g) 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.	Chapter 14: Preliminary Assessment

Source: Appendix 2 of GN 326 (DEA, 07 April 2017)

3 Report Content

The legislated requirements for the content of a Scoping Report are specified in Appendix 2 of the Amendments to the 2014 EIA Regulations (GN 326, 07 April 2017).

Table 3-1 lists the content requirements from GN 326 and provides a reference to the applicable chapter of this document where the specified information is provided.

Table 3-1 Legislated Requirements for the Content of a Scoping Report

Content Requirements (Appendix 2 of GN 326, 07 April 2017)	Reference in this Document
2.(1) A scoping report must contain the information that is necessary for a proper understanding of the process, informing all preferred alternatives, including location alternatives, the scope of the assessment, and the consultation process to be undertaken through the environmental impact assessment process, and must include—	Chapter 3: Report Content
(a) details of — (i) the EAP who prepared the report. (ii) the expertise of the EAP, including a curriculum vitae.	Chapter 4: The Environmental Assessment Practitioner
(b) the location of the activity, including— (i) the 21 digit Surveyor General code of each cadastral land parcel. (ii) where available, the physical address and farm name. (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	Chapter 5: Project Location
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is— (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.	Figure 1-1: Locality Map Figure 5-1: EAC's Allocated Plots within RBIDZ 1F Figure 6-4: Project Layout Plan
(d) a description of the scope of the proposed activity, including— (i) all listed and specified activities triggered. (ii) a description of the activities to be undertaken, including associated structures and infrastructure.	Chapter 6: Project Description Table 7-1: Applicable NEMA Listed Activities
(e) a description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.	Chapter 7: Legislative Context
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location.	Chapter 8: Project Need and Desirability
(g) a full description of the process followed to reach the proposed preferred activity, site and location of the development footprint within the site, including— (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 9: Alternatives Chapter 11: Public Participation Process Chapter 12: Issues Chapter 10: Environmental Attributes

Content Requirements (Appendix 2 of GN 326, 07 April 2017)	Reference in this Document
(v) the impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these impacts— (aa) can be reversed. (bb) may cause irreplaceable loss of resources. (cc) can be avoided, managed or mitigated.	Chapter 14: Preliminary Assessment
(vi) the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives.	Chapter 13: Assessment Methodology
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	Chapter 14: Preliminary Assessment
(viii) the possible mitigation measures that could be applied and level of residual risk.	Chapter 14: Preliminary Assessment
(ix) the outcome of the site selection matrix.	Chapter 14: Preliminary Assessment
(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such.	Chapter 9: Alternatives
(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity.	Chapter 14: Preliminary Assessment
(h) a plan of study for undertaking the environmental impact assessment process to be undertaken, including— (i) a description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity. (ii) a description of the aspects to be assessed as part of the environmental impact assessment process. (iii) aspects to be assessed by specialists. (iv) a description of the proposed method of assessing the environmental aspects, including aspects to be assessed by specialists. (v) a description of the proposed method of assessing duration and significance. (vi) an indication of the stages at which the competent authority will be consulted. (vii) particulars of the public participation process that will be conducted during the environmental impact assessment process. (viii) a description of the tasks that will be undertaken as part of the environmental impact assessment process. (ix) identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.	Chapter 15: Plan of Study for EIA
(i) an undertaking under oath or affirmation by the EAP in relation to— (i) the correctness of the information provided in the report. (ii) the inclusion of comments and inputs from stakeholders and interested and affected parties. (iii) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.	Chapter 16: EAP Affirmation
(j) an undertaking under oath or affirmation by the EAP in relation to the level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment.	Chapter 16: EAP Affirmation
(k) where applicable, any specific information required by the competent authority.	Chapter 17: Other Requirements

Content Requirements (Appendix 2 of GN 326, 07 April 2017)	Reference in this Document
(l) any other matter required in terms of section 24(4)(a) and (b) of the Act.	Chapter 17: Other Requirements
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a scoping report, the requirements as indicated in such notice will apply.	Chapter 17: Other Requirements

Source: Appendix 2 of GN 326 (DEA, 07 April 2017)

4 The Environmental Assessment Practitioner

In accordance with Item 2.(1)(a) in Appendix 2 of GN 326, this chapter provides details of:

(i) The Environmental Assessment Practitioner (EAP) who prepared this report.

(ii) The expertise of the EAP.

4.1 SRK Consulting

SRK was established in South Africa in 1974 and has expanded over the years with the SRK Group Consulting Practices now employing approximately 1 400 professional staff operating from more than 50 established offices on six continents.

SRK offers expertise in a wide range of environmental and engineering disciplines whilst implementing rigorous quality assurance standards in accordance with SRK's International Standards Organisation (ISO) 9001 accreditation.

SRK's independence is ensured by the fact that it is strictly a consultancy organisation, not holding equity in any project and with ownership primarily by staff. SRK's senior technical staff also maintain independent accreditation with the relevant professional accreditation bodies. This permits its consultants to provide clients with conflict-free and objective support on crucial issues. SRK's fee for completing this report is based on its normal professional daily rates plus reimbursement of incidental expenses. The payment of that professional fee is not contingent upon the outcome of the report.

SRK Durban's Environmental Team has been practicing in KwaZulu-Natal since 1989 and has a distinguished track-record of managing a diverse range of large and complex projects.

4.2 Details of the EAP

The EAP for this application is Ms. Kirsten King, Principal Environmental Scientist at SRK.

Pertinent information relating to the expertise of the EAP is summarised below:

- Honours Degree in Geographical and Environmental Science (1995) from the University of Natal.
- 22 years of experience in the field of environmental management.
- Specialises in environmental assessment, environmental auditing and integrated environmental licencing for the industrial, waste management and mining sectors.
- A certified EAP with the Interim Certification Board for EAPs in South Africa (CEAPSA).

For further details, refer to the EAP curriculum vitae (CV) in **Appendix A.**

Contact details for the EAP are provided below:

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5 Project Location

In accordance with Items 2.(1)(b) and 2.(1)(c) in Appendix 2 of GN 326, this chapter provides details of the location of the proposed project, including:

(i) The 21-digit Surveyor General (SG) code of each cadastral land parcel (**Table 5-1**).

(ii) The physical address and property name (refer to the box below).

(iii) Geographical coordinates for the site (**Table 5-2**).

(iv) A plan which locates the proposed activities applied for at an appropriate scale (**Figure 1-1, Figure 5-1** and **Figure 6-4**).

The proposed chlor-alkali plant has a development footprint of 22 500 square metres (m^2) and is proposed to be constructed on a portion of an eight (8) hectare (ha) site located within Phase 1F of the RBIDZ in the Alton area of Richards Bay.

Details of the project location are as follows:

Country:	South Africa
Province:	KwaZulu-Natal
District:	King Cetshwayo District Municipality (previously uThungulu)
Municipality:	uMhlathuze Municipality
Town:	Richards Bay
Suburb:	Alton
Zone:	Phase 1F of the RBIDZ
Erven:	Erf 16672 and Erf 17456, Richards Bay

The physical address and property name of the project site is therefore: Erven 16672 and 17456 Richards Bay, located within Phase 1F of the RBIDZ in Alton.

The extent and SG codes for the two (2) erven comprising the project site are provided in **Table 5-1**.

Table 5-1 Project Site Erven, Extent and SG Codes

Site Erven	Erf Extent	SG Code
Erf 17456 Richards Bay	2.4 ha	N0GV04210001745600000
Erf 16672 Richards Bay	6.0 ha	N0GV04210001667200000

Source: Surveyor General, February 2018

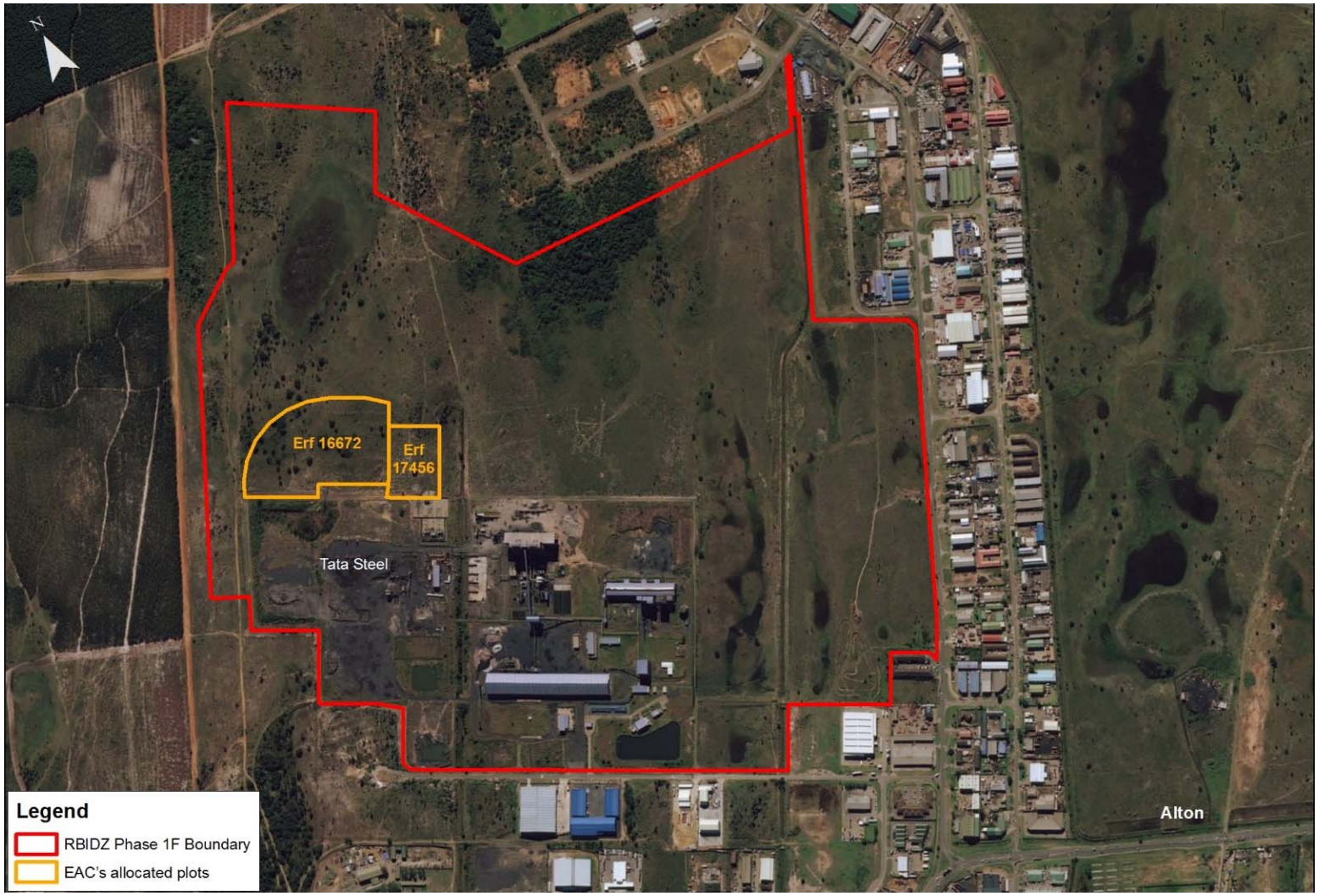
The coordinates of the boundary of the property are provided in **Table 5-2.**

Table 5-2 Geographical Coordinates for the Site

Latitude /Longitude	Degrees	Minutes	Seconds
South	28	44	19.93
East	32	01	24.21

Source: SRK GIS, February 2018

Refer to **Figure 5-1** for a map showing EAC's allocated plots within the RBIDZ 1F and refer to **Section 10-1** for a description of the surrounding land use and the site neighbours.



srk consulting	**Proposed EAC Chlor-Alkali Plant** EAC's Allocated Plots within RBIDZ 1F	Project No. 492425

Figure 5-1 EAC's Allocated Plots within RBIDZ 1F

6 Project Description

In accordance with Item 2(1)(d)(ii) in Appendix 2 of GN 326, this chapter provides a description of the proposed activities, including associated structures and infrastructure.

The proposed chlor-alkali plant is intended to produce caustic soda (NaOH) and chlorine (Cl_2) from brine - a mixture of salt (NaCl) and water (H_2O), using an electrolysis cell process. Secondary products such as caustic flakes, sodium hypochlorite (NaClO), and hydrochloric acid (HCl) will also be produced from the primary products.

The production capacity has been designed at 50 dry metric tonnes per day (DMT pd) of caustic soda (NaOH) and 45 tonnes per day (tpd) of chlorine (Cl_2).

The sub-sections below provide further information in terms of:

- Elegant Afro Chemicals (**Section 6.1**).
- Project motivation (**Section 6.2**).
- Production inputs i.e. feed stocks, consumables and utilities (**Section 6.3**).
- Production outputs i.e. products, liquid effluent, atmospheric emissions and solid waste (**Section 6.4** and **Section 6.5**).
- Production process (**Section 6.6**).
- Plant layout and services (**Section 6.7**).
- Construction and commissioning timeframes (**Section 6.8**).

6.1 Elegant Afro Chemicals

EAC is a new company formed by the founder of Elegant Line Chemicals (Pty) Ltd (ELC), which is an established QSE - as defined in the BBBEE Codes of Good Practice of 2015 - in the cleaning and industrial chemicals manufacturing sector. ELC has 10 years of experience within the chemical industry and distributes water treatment chemicals and provides water and waste treatment solutions to the southern African region.

The sole member of ELC, Ms. Nelly Shezi, has partnered with several shareholders with diverse academic qualifications and extensive business experience (some have specific experience in the chemicals industry) to form EAC. EAC will be 67% black-owned and as such, the project promotes industrial transformation. It is the very first project of its kind in the country to be predominantly owned and operated by African women. EAC received a cost-sharing grant from the Department of Trade and Industry (dti) Incentive Development and Administration Division to conduct a bankable feasibility study.

EAC states that it strives to achieve the governance outcomes of:

- An ethical culture.
- Good performance.
- Effective control.
- Legitimacy.

EAC believes in good corporate citizenship before profitability, as sound business practices translate to a good business image and ultimately, profitability (EAC, 2016). Businesses should be seen to benefit the social, economic and political environment in which they operate. EAC believes that sustainable business practices make good business sense and therefore embraces the United Nations Sustainable Development Goals. As such, EAC's annual reports will report on financial, environmental and social performance.

6.2 Project Motivation

The motivation for the project is provided in the sub-sections below in terms of:

- Employment opportunities.
- Skills development.
- Project location.
- Investment value.
- Feasibility study.
- Market study.

6.2.1 Employment Opportunities

It is projected that EAC's chlor-alkali operation will create 122 permanent skilled employment opportunities, with 55% of these opportunities targeted for previously disadvantaged youth. In addition, approximately 60 people would be employed on a contract basis. There will also be around 300 direct employment opportunities during the construction phase of the project. Opportunities would be created for skilled and trained workers.

EAC plans to award goods and services contracts for the chlor-alkali plant to small, medium and micro-sized enterprises (SMMEs) in the Kwazulu-Natal area. These contracts include canteen, security, gardening, diesel supply, cleaning, transport, mobile equipment maintenance, gardening, sales officer, and Information Communication Technology (ICT). Based on an average of each worker supporting six other persons (refer to **Section 10.13**), the project could potentially provide significant indirect economic benefits.

The expected employment benefits for the chlor-alkali operation are illustrated inError! Reference source not found. **Table 6-1**.

Table 6-1 Expected Employment Benefit from the Chlor-alkali Operation

Parameter	Profile	Value
Jobs created during construction phase	Temporary	300
Jobs created by ongoing operation	Permanent	122
Jobs created through Enterprise and Supplier Development	Flexible	60
Designated jobs for Black People		80%
Designated Jobs for Black Women		50%
Designated Jobs for Black Youth		55%
Designated Jobs for People living with disabilities		3%
Total Number of Jobs Created excl. enterprise development		629
Total Project Investment		ZAR 1 026 million

Source: EAC, 2018

6.2.2 Skills Development

This section has been extracted from EAC's Human Resources Policy (EAC, 2017).

EAC is committed to developing the skills required to run a chlor-alkali plant. EAC's technological partner, ThyssenKrupp Industrial Solutions South Africa (tkISSA), will therefore undertake formal and on-the-job training of production employees. Training manuals will be provided for operation and maintenance of the chlor-alkali plant. The training will be conducted during design, commissioning and ramp-up of the plant. tkISSA will also make resources available for the first year of operation of the

plant for the transfer of specialised skills to production employees in key positions, e.g. production manager. This will be on an ad hoc basis according to the service agreement.

EAC will ensure that its recruitment strategy is aligned to the selection of a team of highly skilled and adequately experienced employees. Each employee will be given the opportunity to develop their skills further as part of their career development pathway. This pathway will outline their progression from their initial position to a position to which they aspire. Career pathways will be unique to each employee.

EAC plans to appoint experienced managers in key management positions, such as the marketing manager and chief financial officer. Management training and development is intended to play a key role in the future growth plans of the enterprise. Relevant training courses and workshops will be attended, where required, to address shortcomings in key performance areas such as strategic planning, general management, strategy implementation, effective coordination and control of activities, and time management.

Some of the training that will be required to be undertaken includes:

- Safety, health and environment management and awareness (including emergency response).
- Forklift operation.
- Dangerous goods handling.
- ISO9001, ISO14001 and NSF listing.
- Plant operation.
- Chlor-alkali chemistry.
- Chlorine handling.
- Crane handling.
- Operation troubleshooting.

ELC is currently involved with the Chemical Industries Education and Training Authority and EAC intends to continue this involvement to further develop skilled employees.

6.2.3 Project Location

The proposed chlor-alkali plant is to be located in the RBIDZ, which is a Special Economic Zone (SEZ). The 2014/15 - 2016/17 Industrial Policy Action Plan identifies SEZs as key contributors to economic development. Being located in a SEZ means that EAC is potentially eligible for certain tax incentives. This, coupled with the plant being located near the Richards Bay port (a major trade port), makes EAC strategically placed to produce, distribute and export chlor-alkali chemicals. EAC has signed a recognition agreement and is in the process of finalising the lease agreement with the RBIDZ State Owned Company (SOC).

6.2.4 Investment Value

The total capital cost of the project is estimated to be ZAR 1 026 million. This encompasses the design, engineering, procurement, fabrication, construction and commissioning aspects of the proposed plant during an expected 24-month period. The project will not only contribute to growth and local economic development within the Richards Bay region, but that of the country at large.

EAC plans to source a range of services from previously disadvantaged SMMEs during operations, currently estimated at between ZAR 10 million and ZAR 20 million per annum. EAC will also incorporate into all tender documentation that a minimum of 30% of the tender value will have to be supplied by previously disadvantaged SMMEs.

The annual salary and wage bill is expected to be ZAR 38 million, which will have a significant multiplier effect into the KwaZulu-Natal area, especially Richards Bay and surroundings. The project also provides import replacement and export opportunities.

6.2.5 Feasibility Study

The following assessments are currently underway to assess the techno-economic feasibility of the proposed EAC chlor-alkali plant:

- Process design - ThyssenKrupp Uhde Chlorine Engineers (tkUCE) have installed around 600 chlor-alkali plants worldwide and is the technology supplier.
- Civil design.
- Costing – capital expenditure (CAPEX) and operational expenditure (OPEX).
- Financial modelling.
- Logistics study.
- Market study.
- Geotechnical study.
- Hydrological study.
- The CAPEX, OPEX and financial modelling will be revised to cater for the outcome of these studies.

6.2.6 Market Study

A market study is being undertaken as part of the project feasibility study. The study includes a market analysis and review of the historical supply and demand characteristics of the relevant product mix. It describes the nature of the chemicals market in South Africa, the size of the market and dominant players in the South African market (EAC, 2017). Various end-users have been secured by EAC via Letters of Intent or Memorandums of Understanding and selling prices of the selected product mix have been projected.

The primary uses, applications and market segments for caustic soda, chlorine and associated secondary products of these chemicals are listed in **Table 6-2.**

Table 6-2 Main Market Segments

Product	Industry Segment	Application Segment
Caustic Soda	Mining	Ore refining
	Water treatment	pH regulation
	Landfill	Leachate treatment (chemical precipitation)
	Food and beverage	Cleaning
	Petroleum	Process gas cleaning
	Paper and pulp	Pulp production
	Textiles	Mercerisation
	Soaps and detergents	Soap production
Chlorine	Plastics	PVC production
	Water treatment	Disinfection
	Chemicals	Chemical production
	Paper and pulp	Bleaching

Product	Industry Segment	Application Segment
	Textiles	Bleaching
	Pesticides	Finished products
	Pharmaceuticals	Molecule synthesis Extraction pH regulation Finished products

Source: EAC, 2017

6.3 Production Inputs

The primary inputs into the proposed production process are:

- Raw salt.
- Chemicals and consumables.
- Water supply.
- Power supply.

6.3.1 Raw Salt

The primary raw material for the chlor-alkali process is raw salt (NaCl) which is required as an input into the process at 3.2 tonnes per hour (tph). It is proposed to purchase the raw salt from external suppliers and to transport the salt to site via road. The salt will be off-loaded from the road trucks onto a salt storage slab with the capacity to store 2 000 tonnes (t) of salt.

6.3.2 Chemicals and Consumables

There are numerous chemicals and consumables which are required as inputs to the process, most of which are required in small quantities to be transported to site via road tanker or truck.

The primary chemicals, resins and consumables required are (refer to **Section 6.3.5** for quantities):

- Sulfuric acid (98% H_2SO_4) for chlorine drying.
- Caustic soda (32% NaOH) for first filling of the electrolyser.
- Sodium carbonate (Na_2CO_3) for brine treatment.
- Barium carbonate ($BaCO_3$) for brine treatment.
- Flocculent for brine settling.
- Pre-coat and filter aid (alpha-cellulose) for brine filtration.
- Active carbon for brine filtration.
- Chelating resins for secondary brine treatment.
- Hydrogen peroxide (50% H_2O_2) for final brine dechlorination

6.3.3 Water Supply

Process water will be required on site for the following uses:

- Demineralised (demin) water – to be produced at the Demin Water Unit using process water.
- Chilled water – to be produced at the Chilled Water Unit using demineralised water.
- Cooling water – process water will be chemically treated and distributed via the cooling system.

Water will also be required for the fire-fighting system and at the ablution facilities.

Mhlathuze Water has available capacity to provide the required 750 cubic metres per day (m^3/d) of clarified water to be used on site as process water and 40 m^3/d of purified (potable) water. The water reticulation network is currently being installed by RBIDZ SOC at Phase 1F.

6.3.4 Power Supply

The maximum power requirement for the proposed plant is 10 megavolt amperes (MVA).

The plant will be operating 333 days per year or 27.75 days per month, as per the design criteria. It is assumed that the plant will carry on operating even during shift changes, effectively operating 24 hours a day. The true power consumption, based on an apparent power of 8 MVA and utilising a power factor correction of 0.9, is 7.2 megawatts (MW).

The required power will be supplied via:

- The plant will connect to the municipal electrical power supply system. The electrical network is currently being installed within Phase 1F by RBIDZ SOC.
- Natural gas will be utilised as fuel for the steam boiler (2.6 MW capacity).
- A diesel generator will be installed to act as the emergency power supply.
- Hydrogen gas (H_2) will be generated as a by-product of the production process and will be used to generate 0.8 MW of power by a fuel cell to be used within the plant to supplement the municipal electrical supply.

6.3.5 Consumption of Feed Stocks and Chemicals

The expected average consumption of the major feed stocks and chemicals is provided in the sub-sections below, based on the plant operating under normal conditions at the rated production capacities of the different sections and units (refer to **Section 6.4.3** for planned production capacities).

Chlorine Production

Table 6-3 provides the expected continuous consumption for the production of 1 000 kilograms (kg) of chlorine (100% basis).

Table 6-3 Expected Continuous Consumptions for 1 000 kg of Chlorine (100% basis)

Inputs	Quantity
Salt (NaCl)	1650 kg
Process water	12.9 m^3 *
Hydrogen peroxide (H_2O_2)	2,4 kg
Hydrochloric acid (HCl)	32.8 kg
Caustic soda (NaOH)	30.2 kg
Chelating resin	0,01 litres
Sodium carbonate (Na_2CO_3)	13 kg
Barium carbonate ($BaCO_3$)	15 kg
Flocculent	0,04 kg
Pre-coat and filter aid (alpha-cellulose)	0,8 kg
Sulfuric acid (H_2SO_4)	23 kg

(*) cubic metres (m^3)

Source: EAC Caustic Soda Plant Design Basis Rev 1A (thyssenkrupp, 03 September 2017)

Hydrochloric Acid Production

Table 6-4 provides the expected continuous consumption for 1 000 kg of absorbed chlorine (Cl_2 100% basis) to produce hydrochloric acid (HCl 32%).

Table 6-4 Expected Continuous Consumptions for 1 000 kg of Absorbed Cl_2 100% to Produce HCl 32%

Inputs	Quantity
Cooling water	140 m^3
Demineralised water	2.1 m^3
Nitrogen (only during plant shut down/start up)	90 Nm^3/hr *
Compressed air (automatic start up)	30 Nm^3/hr **

(*) Peak consumption in normal cubic metres per hour (Nm^3/hr), duration 3 minutes.

(**) Peak consumption, duration 1 minute.

Source: EAC Caustic Soda Plant Design Basis Rev 1A (thyssenkrupp, 03 September 2017)

Sodium Hypochlorite Production

Table 6-5 provides the expected continuous consumption for 1 000 kg of absorbed chlorine (Cl_2 100% basis) to produce sodium hypochlorite (NaClO).

Table 6-5 Expected Continuous Consumptions for 1 000 kg of Absorbed Cl_2 100% to Produce NaClO

Inputs	Quantity
Chilling water	126 m^3
Demineralised water	2.2 m^3
Caustic soda (NaOH)	1 200 kg

Source: EAC Caustic Soda Plant Design Basis Rev 1A (thyssenkrupp, 03 September 2017)

Caustic Soda Production

Table 6-6 provides the expected continuous consumption for 1 000 kg of caustic soda (NaOH 100% basis) concentrated from 32% to 50%.

Table 6-6 Expected Continuous Consumptions for 1 000 kg NaOH 100% Concentrated from 32% to 50%

Inputs	Quantity
Cooling water	94 m^3
Steam	1 560 kg

Source: EAC Caustic Soda Plant Design Basis Rev 1A (thyssenkrupp, 03 September 2017)

6.4 Products

The proposed primary products are:

- Caustic soda (NaOH).
- Chlorine (Cl_2).

The proposed secondary products are:

- Caustic flakes.
- Sodium hypochlorite (NaClO).
- Hydrochloric acid (HCl).

6.4.1 Caustic Soda

EAC's planned production of caustic soda is 14 000 dry metric tonnes per annum (DMT pa), split into 10 600 DMT pa of caustic lye and 3 400 DMT pa of caustic flakes. This volume will represent around 2% of total demand in South Africa, and as such is unlikely to have any material impact on supply and pricing dynamics, and provides opportunities for import replacement.

6.4.2 Chlorine and Chlorine-derivative Products

EAC plans to produce 11 700 tonnes per annum (tpa) of chlorine, 3 125 tpa of hydrochloric acid (32% w/w)[1] and 13 330 tpa of sodium hypochlorite (15% w/w)[2].

6.4.3 Product Mix and Production Capacities

The planned product mix and various daily production capacities are listed in **Table 6-7**.

Table 6-7 Product Mix and Production Capacity

Products	Production Capacity	Target Operating Capacity	Units
Caustic soda (NaOH 100% basis) as 50% w/w solution	45	32.5	DMT pd *
Caustic soda (NaOH 100% basis) as flakes	20	10	DMT pd
Liquid chlorine (Cl_2 100% basis)	40	35	tpd **
Sodium hypochlorite (NaClO 100%) as 15% w/w solution	30	6	tpd
Hydrochloric acid (HCl 100% basis) as 32% w/w solution	25	3	tpd
Hydrogen gas (H_2 100% basis) as hydrogen cell gas	14 800	14 800	Nm^3/d ***

(*) Dry metric tonnes per day (DMT pd).

(**) Tonnes per day (tpd).

(***) Normal cubic metres per day (Nm^3/d).

Source: EAC Caustic Soda Plant Design Basis Rev 1A (thyssenkrupp, 03 September 2017)

[1] 3 125 tpa of 32% w/w hydrochloric acid is equivalent to 1 000 tpa of 100% w/w hydrochloric acid

[2] 13 330 tpa of 15% w/w sodium hypochlorite is equivalent to 2 000 tpa of 100% sodium hypochlorite

6.5 Waste Streams

The following waste streams are expected to be produced by the plant:

- Sludge.
- Liquid effluent.
- Atmospheric emissions.

6.5.1 Sludge

Sludge, in the form of sludge cake, will be produced from brine filtration within the plant. The maximum design sludge production rate is 100 kilograms per hour (kg/h) and the sludge cake is anticipated to be composed of 40% solids, 16% sodium chloride (NaCl) and 44% water (2.5% cellulose in solids). The sludge cake will be collected for off-site disposal at an appropriately licenced waste disposal facility at an expected rate of one 6 m^3 skip every 3 days.

6.5.2 Liquid Effluent

Wherever possible, the liquid streams are to be recycled back into the system. The main streams which are to be recycled are:

- Clarified brine from sludge filtration will be recycled to the brine primary treatment.
- Condensates from chlorine cooling (chlorinated water) to be recycled to brine dechlorination.
- Process condensates from the caustic soda evaporation to be recycled to brine saturation.
- Resin towers alkaline effluents can be recycled back to the saturators.

The liquid effluent which will require off-site disposal under normal operating conditions is:

- Acidic effluents from the chelating resin towers.
- Brine purge for chlorates control.
- Carbon towers backwashing.
- Hydraulic seals pump sealing.
- Cooling tower blow down.

Liquid effluent from the waste water treatment plant which will require off-site disposal is anticipated to comprise of 7% sodium chloride (NaCl) and 93% water, with a pH of 7 and temperature of 50 degrees Celsius (°C). The continuous waste water flow rate after treatment is expected to be 2 cubic metres per hour (m^3/h), with a maximum design rate of 11 m^3/h.

Potential constituents of the liquid effluent include:

- Chlorate.
- Chloride.
- Sulfate.
- Metals from salt source at low concentrations – the metal concentrations are expected to be no higher than that in seawater. Metals such as: cadmium (Cd), chromium (Cr), copper (Cu), iron (Fe), nickel (Ni), lead (Pb) and zinc (Zn) will be monitored to ensure low concentrations to avoid damage to the membranes.

Two alternative options for the disposal of liquid effluent are being investigated, namely via:

- Marine outfall - RBIDZ SOC would be responsible for providing the connection from Phase 1F to the A-line sea outfall pipeline, which is owned and operated by Mhlathuze Water.

- The uMhlathuze Municipality sewer system.

In addition to the liquid effluent to be discharged via the marine outfall / municipal sewer system, spent sulfuric acid (78% H_2SO_4), at a maximum design quantity of 55 kg/h, will require removal by tanker once per month. Industries involved in pickling of metal will be off-takers for the spent sulfuric acid.

6.5.3 Atmospheric Emissions

According to the design engineers, potential gaseous emissions from the plant include:

- Hydrogen (H_2).
- Chlorine (Cl_2).
- Hydrogen chloride (HCl).

Point sources for gaseous emissions to atmosphere include:

- Vent from the emergency hypochlorite stack at the chlorine neutralisation tower, with an anticipated Cl_2 content of < 1 milligrams per cubic metre (mg/m^3) under normal operation (maximum 100 Nm^3/h) and < 5 mg/m^3 under emergency conditions.
- Vent from the HCl absorber (burner), anticipated Cl_2 content of < 3 mg/m^3 under normal operation (max 100 Nm^3/h) and HCl content of < 15 mg/m^3.
- The hydrogen gas (H_2) generated during electrolysis will be used to generate power using a hydrogen fuel cell to be located within the plant site footprint. Any excess H_2 will be vented via the hydrogen stack.

Atmospheric emissions from the plant will be reduced via:

- A waste gas dechlorination unit that will be designed to absorb all chlorine vents to safely shut down the plant within 15 minutes.
- The hydrogen gas generated during electrolysis will be used to generate power using a hydrogen fuel cell.

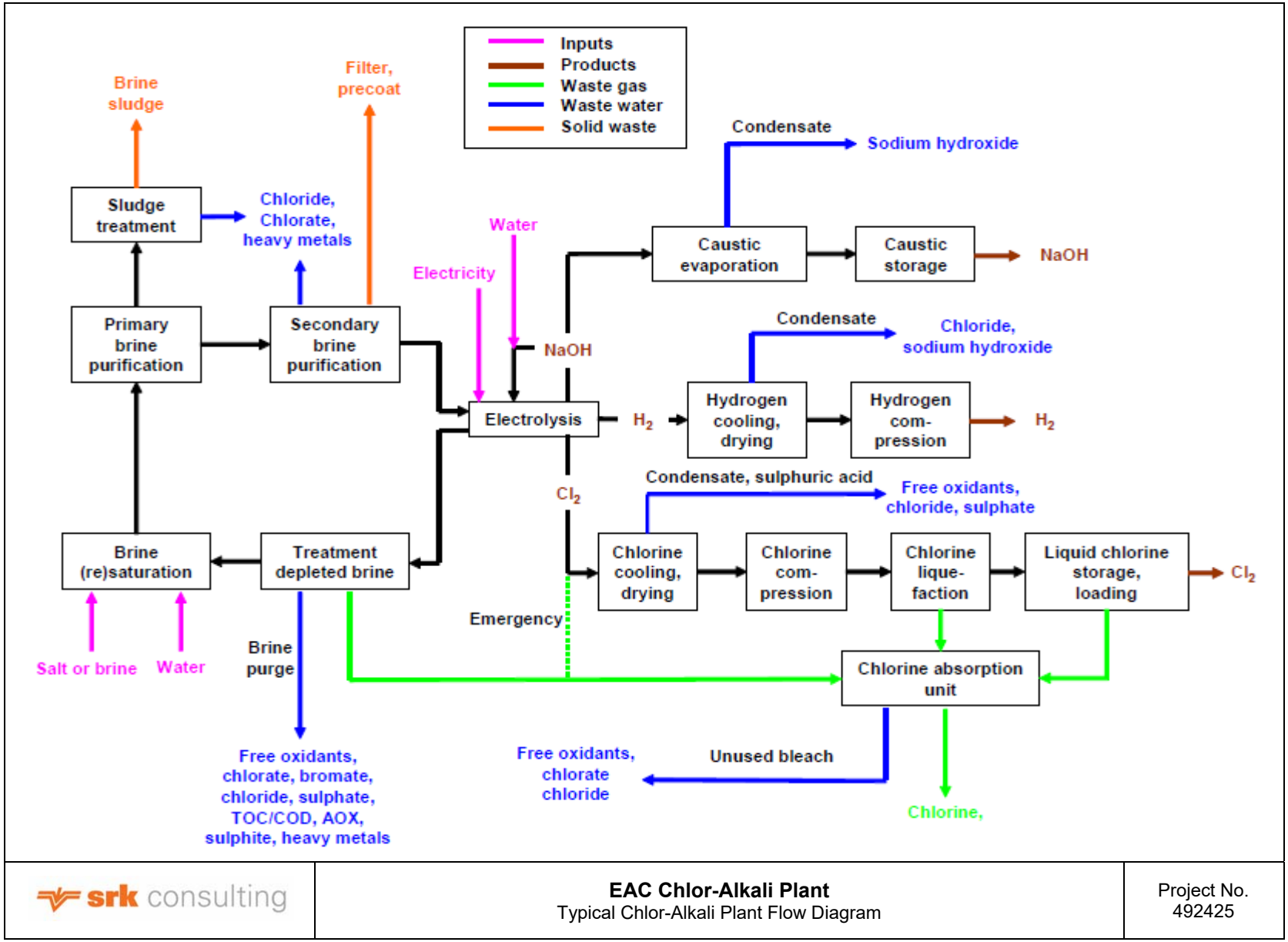
6.6 Process Description

This section provides an overview of the chlor-alkali process. The block flow diagram for a typical membrane cell chlor-alkali process is shown in **Figure 6-1**.

6.6.1 Electrolysis

The chlor-alkali process produces caustic soda (NaOH), chlorine (Cl_2) and hydrogen (H_2), from salt (NaCl) and water (H_2O), by electrolysis. Solid salt is dissolved in water to form a saturated brine. The brine is fed into the electrolyser, which is a bank of membrane electrolysis cells (refer to **Figure 6-2**).

Each electrolysis cell comprises an anode and a cathode, which are separated by an ion-exchange membrane (refer to **Figure 6-3**). This membrane allows the diffusion of sodium (Na^+) ions and a certain quantity of water into the cathode compartment, while it inhibits the diffusion of the other ions. When voltage is applied across the cell, sodium ions and a little water pass through the membrane into the cathode compartment, thus separating the Na+ ions from the ions in the anode compartment. Hydrogen gas and hydroxide (OH^-) ions are generated from H_2O at the cathode. The OH^- ions then react with the Na^+ ions in the cathode compartment to produce NaOH. Chlorine gas is generated at the anode.

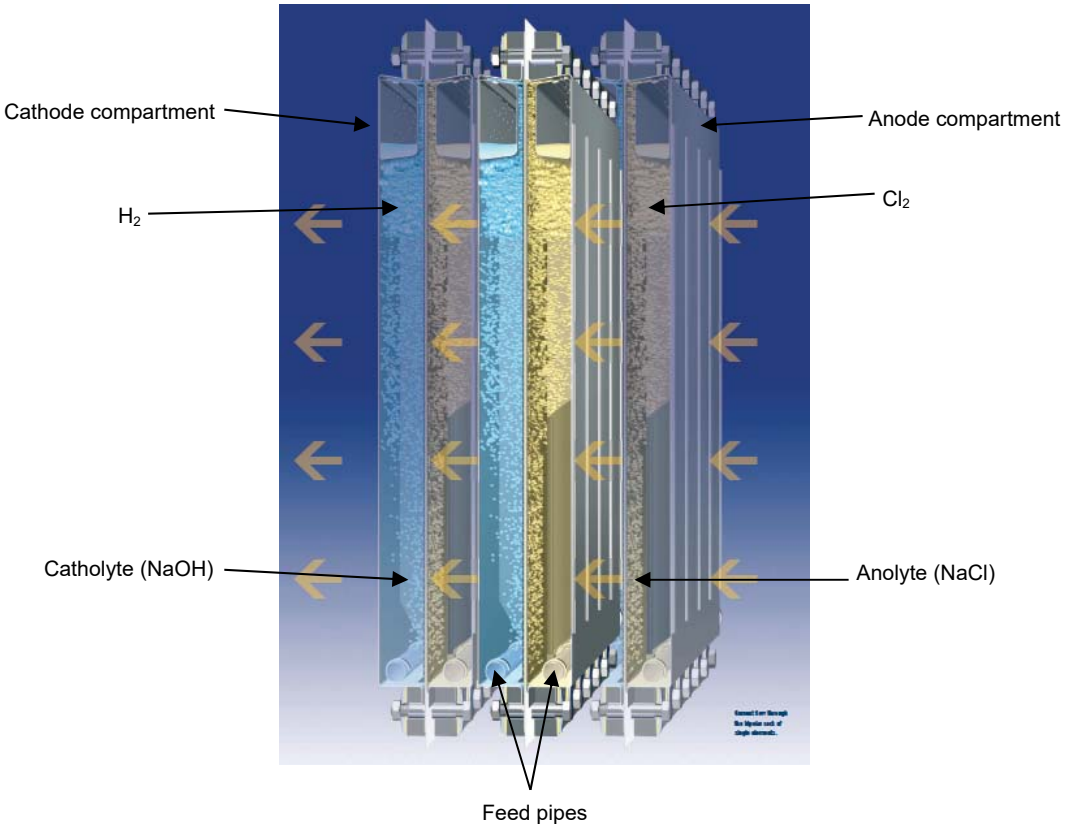


srk consulting	**EAC Chlor-Alkali Plant** Typical Chlor-Alkali Plant Flow Diagram	Project No. 492425

Figure 6-1 Block Flow Diagram of a Typical Chlor-alkali Process

Source: Chlor-alkali electrolysis plants superior membrane process (ThyssenKrupp Uhde, June 2012)

Figure 6-2 Electrolysers at a Chlor-alkali Plant in Norway



Source: Chlor-alkali electrolysis plants superior membrane process (ThyssenKrupp Uhde, June 2012)

Figure 6-3 Current Flow through Electrolysis Cells in a Rack

6.6.2 Processing into Final Products

The chlorine gas leaving the electrolysis cell is converted into three products: liquid chlorine, sodium hypochlorite (NaClO), and hydrochloric acid (HCl). The chlorine gas that leaves the cell is saturated with water and contains some oxygen. It must be cooled, filtered and dried to remove water and impurities. The chlorine is then compressed to liquefy it for storage.

The hydrogen gas is saturated with water, which is partially removed by cooling of the gas.

The caustic solution leaves the cell with 32% w/w concentration. The caustic soda liquid concentration is increased up to 50% w/w using an evaporation process, to be sold at this concentration. Caustic soda flakes will be produced by further evaporating the 50% w/w caustic soda solution.

6.6.3 Brine Treatment and Recirculation

The brine in the anode is depleted by electrolysis. The depleted brine leaving the cell is saturated with chlorine and contaminated with the by-products of the electrolysis reaction. The brine is de-chlorinated and re-circulated into the brine feed stream.

6.6.4 Hydrogen Fuel Cell

The hydrogen gas generated during electrolysis will be used to generate power using a hydrogen fuel cell to be located within the chlor-alkali plant site footprint. The power generated will be used within the EAC plant to supplement the municipal supply.

6.6.5 Monitoring System

The monitoring system will automatically safeguard and analyse the performance of the various elements and will transmit real-time measurements to a central data processing and presentation unit. In the event of any fault or deviation above the set-point, the safety programmable logic controller (PLC) will send a signal for the appropriate shut-down.

6.7 Plant Layout and Services

The general arrangement layout plan of the proposed plant is included in **Figure 6-4.** The general arrangement includes the plant layout, auxiliary building layout, raw material and warehouse areas, as well as the service lines (electricity, water and sewage).

Most of the plant equipment is proposed to be supplied in skid configuration i.e. already assembled on skid structures, pre-tested and ready for field installation. During construction, the preassembled skid mounted equipment is placed on the prepared foundations and interconnected.

Refer to **Figure 6-5** for a diagram showing the compact design of the cell house in a typical skid mounted chlor-alkali plant and to photographs of existing plants in Germany (**Figure 6-6**) and Brazil (**Figure 6-7**).

Space is available within the site for potential future expansion of the plant (potential expansion to 100 tpd caustic in the future – not included in the current application).

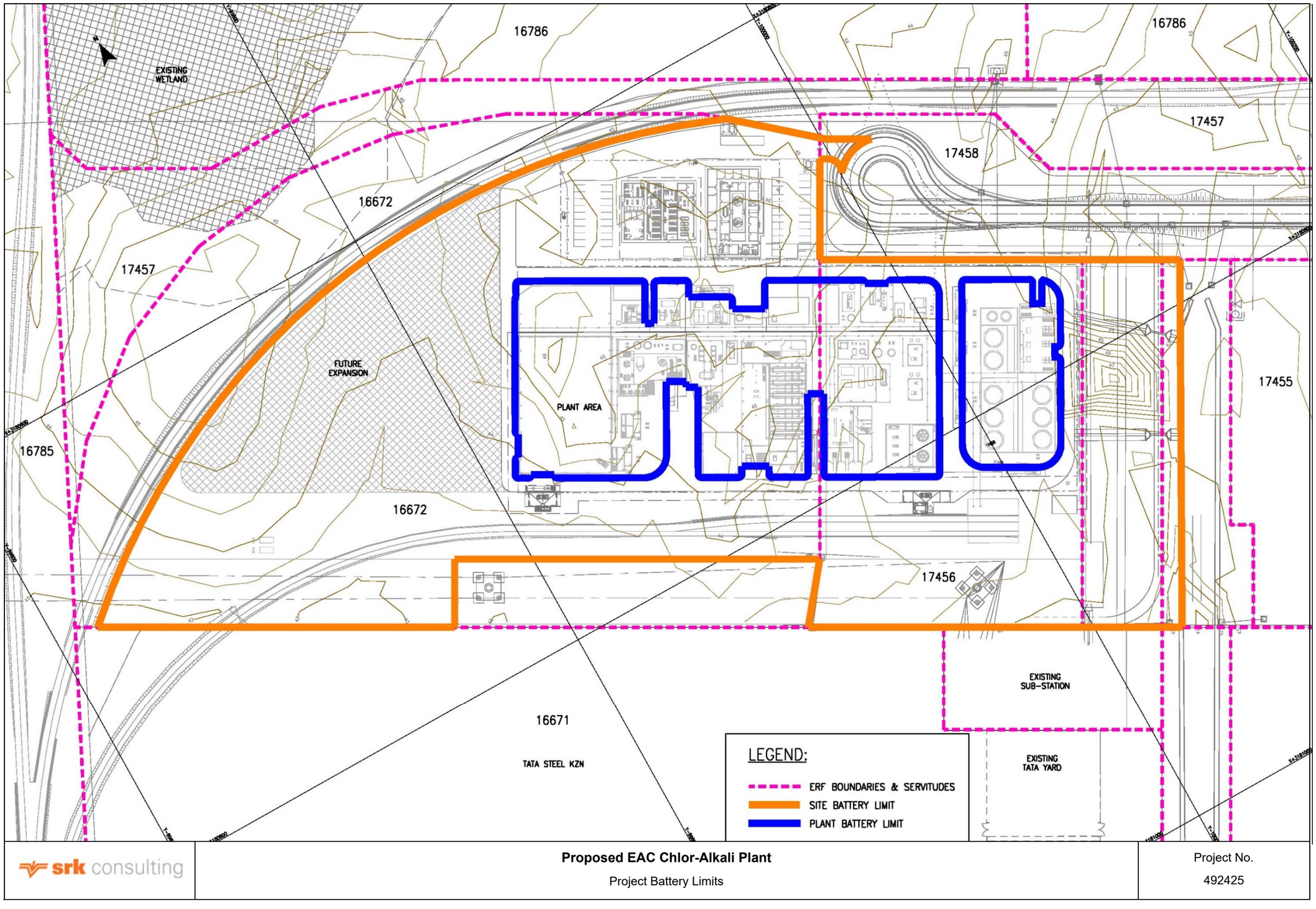
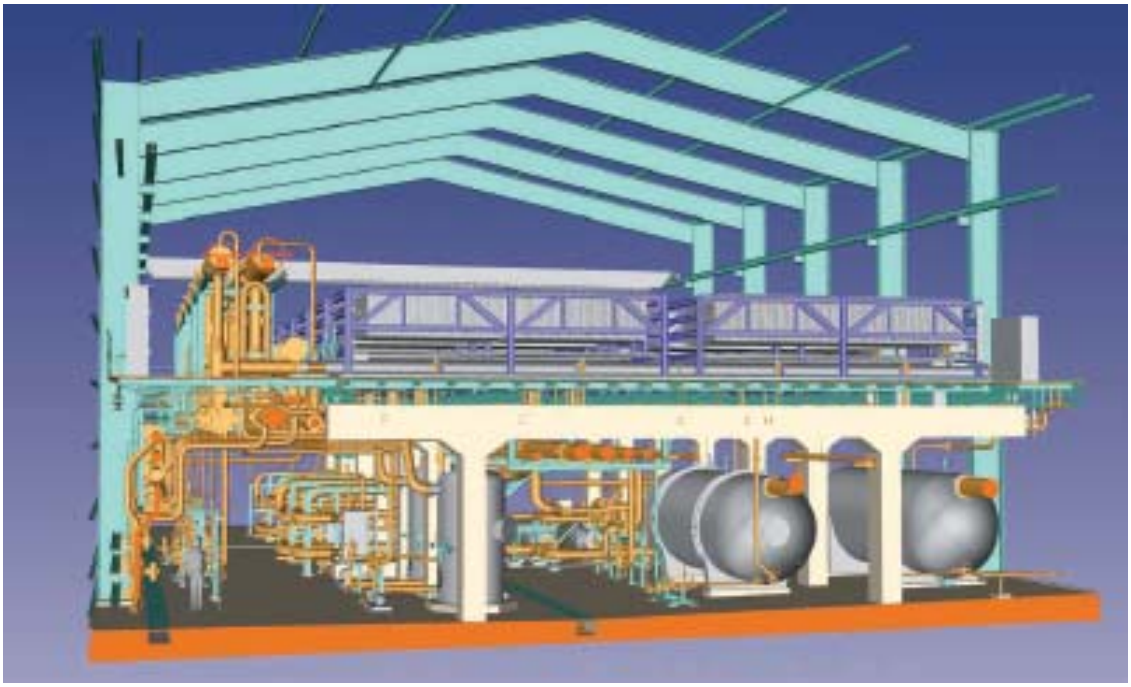


Figure 6-4: Project Layout Plan



Source: Chlor-alkali electrolysis plants superior membrane process (ThyssenKrupp Uhde, June 2012)

Figure 6-5 Compact Cell House Design in a Typical Skid Mounted Chlor-Alkali Plant

Source: Skid Mounted Automated Chlorine Plants (UHDENORA, February 2015)

Figure 6-6 Leuna Harze Plant in Germany

Source: Skid Mounted Automated Chlorine Plants (UHDENORA, February 2015)

Figure 6-7 Construction of a Skid Mounted Chlor-Alkali Plant in Brazil

6.7.1 Energy Efficiency Initiatives

In South Africa's current energy crisis, all industries have been forced to re-examine the efficiencies of their processes and equipment not only to try and reduce individuals' energy demand, but also to try and reduce their carbon footprint.

Energy efficiency initiatives have been taken into consideration for the various sections of the plant during the feasibility study design. The specified energy efficiency initiatives described below are tried and tested technologies that have been applied before in the industry, and have proven not only to be energy efficient, but can also play a huge role in not only reducing the power costs, but the carbon footprint as well.

Lighting

- Light-emitting diode (LED) lighting.
- Internal lighting control by means of motion sensors.
- External lighting control by means of day night switching.

Power Supply

In addition to the municipal power supply, the following is included in the design:

- A solar power system shall also be installed to supplement municipal power. The size of the solar power system shall be dependent on the available roof space once the building has been approved.
- It is planned that the project will generate its own 800 kilowatt (kW) of power from the hydrogen produced by the plant, using a hydrogen fuel cell.

Heating, Ventilation and Air Conditioning

- Two types of heating, ventilation and air conditioning (HVAC) systems will be evaluated at the final stages of the design, to decide which one will be more energy efficient and practical for the type of application. The two HVAC systems that will be evaluated are the centralised and de-centralised systems. In both instances, timers will be designed into the system to make sure that the HVAC system automatically switches off at a particular time. This is to ensure that the system will automatically switch off during night-time and /or weekends if left on by mistake.
- Air conditioner systems in the server room shall be controlled by temperature sensors. However, the control circuit shall allow for manual switching for maintenance purposes and manual operation should the temperature sensor be out of order. Server rooms require temperature control to prevent overheating.
- Air conditioning in the clinic building and canteen shall be wired to a timer circuit. Manual switching on and off shall also be allowed for local control. The change house area will be naturally ventilated.

Water Heating

- A heat pump /solar combination shall be used instead of a geyser for cleaning, dishwashing and bathroom hot water requirements.
- A hydro boiler shall be installed in the canteen area and kitchen instead of using a kettle, to avoid frequent water boiling every time hot water is needed.

Cooking

- Energy-efficient and high-performance burners and ovens such as smeg products.

Process Plant

Technology selection

- The improvement in electrolysis element design has resulted in a power saving of 7 MWh of power per day.

Cooling towers

- Switching off cooling tower fan(s) when cooling demand is low.

Pumps and Compressors:

- Operation at best efficiency point to ensure optimised power demand.

Motors

- High-efficiency motors shall be employed where appropriate.
- Soft-starters complete with by-pass contactors shall be used for motors greater than a predetermined kW rating to reduce the high starting current for large motors.
- Variable speed drives shall be used for speed control where required thus reducing running energy.

Cables and Load Centres

- Cables shall be properly rated and sized to avoid huge volt drops and overheating which can result in unnecessary losses.
- Load centres shall be positioned as close as possible to the equipment it supplies to avoid huge volt drops due to long cable runs.

General Building Design

Energy considerations will be considered and incorporated in the building designs. Where appropriate, guidance will be obtained from the Green Building Council of South Africa Technical Manual, and specialist input will be used in the designs. This will include considerations of construction materials, insulation materials, natural lighting, building management, and sub-metering, amongst others.

6.8 Construction and Commissioning Timelines

The construction and commissioning timelines for a typical chlor-alkali plant of this size are shown in **Figure 6-8**. The process units, skids, control system, and instrumentation will be procured from Uhde in Germany, and many of these are long-lead items. The skids are pre-assembled in Germany and shipped to South Africa.

The civils, pipework, electrical, pumps will mostly be procured from within South Africa, and are not expected to have long lead times. Some process equipment/vessels, which are not skid-mounted, will also be procured from within South Africa.

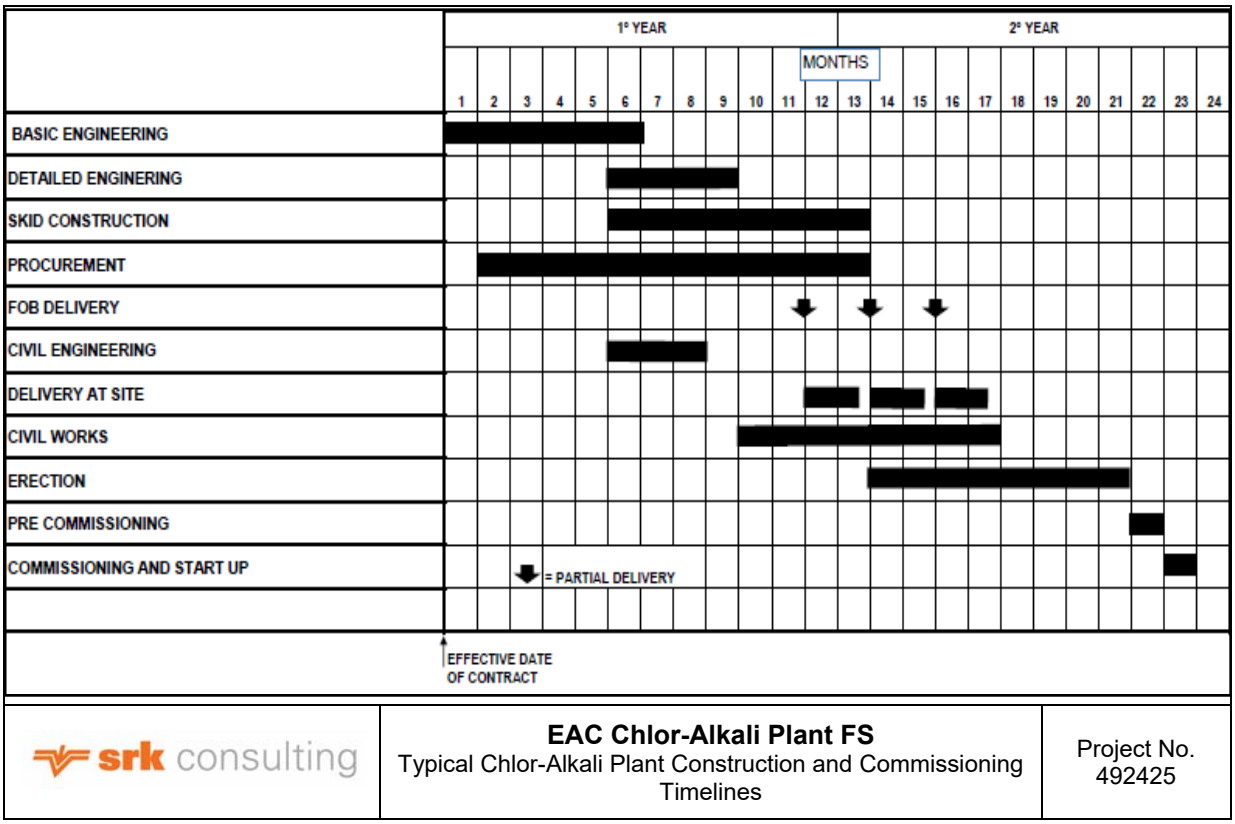


Figure 6-8 Construction and Commissioning Timelines for a Typical Skid-mounted Chlor-Alkali Plant

7 Legislative Context

In accordance with Items 2.(1)(d)(i) and 2.(1)(e) in Appendix 2 of GN 326, this chapter provides:

- A description of all listed and specified activities triggered.
- A description of the policy and legislative context within which the development is proposed, including identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to the assessment process.

The proposed EAC chlor-alkali plant requires certain authorisations, licences and permits prior to the commencement of construction. The identification of the relevant environmental authorisations, licence and permits required was based on the following documents /meetings:

- Final Amended EIA Report and Integrated Water and Waste Management Plan for RBIDZ 1F (Nemai Consulting, July 2016).
- Pre-feasibility study documents (EAC and Global Marketing, 2016).
- Meetings and correspondence with the client and design engineers: ThyssenKrupp.

SRK considered the listed activities authorised for RBIDZ 1F as a whole and identified activities that are specifically applicable to the EAC proposed development as a tenant of RBIDZ Phase 1F.

Relevant legislation, policy, programmes and plans relating to the following aspects were consulted:

1) The South African Constitution.
2) Environmental management.
3) Waste management.
4) Air quality.
5) Water.
6) Biodiversity.
7) Heritage.
8) Health and safety risk.
9) Planning.
10) Municipal bylaws and permits.
11) Local policies, programmes and plans.

The authorisations that are required are outlined in Sections 7.1 to 7.11 below.

7.1 South African Constitution

The Constitution of the Republic of South Africa Act 108 of 1996 is the supreme law of the land. In terms of environmental management, the Constitution provides the overarching framework for sustainable development, including the protection of natural resources while promoting economic and social development.

The environmental clause in Section 24 of the Constitution provides that:

"Everyone has the right –

a) To an environment which is not harmful to their health or wellbeing.

b) To have the environment protected for the benefit of present and future generations through reasonable legislation and other measures that:

i. Prevent pollution and ecological degradation;
ii. Promotes conservation;

iii. Secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development."

7.2 Environmental Management

The National Environmental Management Act 107 of 1998 (NEMA) provides for co-operative governance by establishing decision-making principles on matters affecting the environment including:

- Sustainable development.
- Integrated environmental management.
- Polluter pays principle.
- Cradle to grave responsibility.
- Precautionary principle.
- Involvement of stakeholders in decision-making.

The enforcing authority for NEMA is the DEA and provincial environmental authorities (for this application, EDTEA is the competent authority).

NEMA provides for the management and protection of environmental resources through inter alia the imposition of Environmental Authorisation requirements.

The Amendments to the 2014 EIA Regulations, as issued on 07 April 2017 in terms of NEMA, consist of the following:

- GN 326 specifies the EIA procedures to be followed.
- GN 327 provides Listing Notice 1 – activities that require a Basic Assessment (BA) process.
- GN 325 provides Listing Notice 2 – activities that require a S&EIR process.
- GN 324 provides Listing Notice 3 – activities in identified geographical areas that require a BA process.

7.2.1 Environmental Authorisation for RBIDZ 1F

Environmental Authorisation (DEA Ref: 14/12/16/3/3/2/665) has been issued to the RBIDZ SOC for installation of the necessary infrastructural services at RBIDZ 1F and construction was underway at the time of drafting this report.

The Environmental Authorisation includes the following activities within RBIDZ 1F (including the EAC site):

- Installation of the following infrastructural services:
  - Internal roads.
  - Sewer infrastructure.
  - Internal electrical infrastructure.
  - Water mains.
  - Stormwater infrastructure.
  - Other infrastructure such as the entrance gate complex and information and communications technology (ICT) infrastructure.
- The construction of infrastructure and structures (i.e. the above-mentioned roads, pipelines, stormwater structures, etc. as well as future tenant buildings) covering more than 50 cubic metres (m^3) or more, located within 32 m of a watercourse.
- Infilling of wetlands in accordance with an approved Wetland Management Plan, which includes on-going rehabilitation of designated wetland areas on the RBIDZ 1F site via removal of invasive alien vegetation and solid waste and stormwater management and erosion prevention.

- The physical alteration of undeveloped /vacant land for industrial use, which includes the EAC site as part of the approximately 102 ha of land within RBIDZ 1F to be developed by various tenants.
- The clearance of indigenous vegetation, including a portion of the RBIDZ 1F site which was identified as a Level 3 Critical Biodiversity Area in terms of Ezemvelo KZN Wildlife's Systematic Conservation Plan.

As the above-listed activities have been authorised and are currently under construction, these activities are excluded from the current application for the EAC project.

In addition, the RBIDZ SOC is responsible for obtaining the necessary authorisation prior to construction of the following activities for the RBIDZ 1F site:

- The railway link between RBIDZ 1F and existing railway infrastructure.
- The liquid effluent pipeline link between RBIDZ 1F and the existing Mhlathuze Water A-line sea outfall pipeline.

7.2.2 Application for Environmental Authorisation for EAC Project

The following NEMA listed activities are included in the current application (refer to **Table 7-1**):

- Activity 4 of GN 325: The development and related operation of facilities and infrastructure for the storage and handling of dangerous goods.
- Activity 6 of GN 325: The development of facilities and infrastructure which requires an Atmospheric Emissions Licence (AEL) in terms of national legislation governing the generation or release of emissions (refer to **Section 7.4**).

The NEMA listed activities as described in **Table 7-1** will be triggered by the development and operation of the proposed chlor-alkali plant, and will subsequently require authorisation. As activities from Listing Notice 2 are triggered, a S&EIR process is being undertaken.

Note that although the following activities are included in the proposed project, they do not trigger listed activities:

- There are two waste water treatment systems proposed for the plant: waste water not containing chlorine and water containing chlorine. The two waste water transfer pumps each have a capacity of 25 m^3 per hour and a total daily throughput capacity of 260 m^3 per day which is less than the threshold of 2 000 m^3 per day stipulated in Activity No. 25 of GN 327.
- Although Environmental Authorisation was issued for the bulk transportation of water, sewage and stormwater as part of the RBIDZ 1F EIA, this excluded effluent, process water, waste water, return water, industrial discharge or slimes. However, any effluent or waste water pipelines to be developed and operated for the EAC project will occur within the urban edge and are therefore excluded from Activity 10 of GN 327 in terms of the 2017 Amended EIA Regulations.
- Although 800 kW of power will be generated using a hydrogen fuel cell to be located within the chlor-alkali plant site footprint, this will occur within an urban area and is less than the threshold of 10 MW stipulated in Activity 1 of GN 327.
- The project will include the development and related operation of a natural gas pipeline from the supplier to the plant however the daily throughput capacity of 10 tons per day will be less than the threshold of 700 tons per day stipulated in Activity 7 of GN 325.

Table 7-1 Applicable NEMA Listed Activities

No.	Activity Description	Applicability to the Project
NEMA EIA Listing Notice 2 (GN 325) – S&EIR process required		
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. Where "dangerous goods" means goods containing any of the substances as contemplated in South African National Standard No. 10234, supplement 2008 1.00: designated "List of classification and labelling of chemicals in accordance with the Globally Harmonized Systems (GHS)" published by Standards South Africa, and where the presence of such goods, regardless of quantity, in a blend or mixture, causes such blend or mixture to have one or more of the characteristics listed in the Hazard Statements in section 4.2.3, namely physical hazards, health hazards or environmental hazards.	The proposed combined capacity of containers for the storage and handling of dangerous goods on site will exceed 500 m^3. The following storage capacities are proposed: • 3 x 100 m^3 liquid chlorine • 3 x 350 m^3 caustic 50% • 2 x 400 m^3 hypochlorite 15% • 3 x 400 m^3 hydrochloric acid 32% • 1 x 25 m^3 sulfuric acid 96% • 1 x 25 m^3 sulfuric acid 78%. Construction and operation of the above-listed facilities and associated infrastructure constitutes Listed Activity No. 4 of GN 325.
6	The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding- (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (iii) the development of facilities and infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or (iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.	The development of facilities and infrastructure for the proposed chlor-alkali plant requires application for an Atmospheric Emissions Licence (AEL) in terms of the National Environmental Management: Air Quality Act No. 36 of 2004 (NEM:AQA). Refer to Section 7.4 for further details regarding the AEL application.

7.3 Waste Management

The National Environmental Management: Waste Act 59 of 2008 (NEM:WA) regulates waste management in order to protect the health and environment of South African citizens. This is achieved through pollution prevention, institutional arrangements and planning matters, national norms and standards and the licencing and control of waste management activities.

The enforcing authority for NEM:WA is the DEA for hazardous waste and the provincial environmental authority (EDTEA in KwaZulu-Natal) for general waste.

A list of waste management activities that have, or are likely to have, a detrimental effect on the environment was published in terms of NEM:WA under GN 921 on 29 November 2013 (as amended by GN 1094, 11 October 2017). Waste management activities are listed in three categories (Category A, B and C).

Activities listed in Category A require that a BA process be undertaken as part of the application for a Waste Management Licence (WML), while activities listed in Category B require that a S&EIR process be undertaken for the WML application.

Waste activities listed in Category A and B include:

- Storage of waste in lagoons (excluding effluent, wastewater and sewage).
- Reuse, recycling or recovery of waste.
- Treatment of waste.
- Disposal of waste on land.
- Construction, expansion or decommissioning of facilities and associated structures and infrastructure.
- Residue stockpiles or residue deposits.

Various thresholds are stipulated in Category A and B which determine whether the above-listed waste management activities require application for a WML and if so, whether a BA or S&EIR application is required. Based on a review of the proposed activities, it is deemed that no application for a WML is required.

Category C lists waste management activities for which no WML is required, but a person commencing, undertaking or conducting these activities must comply with the relevant requirements or standards.

The National Norms and Standards for the Storage of Waste (GN 926, 29 November 2013) may potentially be applicable to the proposed development in the following circumstances:

- The storage of general waste at a facility that has a capacity to store in excess of 100 m^3 of general waste at any one time, excluding the storage of waste in lagoons or temporary storage of such waste.
- The storage of hazardous waste at a facility that has the capacity to store in excess of 80 m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or the temporary storage of such waste.

The National Norms and Standards for the Sorting, Shredding, Grinding, Crushing, Screening, or Bailing of General Waste (GN 1093, 11 October 2017) may potentially be applicable to the proposed development in the following circumstances:

- The sorting, shredding, grinding, crushing, screening or bailing of general waste at a waste facility that has an operational area that is 1 000 m^2 and more.

- A waste facility that has an operational area that is less than 1 000 m^2 must comply with Section 4(4) of the Norms and Standards only.

It is not anticipated that any NEM:WA listed activities will be triggered, since waste will not be treated or disposed of on site, and the volumes temporarily stored on site are small (maximum of 6 m^3 in skip bins which will be removed off site weekly). However, all generators of waste (excluding generators of domestic waste), are required to adhere to the requirements set out in the NEM:WA Waste Classification Regulations of 2013. One of these requirements is for generators of waste to classify all waste generated within 180 days of generation.

Sludge from a similar chlor-alkali plant (similar inputs and process) can be used to predict into which category the sludge will be classified. This information can be used to estimate disposal and storage costs. Even though the listed activities are not triggered, the 2013 National Norms and Standards for Storage of Waste (such as bunding, demarcation, etc.) are to be included in the Environmental Management Programme (EMPr) and adhered to as a part of good environmental management practice for the site.

7.4 Air Quality

The National Environmental Management: Air Quality Act 39 of 2004 (NEM:AQA), aims at identifying and providing guidelines to activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage.

All activities which are listed under Section 21 (GN 893, as amended by GN 551 of 12 June 2015) of NEM:AQA, are required to apply for an Atmospheric Emissions Licence (AEL), as well as comply with the specified Minimum Emission Standards (MES) noted in the relevant category.

National Ambient Air Quality Standards were also published in terms of NEM:AQA in GN 1210 on 24 December 2009 and in GN 486 on 29 June 2012 (for particulate matter with an aerodynamic diameter less than 2.5 micron metres $PM_{2.5}$).

The Listed Activities stipulated in GN R893 under NEM:AQA that will be triggered by the proposed project, are provided in **Table 7-2**. The triggered activities require an application for an AEL be submitted to the King Cetshwayo District Municipality. An Air Quality Impact Assessment (AQIA) will be undertaken (refer to **Chapter 15**) to inform the EIA and the AEL application.

Table 7-2 NEM:AQA Listed Activities Triggered

Applicable Listed Activities	Proposed Plant
Subcategory 7.1 Production and or Use in Manufacturing of Chlorine Gas	
• All installations producing or using more than 100 tpa.	• Design production capacity for chlorine gas is 45 tpd.
Subcategory 7.2 Production of Acids	
• The production, bulk handling and or use in manufacturing of hydrochloric and sulfuric acid in concentrations exceeding 10%. • Secondary production of hydrochloric acid through regeneration. • All installations producing or using more than 100 tpa.	• Design production capacity for hydrochloric acid (100% basis) as 32% w/w solution is 40 tpd. • Consumption rate of sulfuric acid is 31 tpm.

Applicable Listed Activities	Proposed Plant
Subcategory 7.7 Production of Caustic Soda	
• All installations producing more than 10 tpm.	• Design production capacity for caustic soda is 50.7 tpd.

7.5 Water

The National Water Act 36 of 1998 (NWA) recognises that water is a scarce resource which belongs to all people and therefore the DWS aims at implementing laws which will promote equal access to water and the use of water resources.

In this regard, all activities that are listed under Section 21 of the NWA require application for a Water Use Licence (WUL) to the Department of Water and Sanitation (DWS).

Activities listed under Section 21 are:

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.

k) Using water for recreational purposes."

The following water uses in terms of Section 21 (c) and (i) were applied for as part of WUL for the development of RBIDZ 1F:

- Crossing of wetlands for the installation of water, sewer, stormwater and roads for industrial development within RBIDZ 1F.
- Infilling of portions of wetlands to enable industrial development within RBIDZ 1F.
- Industrial-related activities occurring within 500 m from a wetland.
- Wetland rehabilitation activities (as part of the offset measures contained in the Wetland Environmental Management Plan).

On 16 March 2016, DWS issued a Directive in terms of Section 20(4) of the NWA to allow development within the RBIDZ 1F to proceed, including upgrading of Medway Road and the railway line to provide access to RBIDZ 1F.

The proposed chlor-alkali plant will produce a single liquid effluent stream, which will need to be disposed of.

Two alternative options for the disposal of liquid effluent are being investigated, namely:

- Marine outfall - RBIDZ SOC would be responsible for providing the connection from Phase 1F to the A-line sea outfall pipeline which is owned and operated by Mhlathuze Water in terms of an existing WUL (refer to **Section 7.6.2** for information regarding the coastal discharge permit).
- The municipal sewer system owned and operated by uMhlathuze Municipality in terms of its WUL.

It is therefore SRK's opinion that no WUL application is required for the proposed project. This will be confirmed with the DWS during the EIA process.

7.6 Biodiversity

The following main pieces of legislation relate to the management of biodiversity resources:

- National Environmental Management: Biodiversity Act 10 of 2004 (NEM:BA).
- National Environmental Management: Coastal Management Act 24 of 2008 (NEM:CMA).
- National Environmental Management: Protected Areas Act 57 of 2003.
- National Forests Act 84 of 1998.
- Conservation of Agricultural Resources Act 43 of 1983.
- KwaZulu-Natal Conservation Management Act 9 of 1997.

The relevant legislation in terms of biodiversity relating to the EAC site is NEM:BA and NEM:CMA as discussed in the sub-sections below.

7.6.1 Biodiversity Act

In terms of section 52(1)(a) of the NEM:BA, a national list of ecosystems that are threatened and in need of protection was gazetted on 09 December 2011 in GN 1002. The list classifies all threatened or protected ecosystems in South Africa in terms of four categories, i.e. Critically Endangered, Endangered, Vulnerable or Protected.

The ecological assessment undertaken for development of RBIDZ 1F (refer to **Sections 10.4 – 10.6**) identified the Critically Endangered ecosystem: Kwambonambi Hygrophilous Grasslands within RBIDZ 1F and therefore the requirements of NEM:BA were taken into account during the EIA for RBIDZ 1F. The DEA, EDTEA, DWS, the Department of Agriculture, Forestry and Fisheries (DAFF) and Ezemvelo KZN Wildlife provided input into the biodiversity offset management measures that were authorised for the industrial development of RBIDZ 1F.

Also of relevance to the EAC site are the Alien and Invasive Species Regulations (GN R598, 01 August 2014) and the associated Alien and Invasive Species Lists (GN 864, 29 July 2016) promulgated under NEM:BA. Invader and weed species must be controlled to prevent infestation and all individuals of invader species (especially Category 1) must be removed and eradicated. These measures are to be included in the EMPr for the project.

7.6.2 Coastal Management Act

Discharge of effluent into the marine environment must be undertaken in compliance with a coastal discharge permit issued in terms of the NEM:CMA. If the chlor-alkali plant effluent quality and quantity can be accommodated by Mhlathuze Water and should it be decided that the preferred alternative for the disposal of liquid effluent from the proposed plant is via sea outfall, an update of Mhlathuze Water's current coastal discharge permit description may be required.

7.7 Heritage

The following applicable pieces of legislation relate to the protection of heritage resources:

- National Heritage Resources Act 25 of 1999 (NHRA).
- KwaZulu-Natal Heritage Act 10 of 1997.

The South African Heritage Resources Agency (SAHRA) and Amafa aKwaZulu-Natali are the responsible heritage resources authorities in KwaZulu-Natal.

In terms of Section 38 of the NHRA, SAHRA must be notified and furnished with details regarding the location, nature and extent of any proposed development categorised as —

(a) "The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length.

(b) The construction of a bridge or similar structure exceeding 50 m in length.

(c) Any development or other activity which will change the character of a site—

(i) Exceeding 5 000 m^2 in extent; or

(ii) Involving three or more existing erven or subdivisions thereof; or

(iii) Involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority.

(d) The re-zoning of a site exceeding 10 000 m^2 in extent.

(e) Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority."

A heritage impact assessment was undertaken for the development of RBIDZ 1F and no heritage resources were identified within RBIDZ 1F, including the EAC site (refer to **Section 10-11**).

Mitigation measures will however be included in the EMPr in the unlikely event of chance heritage resource finds being encountered during construction.

7.8 Health and Safety Risk

In South Africa, risk assessments are carried out under the legislation of two separate acts, each with different requirements. These are discussed in the subsections that follow.

7.8.1 EIA Risk Assessment

Risk assessments regarding public health and safety from major incidents under NEMA are associated with EIAs and must be performed in accordance with NEMA. In this instance, impacts on the environment must be evaluated and mitigation proposed by the specialist conducting the investigation.

Section 30 of NEMA deals with the control of emergency incidents where an incident is defined as an "*unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed*." NEMA goes further by giving instructions with regard to reporting such an incident and limiting the effects of such an incident regarding risks to public health and the environment. The identification and mitigation of potential Section 30 incidents is thus crucial in the risk assessment of the project.

Generally, at the EIA phase there is insufficient detailed information to complete a Major Hazard Installation (MHI) risk assessment in full accordance with the MHI Regulations (refer to **Section 7.8.2**).

For example, emergency plans have not been developed and final designs have not been completed. Under these circumstances, a risk assessment would be conducted generally in accordance with the prescribed topics of the MHI Regulations. The MHI risk assessment is not a requirement for EIA approval.

The EIA phase determines if there are any fatal flaws that will prevent the project proceeding and the EIA risk assessment should have a statement from a professional person covering:

- The identification of potential NEMA Section 30 incidents.
- The determination of whether the proposed project is likely to be considered a MHI.
- If found to be an MHI, the determination of whether the proposed project would meet the requirements of the MHI Regulations and whether the risks could be engineered or managed to an acceptable level.
- The determination of whether there any factors that will prevent the project from proceeding to the next phase of construction or alternatively whether the project could continue under certain conditions or with mitigation.
- The determination of whether there are any special requirements that the local authorities should be aware of when evaluating the proposal.

7.8.2 MHI Risk Assessment

The Occupational Health and Safety Act 85 of 1993 (OHSA) and the MHI Regulations (GN R692, 30 July 2001) require that a MHI risk assessment be undertaken for installations which have on their premises a quantity of a substance which can pose a significant risk to the health and safety of employees and the public.

Should the EIA risk assessment confirm that the facility is a MHI and no fatal flaws are identified, the Department of Labour requires that a MHI risk assessment be undertaken prior to construction to determine if the project can be constructed and operated with all risks to employees and the public at an acceptable level.

The MHI report must be prepared by a registered Department of Labour Approved Inspection Authority. The risk assessment undertaken during the EIA would be updated to include recalculations for the changes indicated by the Environmental Authorisation and would include all the required elements of the MHI Regulations not completed in the EIA risk assessment, such as evaluation of emergency planning.

The MHI risk assessment must be submitted to the Department of Labour and the uMhlathuze Municipality: Disaster Management / Fire and Rescue.

7.9 Planning

In KwaZulu-Natal, the relevant provincial planning law is that contained in the KwaZulu-Natal Planning and Development Act 6 of 2008, which came into effect on 1 May 2010.

This act is not however applicable to the EAC site which falls within the Richards Bay Town Planning Scheme and is zoned for industrial use. The applicable authority in terms of planning issues is the uMhlathuze Municipality.

7.10 Municipal Bylaws and Permits

The following permits /licences will need to be obtained from the uMhlathuze Municipality in terms of the proposed project:

- Discharge of sewage to the sewage disposal system.
- Discharge of industrial effluent to the sewage disposal system.
- Water supply permit /agreement for potable water and firefighting requirements.
- Electricity supply permit /agreement.
- General and /or industrial waste removal permit /agreement for the removal of general and /or industrial waste (any industrial waste for which waste removal contractors are not used).
- Scheduled trade permit in terms of the environmental health bylaws.

The following permits may also be required:

- A rail safety permit (GN R549) in terms of the National Railway Safety Act 16 of 2002.
- Permit(s) related to operation in a customs area.
- Permits related to export of scheduled substances (GN R92) in terms of the International Trade Administration Act 71 of 2002.
- Licence for the supply of hazardous substances in terms of the Hazardous Substances Act 15 of 1973.

7.11 Local Policies, Programmes and Plans

A plethora of policies, programmes and plans are applicable to the proposed project, the most relevant being:

- The Richards Bay Environmental Management Framework (EMF).
- uMhlathuze Municipality Integrated Development Plan (IDP).

7.11.1 Environmental Management Framework

The EMF for the Richards Bay Port Expansion Area and Industrial Development Zone (IDZ) was formally adopted on 01 December 2015. This area is of strategic importance to the country because it contains the Port of Richards Bay and the nationally designated IDZ. The purpose of the EMF is to guide decision-making in the area to secure environmental protection and promote sustainability and cooperative environmental governance.

The EMF notes that Phase 1F falls within the Coastal Plain Commercial-Industrial Zone (Zone 7 of the EMF) and is located in the Alton North area, a few kilometres to the north of the other IDZ sites. Tata Steel (now Richards Bay Alloys) is located within RBIDZ 1F, with the remaining vacant land being largely transformed. Historically, the existence of water-logged areas on the plains necessitated the construction of drainage channels to mitigate potential flooding in the industrial area of Alton. The Nsezi Rail Yard lies immediately to the west, Richards Bay Cemetery to the north-east and light industrial development to the south-east of the RBIDZ 1F.

7.11.2 Integrated Development Plan

The uMhlathuze Local Municipality 2017/8 – 2021/22 Integrated Development Plan (IDP) and 2017 Spatial Development Framework (SDF) note the importance of the IDZ as a Strategic Economic Zone (SEZ) linked to the Port of Richards Bay. This provides the Province and the Municipality with an ideal platform to promote the declared intent to maximize opportunities related to the ocean economy, manufacturing, beneficiation, as well as new and innovative oil gas energy options.

The IDP notes that the benefits to industries located in the IDZ include:

- Existing efficient deep-water port.
- Suited to export-orientated production.
- Customs controlled area.
- Value Added Tax and import duty exemption.
- Same time zone as Europe.
- Strategic location to access world markets.
- Allowance for 100% foreign ownership.
- Established local and service industries.
- Down-streaming opportunities with respect to: Aluminium, Heavy Metals, Chemicals, Wood, Paper, Pulp and various agricultural products.

8 Project Need and Desirability

In accordance with Item 2.(1)(f) in Appendix 2 of GN 326, this chapter provides a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location.

The DEA has published a “Guideline on Need and Desirability” (DEA, 2017) which contains best practice guidelines for the consideration of the need and desirability of a development involving NEMA listed activities.

Need and desirability is based on the principle of sustainability, set out in the Constitution and in NEMA, and provided for in various policies and plans, including the National Development Plan 2030. Addressing the need and desirability of a development is a way of ensuring sustainable development – in other words, that a development is ecologically sustainable and socially and economically justifiable – and ensuring the simultaneous achievement of the triple bottom-line.

The guideline sets out a list of questions which should be addressed when considering need and desirability of a proposed development based on Section 24 of the Constitution which calls for the securing of “ecological sustainable development and use of natural resources” and the promotion of “justifiable economic and social development”.

In terms of the proposed EAC development, the guideline list of questions are answered in **Table 8-1** with reference to the relevant spatial plans, including the EMF, IDP and SDF.

Also of relevance to this chapter is the project motivation outlined in **Section 6.2**.

Table 8-1: Project Need and Desirability

No.	Questions from the Guideline on Need and Desirability (DEA, 2017)	Applicability to the Project
"securing ecological sustainable development and use of natural resources" (Section 24 of the Constitution)		
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?		
1.1	How were the following ecological integrity considerations taken into account?: 1.1.1 Threatened Ecosystems. 1.1.2 Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure. 1.1.3 Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). 1.1.4 Conservation targets. 1.1.5 Ecological drivers of the ecosystem. 1.1.6 Environmental Management Framework. 1.1.7 Spatial Development Framework. 1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	An ecological study and numerous wetland studies were undertaken for the EIA for RBIDZ 1F. Recommendations from these studies and authority requirements were included in the EMPr which is currently being implemented for the development of the RBIDZ 1F. Refer to **Sections 10.4** to **10.6**. The approved development option for RBIDZ 1F involves: • Conservation and rehabilitation of Wetland A, located to the north-west of the EAC site (refer to **Figure 6-4**). This has been achieved by means of excluding Wetland A and a 30m wide buffer zone from the developable area, repositioning the proposed railway line outside of the core wetland and buffer areas and ensuring ongoing rehabilitation through the removal of invasive alien plant species and solid waste. • The rehabilitation and utilisation of the lower portions of Wetlands B and C, situated to the south-east of the EAC site, for the purpose of improving the quality of water leaving the RBIDZ 1F property. In accordance with the approved plans, the majority of Wetlands B and C are in the process of being in-filled as part of the development footprint during the construction of the RBIDZ 1F services. The specialist studies undertaken for RBIDZ 1F confirmed that there are no wetlands located within the EAC site. The closest wetland is Wetland A and associated buffer area, located adjacent to the north-west boundary of the EAC site. The EMF and SDF were reviewed and are referenced in **Section 7.11.**
1.2	How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	

No.	Questions from the Guideline on Need and Desirability (DEA, 2017)	Applicability to the Project
1.3	How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	• **Water**: An Integrated WUL application was submitted to DWS for RBIDZ 1F and DWS has approved the commencement of the RBIDZ 1F development (refer to **Section 7.5**). A surface and groundwater impact assessment will be undertaken for the proposed EAC plant as part of the current application and recommended mitigation measures will be included in the EMPr (refer to **Chapter 15**). • **Air:** An AQIA and application for an AEL for the EAC plant will be undertaken in parallel to the EIA process (refer to **Section 7.4**).
1.4	What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	The following waste streams are expected to be produced by the plant: sludge, liquid effluent and atmospheric emissions (refer to **Section 6.5**). Wherever possible, the liquid streams are to be recycled back into the system. Atmospheric emissions from the plant will be reduced via: • A waste gas dechlorination unit will be designed to absorb all chlorine vents to safely shut down the plant within 15 minutes. • The hydrogen gas generated during electrolysis will be used to generate power using a hydrogen fuel cell.
1.5	How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	As the site is located within the RBIDZ 1F and is surrounded by existing industry, visual impact on the landscape is anticipated to be limited (refer to **Section 10-10).** A visual impact assessment will be undertaken as part of the EIA and recommended mitigation measures included in the EMPr (refer to **Chapter 15**)**.** A heritage impact assessment was undertaken as part of the EIA for RBIDZ 1F and no cultural heritage resources were identified within the RBIDZ 1F, including the EAC site (refer to **Section 10-11**). The EMPr for the proposed development will include the provision that in the unlikely event that any potential cultural heritage resources are discovered during construction, construction works should halt and Amafa be contacted.
1.6	How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be	Use coal-powered electricity from the municipal system will be reduced by means of the following measures:: • Natural gas will be utilised as fuel for the steam boiler. • Hydrogen gas (H_2) will be generated as a by-product of the production process and will be used to generate 0.8 MW of power by a fuel cell.

No.	Questions from the Guideline on Need and Desirability (DEA, 2017)	Applicability to the Project
	avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	• During the feasibility study design, energy efficiency initiatives have been included which are tried and tested technologies that have been applied before in the industry, have proven to be energy efficient and reduce the carbon footprint (refer to **Section 6.7.1).**
1.7	How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? 1) Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life). 2) Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources for the proposed development alternative?). 3) Do the proposed location, type and scale of development promote a reduced dependency on resources?	The primary inputs into the proposed production process are: • Raw salt sourced from commercial suppliers (a desalination plant was investigated but proved unfeasible at this stage). • Chemicals and consumables (various secondary products are produced from the primary products). • Water supply from Mhlathuze Water (water is treated and recycled to the greatest extent possible). • Power supply (municipal electricity, natural gas, hydrogen cell and back-up diesel generator). The project design is based on international Best Available Technology (refer to **Section 9.1**).
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts? 1) What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 2) What is the level of risk associated with the limits of current knowledge?	An ecological assessment was undertaken for RBIDZ 1F in 2015 and four wetland assessments were undertaken for the site by various consultants between 2010 and 2016. The wetland management plan was approved by the various relevant authorities, including Ezemvelo KZN Wildlife and DWS, prior to implementation. There are no wetlands or ecological resources of significant value within the EAC site.

No.	Questions from the Guideline on Need and Desirability (DEA, 2017)	Applicability to the Project
	3) Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	
1.9	How will the ecological impacts resulting from this development impact on people's environmental right in terms following: 1) Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 2) Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	The following specialist studies will be undertaken as part of the EIA: • Health and safety risk. • Air quality. • Surface and groundwater. • Traffic. • Visual. • Socio-economic.
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Due to the construction of services across the site, the site is extensively disturbed and no direct ecological impacts are anticipated. Potential impacts on air and water will be assessed during the EIA phase.
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	As above.
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	As the proposed development is to be located within an existing IDZ, the nature of the site has been determined as suitable for industrial development.
1.13	Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	As above.

No.	Questions from the Guideline on Need and Desirability (DEA, 2017)	Applicability to the Project
"promoting justifiable economic and social development" (Section 24 of the Constitution)		
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations? 1) The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area. 2) Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.). 3) Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and 4) Municipal Economic Development Strategy ("LED Strategy").	The site is located within the RBIDZ, which has been assessed as suitable for industrial development in terms of the Richards Bay EMF and the RBIDZ 1F EIA. The uMhlathuze IDP and SDF both identify the importance of the RBIDZ in terms of achieving sustainable development objectives and reducing the high levels unemployment and poverty in the area (refer to **Section 7.11** and **Section 10.13**).
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 1) Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	A socio-economic impact assessment will be undertaken during the EIA phase. This will be responded to during the EIA phase.
2.3	How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	This will be responded to during the EIA phase.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	This will be responded to during the EIA phase.
2.5	In terms of location, describe how the placement of the proposed development will: 1) Result in the creation of residential and employment opportunities in close proximity to or integrated with each other. 2) Reduce the need for transport of people and goods.	As the proposed EAC project is located within RBIDZ 1F, the proposed development will: • Create employment opportunities in close proximity to other employment opportunities with the potential to result in densification and the achievement of thresholds in terms public transport. • Complement other industrial uses in the area.

No.	Questions from the Guideline on Need and Desirability (DEA, 2017)	Applicability to the Project
	3) Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport). 4) Compliment other uses in the area. 5) Be in line with the planning for the area. 6) For urban related development, make use of underutilised land available with the urban edge. 7) Optimise the use of existing resources and infrastructure. 8) Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement). 9) Discourage "urban sprawl" and contribute to compaction/densification. 10) Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs. 11) Encourage environmentally sustainable land development practices and processes. 12) Take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.). 13) The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential). 14) Impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area. 15) In terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	• Be in line with the planning for the area. • Make use of underutilised land available within the urban edge. • Optimise the use of services and infrastructure currently being installed within RBIDZ 1F. • Opportunity costs were realised in terms of the installation of bulk infrastructure. • Discourage "urban sprawl" and contribute to compaction/densification within the IDZ areas. • Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs. • Encourage environmentally sustainable land development practices and processes. • Take into account special locational factors, namely: the benefits of the IDZ, access to the port and access to rail. • Richards Bay has a high economic potential and the investment will generate the highest socio-economic returns.
2.6	How were a risk-averse and cautious approach applied in terms of socio-economic impacts?: 1) What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 2) What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic	This will be responded to during the EIA phase.

No.	Questions from the Guideline on Need and Desirability (DEA, 2017)	Applicability to the Project
	vulnerability and sustainability) associated with the limits of current knowledge? 3) Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	
2.7	How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: 1) Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 2) Positive impacts. What measures were taken to enhance positive impacts?	This will be responded to during the EIA phase.
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	This will be responded to during the EIA phase.
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	This will be responded to during the EIA phase.
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	This will be responded to during the EIA phase.
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	This will be responded to during the EIA phase.

No.	Questions from the Guideline on Need and Desirability (DEA, 2017)	Applicability to the Project
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	This will be responded to during the EIA phase.
2.13	What measures were taken to: 1) Ensure the participation of all interested and affected parties. 2) Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation. 3) Ensure participation by vulnerable and disadvantaged persons. 4) Promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means. 5) Ensure openness and transparency, and access to information in terms of the process. 6) Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge. 7) Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?	Refer to **Chapter 11**.
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	This will be responded to during the EIA phase.
2.15	What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	This will be responded to during the EIA phase.

No.	Questions from the Guideline on Need and Desirability (DEA, 2017)	Applicability to the Project
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects: 1) The number of temporary versus permanent jobs that will be created. 2) Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area). 3) The distance from where labourers will have to travel. 4) The location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits). 5) The opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	This will be responded to during the EIA phase.
2.17	What measures were taken to ensure: 1) That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment. 2) That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	This will be responded to during the EIA phase.
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	This will be responded to during the EIA phase.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	This will be responded to during the EIA phase.
2.20	What measures were taken to ensure that he costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	This will be responded to during the EIA phase.
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being	This will be responded to during the EIA phase.

No.	Questions from the Guideline on Need and Desirability (DEA, 2017)	Applicability to the Project
	proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	This will be responded to during the EIA phase.

9 Alternatives

Item 2.(1)(g) in Appendix 2 of GN 326 stipulates that the Scoping Report must provide a full description of the process followed to reach the preferred activity, site and location of the development footprint within the site.

This chapter meets the requirements of Items 2.(1)(g)(i) and 2.(1)(g)(x), by providing details of all the alternatives considered and a motivation where alternatives were not considered.

The following alternatives are discussed in the sub-sections below:

- Technology.
- Power supply trade-off study.
- Desalination.
- Location.
- Layout.
- Effluent disposal.
- No-go.

9.1 Technology

Three technologies exist for the production of chlor-alkali chemicals: mercury cell, diaphragm cell and membrane cell technology. Older technology such as the mercury and diaphragm cell technology is being gradually phased out, and therefore only the membrane electrolysis cell technology was considered, because it is currently the best available technology, as verified by the European Union Best Available Technology Reference Document for chlor-alkali production (2014).

EAC has selected tkISSA as its technology partner due to tkISSA's vast experience in chlor-alkali technology. Over 600 chlorine plants using Uhde (tkUCE) electrolysers are in operation worldwide. tkISSA will be installing tkUCE's sixth generation elements at the proposed EAC plant.

Other technology suppliers were investigated, but tkUCE's technology and local presence positioned them favourably over other suppliers. tkISSA is the only licensor that can provide a full engineering, procurement and construction solution, including design, manufacture, construction, training and after-sales service. tkISSA has a local presence in South Africa with strong technical capabilities and a Level 4 BBBEE status.

9.2 Power Supply Trade-off Study

A financial trade-off study was conducted to assess the possibility of incorporating a hydrogen fuel cell as a complementary power supply to the chlor-alkali plant. This hydrogen fuel cell would use the hydrogen generated in the chlor-alkali process to generate power, which would allow the plant to use less power supplied by Eskom, thereby reducing its carbon footprint.

The operational costs of power supplied by the Municipality /RBIDZ SOC were compared to the operational and capital costs of a combination power supply from Municipality /RBIDZ SOC and hydrogen fuel cell. All costs were escalated over the life of the operation, and seasonal tariffs and fixed charges were also accounted for.

The trade-off study concluded that the inclusion of the hydrogen fuel cell supply in the energy mix would be beneficial for the proposed EAC plant.

9.3 Desalination

As an alternative to purchasing salt from commercial suppliers, an evaluation was undertaken on the feasibility of incorporating a desalination plant as part of the project. A further crystallisation step is required for the brine from a desalination plant prior to use in a chlor alkali plant. Based on tests conducted on desalination of sea water, it was determined that desalination is not a feasible option for the proposed plant at this stage.

9.4 Location

The site location was selected based on the following factors:

- Proximity to the Port of Richards Bay:
  - Allows for lower logistics costs when transporting raw materials to site.
  - Allows access to international shipping routes for product export.
- Product demand in KwaZulu-Natal:
  - Allows EAC to service coastal markets more cost-effectively than producers in Gauteng.
- Benefits associated with being situated within an IDZ.
- Location adjacent to a railway siding within RBIDZ 1F.

9.5 Layout

Alternative site layouts were considered in terms of a preliminary risk and logistics assessment as part of the feasibility study. The health and safety risk assessment to be undertaken in the next phase of the EIA process will undertake modelling to consider the risk levels with respect to processes such as liquefaction and chlorine storage and recommendations from the study may result in further amendments to the layout to mitigate potential risks to an acceptable level.

9.6 Effluent Disposal

Two alternative options for the disposal of liquid effluent are being investigated, namely via:

- Marine outfall - RBIDZ SOC would be responsible for providing the connection from Phase 1F to the A-line sea outfall pipeline which is owned and operated by Mhlathuze Water.
- The uMhlathuze Municipality sewer system.

9.7 No-go

The no-go alternative implies the continuation of the status quo in terms of development potential, zoning and management. In the case of the EAC site, this would mean leaving the land as is i.e. vacant. However, the site has been zoned for industrial use, is located within the IDZ, is in line with the EMF and SDF and is extensively disturbed from the installation of services. It seems likely that industrial development will take place on the site at some stage, especially as it is located in an area that is not sensitive from an environmental resources point of view. Potential negative risks and impacts associated with the proposed development would not apply in a no-go situation. However, potentially highly significant positive socio-economic impacts would also not be realised.

10 Environmental Attributes

This chapter meets the requirements of Item 2.(1)(g)(iv) in Appendix 2 of GN 326, by providing details of the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.

A general description of the status quo of the receiving environment in the project area provides the context within which the EIA is being conducted and allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project. The study area includes the development and construction footprint and the surrounding receiving environment, including the regional context of environmental features, where applicable, with a focus on the local surrounding environment.

Several specialist investigations were undertaken to inform the *Amended EIA Report for RBIDZ 1F* (Nemai, July 2016) and these specialist studies are referenced in the sub-sections below, where applicable to the EAC site.

Refer to **Chapter 12** for the identification of environmental issues and to **Chapter 14** for an initial assessment of potential impacts to the receiving environment.

10.1 Land use

The RBIDZ 1F is situated on the northern boundary of the existing Industrial Township of Alton and approximately 1.5 km to the west of the Central Business District of Richards Bay (refer to **Figure 1-1**). It is bordered to the east by the future Central Freeway, to the north by the Richards Bay Cemetery and Mandlazini reservoirs and to the west by the Nsezi railway marshalling yard and future Western Arterial.

In terms of land use, the quaternary catchment area is characterised by intense past land-use modifications from agriculture, mining, tourism, residential, recreational and industrial development activities. The RBIDZ 1F is bordered by mixed-use industrial developments as well as residential areas and open areas (refer to **Figure 5-1**). The broader surrounding area contributes significantly to the stormwater drainage that runs through the study site.

The RBIDZ 1F is zoned as IDZ Industrial by the uMhlathuze Municipality. IDZ Industry provides for lower impact industries as compared to General Industrial zonation. The developable land has a surface area of approximately 100 ha, although the area to be developed will be less (based on the required coverage factor).

The terrain across RBIDZ 1F is generally very flat with a gradual slope towards the south from an elevation of approximately 67 metres above mean sea level (mamsl) on the northern boundary to approximately 42 mamsl on the southern boundary. Two natural watercourses traverse the RBIDZ 1F site from north to south, parallel to the eastern and western boundaries. Drainage is extensively influenced by a large drainage channel along the eastern boundary.

The EAC site (Erven 16672 and 17456, Richards Bay) is located within the western portion of RBIDZ 1F. It is bordered to the south-east by Richards Bay Alloys (the ferrochrome smelter formerly owned by Tata Steel, which was purchased by Traxys in 2016) and a power station and to the north-west by a proposed railway line (to be constructed by RBIDZ SOC), beyond which lies a wetland area (refer to **Section 10.4**) and vacant plots of industrial land. The proposed chlor-alkali plant area slopes very gently to the north-west at an elevation of approximately 48 mamsl.

10.2 Geology and Soils

SRK conducted a geotechnical investigation for the proposed EAC chlor-alkali plant, the results of which are presented in the *Geotechnical Investigation Report for the EAC Chlor-alkali Plant on Erven 16672 and 17456, Richards Bay* (SRK, December 2017).

The proposed chlor-alkali plant is directly underlain by Quaternary aged fine to medium-grained silty and /or clayey sand. The surficial materials in the immediate area surrounding Richards Bay predominantly comprise unconsolidated sediments. Bedrock was interpreted to be in excess of around 50 m below natural ground level and the groundwater level is expected to lie at around 2 m. Vegetation has already been cleared across most of the site for the installation of the bulk infrastructure and access roads.

The sands directly underlying the site are considered to have a high erosion potential. Where heavily loaded structures are proposed on site, a piling solution will be required for foundations. As the site is located in a low to moderate seismic hazard area, additional foundation design considerations are not considered to be applicable to the site.

The potential loss of agricultural land was assessed as part of the EIA for RBIDZ 1F. According to the Department of Agriculture, Forestry and Fisheries (DAFF), the site occurs in an area of moderate potential arable land. The DAFF soil classes information shows that the site occurs on imperfectly drained sandy soils, which are usually highly erodible. No specialist study was deemed necessary as the impact of the RBIDZ 1F development was determined to be limited as there are limited farming activities taking place in close proximity to the site and the area is zoned as industrial.

10.3 Geohydrology

According to the *Assessment of Anticipated Geohydrological Conditions for the Proposed RBIDZ 1F* (Engeolab, October 2014), below the redistributed Quaternary sandy and clayey soils that blanket the study area, tertiary or cretaceous sediments comprising of siltstone or sandstone or marine glauconitic siltsone and concretionary horizons may be expected. This formation has been incised by alluvial processes which have resulted in paleochannels which can have a large impact on the hydrology. Further, there is a predominantly primary (unconfined) aquifer with high sand and clay content that is generally less than 30 m in thickness in the area.

In terms of the groundwater quality results, with the exception of the iron (Fe) and manganese (Mn) concentrations, all other samples analysed during the geohydrological study were classified as ambient and representative of the natural, background water quality. The Fe and Mn concentrations in the majority of samples were very high and above drinking or ambient standards. This was attributed to the industrial processes in the area.

According to the Engeolab report (2014), there should be no groundwater extraction in the Richards Bay area since private boreholes are prohibited by municipal by-laws. However it was noted that some industries do extract groundwater as a precaution against contamination. Review of the borehole database records indicated that the majority of boreholes were either observation or monitoring boreholes with no existing data reflecting production or domestic supply boreholes.

No production boreholes or extraction boreholes were discovered on the proposed RBIDZ 1F site during the geohydrological study. Only one monitoring borehole was found on the south-western corner of the site which was believed to belong to the neighbouring property.

Potential groundwater impacts associated with development of the proposed chlor-alkali plant will be assessed as a specialist study to inform the EIA report and a Water Quality Monitoring Plan will be developed (refer to **Chapter 15**).

10.4 Wetlands and Watercourses

The following detailed wetland studies were incorporated into the RBIDZ 1F EIA:

- *Environmental Risk Assessment of RBIDZ 1A-F: Wetland Assessment Report* (Sivest, August 2010).
- *Updated Wetland Functionality and Health Assessment Report for RBIDZ 1F* (Mullins, September 2013).
- *Wetland Mitigation Plan for RBISZ 1F* (Royal Haskoning DHV, July 2016).
- *Wetland Environmental Management Plan for RBIDZ 1F* (Royal Haskoning DHV, July 2016).

The EAC site falls within the (former) Usutu to Mhlathuze Water Management Area and quaternary drainage region W12F. The closest major drainage feature is the Nsezi River, which is located some 3 km north-west of the EAC site. Much of the hydrology of the area is linked with the shallow water table of the coastal plain. Wetlands in the area tend to be an expression of the groundwater /soil surface interface.

Wetland systems were identified on the north-western and eastern portions of RBIDZ 1F. The wetland areas were classified into three (3) distinct wetland hydro-geomorphic units. Wetland A is located in the north-western portion of RBIDZ 1F (refer to **Figure 6-4**) and comprises a large permanent inundated pan linked to surrounding fringe areas of seasonal and temporary inundation. Wetland B was delineated in the central-eastern portion of RBIDZ 1F and Wetland C was identified along the eastern boundary. Wetlands B and C were separated by a sizable artificial drain that had been excavated down the entire length of RBIDZ 1F and both wetland units were classed as predominantly seasonal and temporary in hydrological status.

Based on comments received from the relevant regulating authorities, the approved development option for RBIDZ 1F involves:

- Conservation and rehabilitation of Wetland A, located to the north-west of the EAC site. This has been achieved by means of excluding Wetland A and a 30 m wide buffer zone from the developable area, repositioning the proposed railway line outside of the core wetland and buffer areas and ensuring ongoing rehabilitation through the removal of invasive alien plant species and solid waste.
- The rehabilitation and utilisation of the lower portions of Wetlands B and C, situated to the south-east of the EAC site, for the purpose of improving the quality of water leaving the RBIDZ 1F property.

In accordance with the above approved plans, the majority of Wetlands B and C are in the process of being in-filled as part of the development footprint during the construction of the RBIDZ 1F services.

The specialist studies undertaken for RBIDZ 1F confirmed that there are no wetlands located within the EAC site. The closest wetland is Wetland A and associated buffer area, located adjacent to the north-west boundary of the EAC site.

The current surface water runoff from the EAC site flows mainly in an easterly direction into the existing stormwater channel that traverses the eastern boundary of the site. The stormwater channel extends past the Richards Bay Alloys (formerly Tata Steel) property, through other industrial complexes and ultimately drains into a stream.

Potential surface water impacts associated with development of the proposed chlor-alkali plant will be assessed as a specialist study to inform the EIA report and a Stormwater Management Plan and Water Quality Monitoring Plan will be prepared (refer to **Chapter 15**).

10.5 Flora

An ecological assessment was undertaken for the EIA for RBIDZ 1F and the following specialist report was prepared: *Ecological Assessment Report for the Proposed Installation of Bulk Infrastructure Services at RBIDZ 1F* (Nemai Consulting, July 2015). This section provides a summary of the results of the flora assessment as applicable to the proposed EAC development.

Even prior to the installation of the bulk infrastructure services at RBIDZ 1F, most of the RBIDZ 1F had already been transformed, largely due to informal dumping of rubble and domestic refuse, human presence and numerous foot paths.

The KwaZulu-Natal Provincial Biodiversity Plan provides a spatial representation of land and coastal marine area that is required to ensure the persistence and conservation of biodiversity within the province. According to the Critical Biodiversity Areas map, the EAC project area falls within R0 (Critical Biodiversity Area 3 Optimal). Areas designated as 'Optimal' are areas that are the most optimal solution to meet the required biodiversity conservation targets while avoiding high cost areas as much as possible.

The EAC site falls into the Indian Ocean Coastal Belt Biome with the original vegetation type classed as Maputaland Wooded Grassland. The Critically Endangered Kwambonambi Hygrophilous Grasslands was listed as the only terrestrial threatened ecosystem which was recorded in the western portion of the RBIDZ 1F i.e. in the vicinity of the EAC site.

Anthropogenic activities such as footpaths, littering and habitat fragmentation were already prevalent within the RBIDZ 1F study area prior to installation of the services infrastructure. At the time of the field surveys undertaken as part of the ecological assessment in March 2014 and January 2015, few patches of natural grasslands were still in existence.

The grassland community found across the EAC development footprint was dominated by species of *Themeda, Eragrostis, Aristida* and *Digitaria*. A number of herbs, especially *Asteraceae* were also found. Woody species were present in this community and were often dominated by exotics such as *Conyzabonariensis, Eucalyptus spp* and encroached by species such as *Dichrostachyscinerea.*

No protected plant species or orange data listed species were recorded within the EAC site.

Alien invasive plant species within the RBIDZ 1F study area were observed to occur in clumps, scattered distributions or as single individuals on site. Species such as *Chromolaenaodorata, Lantana camara,* and *Daturastramonium* (all Category 1) were common in the study area.

10.6 Fauna

Faunal data was obtained during field surveys undertaken by Nemai Consulting in March 2014 and January 2015 as part of the ecological assessment for RBIDZ 1F.

As most parts of the study area had already been significantly transformed at the time of the field surveys, the actual faunal species recorded on site were substantially reduced from the lists of species that could potentially occur in the area, based on literature review. All species recorded were common and of no conservation importance in the area. No Red Data animal species were recorded.

A summary of the results of the faunal assessment is provided in the sub-sections below in terms of:

- Mammals.
- Avifauna.
- Reptiles.
- Amphibians.

10.6.1 Mammals

Habitat transformation, together with elevated human presence and impacts such as disturbance, hunting and persecution, has negatively impacted on large mammal occurrence. **Table 10-1** lists all mammals recorded during the site surveys.

Table 10-1 Mammals recorded within RBIDZ 1F during 2014-15

Order	Scientific Name	English Name	Status
Lagomorpha	*Lepus saxatilis*	Scrub Hare	Least concern
Muridae	*Mus musculus*	Common House Mouse	Least concern
Muridae	*Rattus rattus*	House Rat	Least concern
Artiodactyla	*Sylvicapra grimmia*	Grey /Common Duiker	Least concern

Source: Ecological Assessment Report for RBIDZ 1F (Nemai Consulting, July 2015)

The four mammal species recorded were common and of no conservation importance in the area, which was expected due to the high levels of habitat transformation evident in the study area, associated with urban development.

10.6.2 Avifauna

The study area did not contain or form part of any Important Bird Area. These are areas that are considered to be of critical importance for the conservation of avifauna. Sixteen (16) bird species (**Table 10-2**) were recorded during the field survey. Species recorded were common and of no conservation importance.

Table 10-2 Bird species recorded within RBIDZ 1F during 2014-15

Species number	Common name	Scientific name
71	Cattle Egret	*Bubulus ibis*
94	Hadeda Ibis	*Bostrychia hagedash*
258	Blacksmith Lapwing (Plover)	*Vanellus armatus*
349	Rock Pigeon	*Columba guinea*
352	Red-eyed Dove	*Streptopelia semitorquata*
355	Laughing Dove	*Streptopelia senegalensis*
548	Pied Crow	*Corvus albus*
568	Red-eyed Bulbul	*Pycnonotus nigricans*
732	Common Fiscal (Shrike)	*Lanius collaris*
758	Common (Indian) Myna	*Acridotheres zeylonus*
801	House Sparrow	*Passer domesticus*
814	Southern Masked-Weaver	*Ploceus velatus*
824	Southern Red Bishop	*Euplectes orix*
826	Yellow-crowned Bishop	*Euplectes afer*
832	Long-tailed Widowbird	*Euplectes progne*
846	Common Waxbill	*Estrilda astrild*

Source: Ecological Assessment Report for RBIDZ 1F (Nemai Consulting, July 2015)

10.6.3 Reptiles

Increased habitat modification and transformation as well as increased human presence and associated disturbances (illegal reptile collecting, indiscriminate killing of snake species, frequent fires), coupled with increased habitat destruction and disturbances on the neighbouring properties, are all causal factors in the alteration and disappearance of reptile diversity in the area. **Table 10-3** indicates three reptile species recorded on site during the field survey.

Table 10-3 Reptiles recorded within RBIDZ 1F during 2014-15

Genus	Species	Subspecies	Common Name
Agama	*aculeata*	*distanti*	Distant's Ground Agama
Lygodactylus	*capensis*	*capensis*	Common Dwarf Gecko
Acanthocercus	*atricollis*	*atricollis*	Southern Tree Agama

Source: Ecological Assessment Report for RBIDZ 1F (Nemai Consulting, July 2015)

10.6.4 Amphibians

Frogs are useful environmental bio-monitors (bio-indicators) and may act as an early warning system for the quality of the environment. According to the 2014 Frog Atlas of Southern African, the Spotted Shovel-nosed Frog and Natal Leaf-folding Frog are red data frog species which are known to occur in the region of RBIDZ 1F.

The drainage channel and wetlands within RBIDZ 1F hold water and are probably important breeding habitat for most of the frog species which occur within the site. Only two frog species, neither if which are protected, were recorded on site during the survey (**Table 10-4**).

Table 10-4 Amphibian species recorded within RBIDZ 1F during 2014-15

Genus	Species	Common name
Amietophrynus	*gutturalis*	Guttural Toad
Kassina	*senegalensis*	Bubbling Kassina

Source: Ecological Assessment Report for RBIDZ 1F (Nemai Consulting, July 2015)

10.7 Climate

Richards Bay has a humid subtropical climate. Summers are warm and wet whilst the winter period is mild and moist to dry.

The average temperature for the year in Richards Bay is 21.9°C. The warmest month, on average, is January with an average temperature of 25.3°C. The coolest month on average is June, with an average temperature of 17.9°C. The average amount of precipitation for the year in Richards Bay is 1 176 millimetres (mm). The month with the most precipitation on average is January with 165.1 mm of precipitation. The month with the least precipitation on average is June with an average of 55.9 mm. There are an average of 114.6 days of precipitation, with the most precipitation occurring in November with 13.4 days and the least precipitation occurring in June with 5.8 days (www.weatherbase.com).

The prevailing winds in the region are north-easterly and south-westerly. 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. Wind speeds range from gentle (< 2 m/s) to strong (> 8 m/s), with the strongest winds originating from the south-westerly sector.

10.8 Air Quality

Richards Bay constitutes one of the highly industrialised areas in the country, consisting of various types of industries including smelters, pulp and paper mills, chemicals, the harbour, iron, steel, fertiliser, coal exporters, mineral mining, forestry, cement, blasting, sugar cane and the expanding RBIDZ. In relatively close proximity to the industrial areas are residential areas, both rural and urban, in which various domestic activities are conducted, including the burning of wood and tyres, imbawula (coal stoves) and small-scale agricultural activities (uMhlathuze Local Municipality Integrated Development Plan, May 2017).

The main sources of air pollution within the area are industries and vehicle emissions with other sources include biomass burning, agricultural activities and mining operations (King Cetshwayo District Municipality IDP 2017/18 - 2021/22).

uMhlathuze Municipality operates three (3) ambient monitoring stations located at eSikhaleni, Arboretum and Brackenham Cemetery.

The pollutants currently measured by these stations include:

- Sulfur dioxide (SO_2).
- Nitrogen dioxide (NO_2).
- Particulate matter with an aerodynamic diameter of less than 10 microns (PM_{10}).
- Particulate matter less than 2.5 microns ($PM_{2.5}$).
- Ozone (O_3).

The monitoring stations also continuously monitor meteorological data, including: wind direction and speed, temperature, relative humidity and rainfall.

The Richards Bay Clean Air Association (RBCAA) has also established a real time monitoring network consisting of nine stations in the Richards Bay area that monitor meteorology as well as:

- SO_2.
- Total reduced sulfur (TRS).
- PM_{10}.

Detailed complaint records are maintained, updated and distributed to the RBCAA's complaints mailing list on a weekly basis. Monthly air quality reports are prepared summarising the meteorology, SO_2, TRS and PM_{10} monitoring results.

EAC is required to comply with relevant local, national and international air quality standards and regulations and to obtain an air emissions licence (AEL). The AEL will provide conditions to ensure that any potential negative air quality impacts associated with the proposed plant are mitigated.

An Air Quality Impact Assessment (AQIA) will be undertaken to inform the EIA Report and the AEL application. The AQIA will assess the potential air quality impacts associated with the proposed plant, including the potential cumulative impact on the air quality in the area (refer to **Chapter 15**).

10.9 Noise

Noise levels in the study area are currently generated mostly by vehicular traffic and surrounding industries. Noise impact may result during the construction phase such as the operation of machinery and equipment, as well as construction vehicle traffic noise. During operation, the chlor-alkali plant has been designed to ensure that noise levels do not exceed a maximum of 85 decibels (dB) at 1 m from operating machinery. The construction and operational phases of the proposed EAC development are expected to have a low cumulative impact on the noise levels in the surrounding area. On-going noise monitoring to ensure compliance with legislated requirements will be included in the EMPr.

10.10 Visual Landscape

As the site is surrounded mainly by other industries and vacant land, the aesthetic character of the landscape is not anticipated to be significantly impacted by the proposed development. During the construction phase, the inadequate storage of material, equipment and waste may result in a potential visual impact. In terms of the operational phase, photographs of similar plants and typical plant layouts are shown in **Chapter 6.** A visual impact assessment specialist study to assess potential visual impacts associated with the plant will be undertaken to inform the EIA report and management and mitigation measures, if required, will be included in the EMPr (refer to **Chapter 15**).

10.11 Heritage

A cultural heritage impact assessment was undertaken to inform the EIA for RBIDZ 1F. The study included a desktop study and ground survey of the entire RBIDZ 1F footprint area. The results are documented in the report: *Cultural Heritage Impact Assessment of RBIDZ 1F* (Active Heritage, January 2015) and the relevant findings are summarised below.

The Richards Bay area has been relatively well surveyed for heritage sites and the available evidence is captured in the Amafa aKwaZulu-Natali and KwaZulu-Natal Museum heritage site inventories. The greater Richards Bay area contains a wide spectrum of archaeological sites covering different time-periods and cultural traditions ranging from Early Stone Age to Later Iron Age sites. A large percentage of the more recently recorded sites occur along the dune cordon associated with the coastline, while further inland in the coastal plain, within which the site is located, known archaeological sites are rare. The study area does not form part of any known cultural landscape.

At the time of the ground survey, the RBIDZ 1F footprint was covered by remnant grassland and some woody vegetation. There was evidence of some disturbance of the topsoil but none of these disturbed areas were associated with heritage sites. Archaeological visibility was compromised by dense vegetation cover in parts of the site. Nevertheless, previous archaeological surveys in similar areas of the greater Richards Bay area also located no heritage sites. No man-made structures or other anthropogenic features older than sixty years were identified.

As such, the cultural heritage specialist study concluded that no heritage sites were in any danger of being destroyed or altered during development of RBIDZ 1F.

10.12 Existing Infrastructure and Services

Installation of the necessary infrastructural services to make the RBIDZ 1F attractive to potential investors is currently underway including:

- Water mains.
- Stormwater infrastructure.
- Sewer infrastructure.
- Internal electrical infrastructure.
- Internal roads.
- Other infrastructure such as the entrance gate complex and ICT infrastructure.

These are further described in relation to the EAC proposed development in the sub-sections below.

10.12.1 Water

The following existing water services occur at the RBIDZ 1F:

- The two (2) Mandlazini twenty (20) megalitre (Ml) bulk water storage reservoirs are located north of the RBIDZ 1F.
- A 800 millimetre (mm) diameter bulk water gravity distribution main from the reservoirs to the service area on the western boundary of RBIDZ 1F.
- A 600 mm diameter bulk water gravity distribution main from the reservoirs to the service area on the eastern boundary of RBIDZ 1F.
- The RBIDZ 1F will be connected to the water mains via 2.7 km of water pipelines which are currently under construction, with diameters ranging from 150 to 450 mm and a throughput of 94.3 litres per second (l/s) for domestic use and 100 l/s for fire water.
- The proposed plant will connect to the existing RBIDZ 1F water pipelines supplying the EAC site.

10.12.2 Stormwater

Approximately 2.3 km of stormwater pipeline, ranging from 450 to 1 800 mm in diameter, is currently being constructed across RBIDZ 1F. The distribution of stormwater across the RBIDZ 1F will be primarily by means of stormwater channels and culverts. Each road stormwater manhole is being provided with an attenuation chamber which will attenuate the concentrated flow. The chamber will provide for both stormwater attenuation and act as a silt trap. Erosion protection is being provided at all discharge points (RHDHV, 2015).

On-site attenuation for individual developments within the RBIDZ 1F will be enforced through the building code of the RBIDZ 1F. EAC is responsible for constructing an attenuation area on site that will tie into the existing stormwater infrastructure. A Stormwater Management Plan will be prepared for the EAC site and the stormwater management measures stipulated will inform the EMPr for the project.

10.12.3 Sanitation

There are existing collector sewers, including eastern and western collector sewers, which have a capacity of 60 l/s and 30 l/s respectively. New link sewers on the southern boundary of the RBIDZ 1F are currently being constructed.

Approximately 2.8 km of sewer line, with a diameter ranging from 160 to 315 mm, is currently under construction across the RBIDZ 1F. The throughput of these pipelines will be between 30 and 60 l/s. The whole of the RBIDZ 1F development can be drained under gravity. Connections to each erven is being provided so that 100% of the erf area is drained at a nominal slope of 1:100 across the diagonal, with pipe cover of 500 mm at the top end of the erf. At least one 150 mm diameter connection has been provided at each stand. Maximum spacing of manholes is 150 m (Endecon Ubuntu Ltd, 2013).

10.12.4 Electricity

In order to cater for the RBIDZ 1F development, a 132 kilovolt (kV) backbone network was extended to the Phoenix and Indus Substations. Electrical services in the form of 11 kV lines are currently being installed at RBIDZ 1F.

10.12.5 Railway

The existing railway infrastructure and railway servitudes to the west of the site will be utilised. The establishment of a railway link between the RBIDZ Phase 1F and the existing railway infrastructure is subject to a separate EIA process.

10.12.6 Roads

The project site has two important arterial roads in close proximity to it. These are the R619 situated close to the north-east boundary of the RBIDZ 1F and the R34 John Ross Parkway that is the conduit to the N2 highway between Durban and Richards Bay. Access to the RBIDZ 1F is via Alumina Allee which traverses through the Alton North industrial area and which comprises of one lane in each direction with no turning refuge lanes. A new road, designed for industrial purposes is being constructed to provide access to each bordering stand within the RBIDZ 1F, including the EAC site.

A traffic impact assessment was undertaken for the development of the RBIDZ 1F (SMEC, October 2013). As the phasing of the development was unknown at the time of the study, the worst-case scenario was assessed to determine the impact of traffic generated by the proposed RBIDZ 1F. The study took into consideration the external road network in the immediate vicinity of the proposed RBIDZ 1F, as well the site access. A growth factor of 3.5% per annum was applied to the existing traffic volumes to obtain future background traffic volumes, plus development generated traffic volumes.

The analysis indicated that although a majority of the existing road network was operating below capacity, specific sections require infrastructure upgrades to increase capacity as well as ensure road users safety. It was recommended that development of the RBIDZ 1F should be undertaken in conjunction with certain specified improvements in the external road network and intersections on the R619 and Alumina Allee. As the development will be phased, provision for an associated phasing in of the required road infrastructure was recommended.

A traffic study will be undertaken for the proposed EAC development to inform the EIA report (refer to **Chapter 15**).

10.12.7 Marine Outfall

RBIDZ SOC would be responsible for providing the connection from Phase 1F to the A-line sea outfall pipeline which is owned and operated by Mhlathuze Water.

The A-line discharges buoyant effluent (while the B- and C-lines discharge dense effluent in the form of gypsum slurry from Foskor). The A-line extends about 4.7 km offshore and discharges the buoyant effluent at a depth of about 25 – 28 m through ports on an approximately 640 m long diffusor section. The average daily flow through the A-line is currently approximately 210 000 m^3, which includes about 40 000 m^3 of seawater added to dilute the effluent. The bulk of this flow comprises effluent generated by Mondi Ltd paper mill in Richards Bay, with other industrial sources including the MPACT packing mill in Felixton (about 20 km south-west of Richards Bay), the two aluminium smelters (Hillside and Bayside Aluminium) and the Foskor Limited fertiliser and phosphoric acid plant in Richards Bay. Relatively small volumes of sanitary effluent are also discharged through the A-line from the macerators.

10.13 Socio-economic Environment

The Port of Richards Bay is one of the largest and busiest ports in Africa, creating a driver for the area to be one of the major industrial investment opportunities. The Port plays an important economic role not only for KwaZulu-Natal but for the whole of South Africa.

Richards Bay also functions as a district node and commercial centre within the King Cetshwayo District, providing greater economic opportunities for the hinterland. A key feature of uMhlathuze Municipality is the N2 Development Corridor: the eThekwini-Ilembe-uMhlathuze Corridor. The Dube Trade Port and King Shaka Airport are approximately 145 km from Richards Bay.

The area is the third most important area in KwaZulu-Natal in terms of economic production and primary manufacturing and is also rich in mineral resources. These minerals meet all of South Africa's

demand for titanium dioxide, zircon and almost all of the country's pig iron requirements. Most of the industrial and commercial activities are vested in Richards Bay, Empangeni and Felixton (specifically the industrial development nodes of the City of uMhlathuze). The manufacturing sector employs the majority of population.

uMhlathuze's economy has the following main economic sectors:

- Manufacturing.
- Community Services/ Social.
- Trade.
- Financial/ Real Estate/ Business.
- Agriculture/ Forestry/ Fishing.
- Construction.
- Transport/ Communication.
- Mining/ Quarrying.

Key issues that relate to the economy are as follows:

- High unemployment.
- High poverty.
- Little diversity in the economy.
- Declining resource base and the impacts of climate change.

Even though the economic performance of the local area is good, unemployment remains high and the number of dependants per person employed is estimated at around 6. Individual monthly income is, on average, higher in Richards Bay than in Empangeni, eNseleni or eSikhaleni.

The advent of the RBIDZ serves to boost economic activity and to attract international investors wishing to take advantage of opportunities on offer. Potential job opportunities could be created during the construction and operational phases of the proposed development, as well as indirect economic opportunities.

A socio-economic impact assessment specialist study will be undertaken to inform the EIA report (refer to **Chapter 15**).

11 Public Participation Process

This chapter meets the requirements of Item 2.(1)(g)(ii) in Appendix 2 of GN 326, by providing details of the public participation process to be undertaken in terms of Regulation 41 of the Amendments to the 2014 EIA Regulations (GN 326, 07 April 2017) and will include copies of the supporting documents and inputs.

The purpose of the public participation process is to ensure that the issues, inputs and concerns of interested and affected parties (I&APs) are taken into account during the decision-making process. This requires the identification of I&APs (including authorities, technical specialists and the public), communication of the process and findings to these I&APs and the facilitation of their input and comment on the process and environmental impacts, including issues and alternatives that are to be investigated.

A successful public participation process is one that is inclusive, actively engages the public and provides ample opportunity for the public to participate in the application process.

SRK has taken cognisance of the requirements for public participation in terms of the EIA Regulations (GN 326, 07 April 2017) and the Guideline on Public Participation in the EIA Process (GN 807, 10 October 2012) and will strived to ensure that the public participation principles are upheld. Refer to **Table 11-1,** which outlines how the public participation undertaken for this project will meet the requirements of Chapter 6 of the 2014 EIA Regulations.

Activities to be undertaken as part of the public participation process are described in the sub-sections below.

11.1 Provincial Authorities Pre-Application Meeting

A pre-application meeting was held on 08 December 2017 with the EDTEA. The purpose of the meeting was to introduce the project and the proposed EIA process and it was confirmed that EDTEA is the competent authority for the EIA application in terms of the EIA Regulations.

11.2 Identification of Interested and Affected Parties

Existing I&AP databases will be reviewed and merged to create a comprehensive database of relevant authorities and key stakeholders in the area. Key stakeholders include: commenting authorities, the local and district municipality, ward councillors, local ratepayers and environmental associations, RBIDZ 1F and adjacent landowners and occupiers.

The I&AP database will be updated on a regular basis during the course of the public participation process as additional I&APs are identified.

11.3 Project Announcement

11.3.1 Newspaper Advertisement

An advertisement will be placed in the Zululand Observer to notify the broader public of the project and the availability of the DSR for review and comment. The notice will provide details for I&APs to register, obtain further information and provide comment.

11.3.2 Public Notices

Public notices in the form of A2-size colour laminated posters will be placed in locations conspicuous to and accessible by the public at the entrance to RBIDZ 1F and in nearby additional locations in highly frequented public areas.

11.3.3 Letters to Key Stakeholders and Authorities

Relevant authorities, officials and key stakeholders will be sent notification letters inviting them to register, providing notification of the availability of the DSR and inviting submission of comments.

11.4 Distribution of Reports for Comment

11.4.1 Draft Reports

The draft versions of the Scoping Report (i.e. this report) and the EIA Report will be distributed to the relevant authorities and key I&APs.

Hard copies of the draft reports will be distributed as follows for review and comment:

- Richards Bay Main Community Library.
- EDTEA.
- DWS.
- uMhlathuze Local Municipality.
- King Cetshwayo District Municipality.
- KwaZulu-Natal Department of Transport.
- KwaZulu-Natal Department of Health.

Digital copies of the draft reports will be made available on the SRK website and emailed to I&APs on request.

All registered I&APs and relevant authorities will be notified via written correspondence of the availability of the draft reports for review and comment, and provided with a period of 30 days to submit comments.

Meetings will be held with I&APs when and if the need arises.

11.4.2 Revised Reports

All comments received on the draft reports will be incorporated into revised/ final reports, which will be submitted to EDTEA and will be made available on the SRK website for review by commenting authorities and I&APs. All relevant authorities and registered I&APs will be notified of the availability of the final reports for further comment for a period of 30 days. Comments received on final reports will be submitted directly to EDTEA for inclusion in the decision-making process.

11.5 Decision Notification

In accordance with section 4(2) of the EIA Regulations, all registered I&APs will be notified in writing within 14 days of the decision date and the appeal process.

Table 11-1 Requirements for Public Participation

Public Participation Requirements in terms of Chapter 6 of the Amended 2014 EIA Regulations (Regulations 39 - 44) (GN 326, 07 April 2017)		EAC Chlor-alkali EIA Public Participation Process
39. Activity on land owned by person other than proponent		
(1)	If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.	The project site consists of Erf 16672 and Erf 17456 with the RBIDZ 1F. The current registered landowner is uMhlathuze Municipality. The Landowner Owner Consent Form has been signed by Ms. Nontsundu Ndonga, uMhlathuze Deputy Municipal Manager - City Development and attached to the EIA application form, as required.
(2)	Subregulation (1) does not apply in respect of- (a) linear activities; (b) activities constituting or activities directly related to prospecting or exploration of a mineral and petroleum resource or extraction and primary processing of a mineral or petroleum resource; and (c) strategic integrated projects as contemplated in the Infrastructure Development Act, 2014.	
40. Purpose of public participation		
(1)	The public participation process to which the- (a) basic assessment report and EMPr, and where applicable the closure plan, submitted in terms of regulation 19; and (b) scoping report submitted in terms of regulation 21 and the environmental impact assessment report and EMPr submitted in terms of regulation 23; was subjected to must give all potential or registered interested and affected parties, including the competent authority, a period of at least 30 days to submit comments on each of the basic assessment report, EMPr, scoping report and environmental impact assessment report, and where applicable the closure plan, as well as the report contemplated in regulation 32, if such reports or plans are submitted at different times.	Potential I&APs and relevant authorities will be notified of the application and the availability of the DSR for review and comment via a newspaper advert, posters and notification letters; and will be provided with a comment period of 30 days to register and submit comments on the DSR. All registered I&APs and the relevant authorities will also be provided with a period of 30 days to submit comments on the Draft EIA Report (DEIAR).
(2)	The public participation process contemplated in this regulation must provide access to all information that reasonably has or may have the potential to influence any decision with regard to an application unless access to that information is protected by law and must include consultation with- (a) the competent authority; (b) every State department that administers a law relating to a matter affecting the environment relevant to an application for an environmental authorisation; (c) all organs of state which have jurisdiction in respect of the activity to which the application relates; and (d) all potential, or, where relevant, registered interested and affected parties.	The following consultation has taken place / is planned to occur: (a) Pre-application meeting with EDTEA on 08 December 2017. (b) Hard copies of the DSR will be sent to EDTEA, DWS, uMhlathuze Municipality, King Cetshwayo District Municipality, KZN Department of Transport and KZN Department of Health. (c) Potential I&APs including adjacent neighbours, the ward councillor and local ratepayer and environmental organisations. SRK will endeavour to ensure that access is being provided to all information that SRK is aware of, that reasonably has or may have the potential to influence any decision with regard to this application.

Public Participation Requirements in terms of Chapter 6 of the Amended 2014 EIA Regulations (Regulations 39 - 44) (GN 326, 07 April 2017)		EAC Chlor-alkali EIA Public Participation Process
(3)	Potential or registered interested and affected parties, including the competent authority, may be provided with an opportunity to comment on reports and plans contemplated in subregulation (1) prior to submission of an application but must be provided with an opportunity to comment on such reports once an application has been submitted to the competent authority.	Potential I&APs and relevant authorities will be provided with an opportunity to comment on the DSR and the DEIAR.
41. Public participation process		
(1)	This regulation only applies in instances where adherence to the provisions of this regulation is specifically required.	This regulation does specifically apply to the applications – refer below.
(2)	The person conducting a public participation process must take into account any relevant guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of an application or proposed application which is subjected to public participation by- (a) fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of- (i) the site where the activity to which the application or proposed application relates is or is to be undertaken; and (ii) any alternative site; (b) giving written notice, in any of the manners provided for in section 470 of the Act, to- (i) the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (ii) owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (iii) the municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area; the municipality which has jurisdiction in the area; (v) any organ of state having jurisdiction in respect of any aspect of the activity; and (vi) any other party as required by the competent authority; (c) placing an advertisement in- (i) one local newspaper; or (ii) any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations; (d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this	The DEA (2012*) IEM Guideline Series 7: Public Participation in the EIA Process* will be taken into account during this process. (a) Notice will be given to potential I&APs of the application by fixing notice boards at key locations near the site. (b) Written notice will be provided to- (i) RBIDZ 1F SOC. (ii) Adjacent landowners. (iii) The local ratepayers association and the relevant ward councillor. (iv) uMhlathuze Municipality and King Cetshwayo District Municipality. (v) Organs of state: EDTEA, DWS, KZN Department of Transport, KZN Department of Health, SAHRA and EKZNW. (vi) Other key parties: Local environmental organisations such as the Richards Bay Clean Air Association (RBCAA). (c) An advertisement will be placed in the Zululand Observer. (d) The activity will not have an environmental impact that extends beyond the boundaries of the district municipality in which it will be undertaken. (e) Assistance will be provided if required.

Public Participation Requirements in terms of Chapter 6 of the Amended 2014 EIA Regulations (Regulations 39 - 44) (GN 326, 07 April 2017)		EAC Chlor-alkali EIA Public Participation Process
	paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii);and (e) using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to- (i) illiteracy; (ii) disability; or (iii) any other disadvantage.	
(3)	A notice, notice board or advertisement referred.to in subregulation (2) must- (a) give details of the application or proposed application which is subjected to public participation; and (b) state- (i) whether basic assessment or S&EIR procedures are being applied to the application; (ii) the nature and location of the activity to which the application relates; (iii) where further information on the application or proposed application can be obtained; and (iv) the manner in which and the person to whom representations in respect of the application or proposed application may be made.	The notices, notice boards and advertisement will: (a) Provide a description of the applications, including the applicant and the nature and location of the activity. (b) State that a S&EIR process is being applied to the application. (c) Provide contact details (names, postal addresses, phone, fax, email and website address) where further information on the applications can be obtained and representations in respect of the applications may be made.
(4)	A notice board referred to in subregulation (2) must- (a) be of a size of at least 60cm by 42cm; and (b) display the required information in lettering and in a format as may be determined by the competent authority.	The notice boards will be - (a) A2-size and laminated. (b) Displayed the required information.
(5)	Where public participation is conducted in terms of this regulation for an application or proposed application, subregulation (2)(a), (b), (c) and (d) need not be complied with again during the additional public participation process contemplated in regulations 19(1)(b) or 23(1)(b) or the public participation process contemplated in regulation 21(2)(d), on condition that- (a) such process has been preceded by a public participation process which included compliance with subregulation (2)(a), (b), (c) and (d); and (b) written notice is given to registered interested and affected parties regarding where the- (i) revised basic assessment report or, EMPr or closure plan, as contemplated in regulation 19(1)(b); (ii) revised environmental impact assessment report or EMPr as contemplated in regulation 23(1)(b); or	Written notice will be given to registered I&APs when the revised final Scoping Report and EIA Report are available for download from SRK's website and digital copies will be available on request from SRK. The notice will include the contact details, the manner in which representations on the revised documents may be made and a period of 30 days will be provided for the submission of representations.

Public Participation Requirements in terms of Chapter 6 of the Amended 2014 EIA Regulations (Regulations 39 - 44) (GN 326, 07 April 2017)		EAC Chlor-alkali EIA Public Participation Process
	(iii) environmental impact assessment report and EMPr as contemplated in regulation 21(2)(d); may be obtained, the manner in which and the person to whom representations on these reports or plans may be made and the date on which such representations are due.	
(6)	When complying with this regulation, the person conducting the public participation process must ensure that- (a) information containing all relevant facts in respect of the application or proposed application is made available to potential interested and affected parties; and (b) participation by potential or registered interested and affected parties is facilitated in such a manner that all potential or registered interested and affected parties are provided with a reasonable opportunity to comment on the application or proposed application.	SRK will strive to ensure all information which contains relevant facts in respect of the application and of which SRK is aware, will be made available to I&APs and participation by I&APs is facilitated in such a manner that all potential I&APs are provided with a reasonable opportunity to comment on the application.
(7)	Where an environmental authorisation is required in terms of these Regulations and an authorisation, permit or licence is required in terms of a specific environmental management Act, the public participation process contemplated in this Chapter may be combined with any public participation processes prescribed in terms of a specific environmental management Act, on condition that all relevant authorities agree to such combination of processes.	The EIA process is being undertaken in parallel to the application for an AEL and a MHI risk assessment, and the public participation process for these processes will be combined.
42. Register of interested and affected parties		
(1)	A proponent or applicant must ensure the opening and maintenance of a register of interested and affected parties and submit such a register to the competent authority, which register must contain the names, contact details and addresses of- (a) all persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP; (b) all persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and (c) all organs of state which have jurisdiction in respect of the activity to which the application relates.	A register of I&APs will be opened and will be maintained and updated. The I&AP Register will contain the names, contact details and email addresses of all relevant organs of state and all persons who requested to be registered or who submitted written comments or attended meetings in respect of the application.
43. Registered interested and affected parties entitled to comment on reports and plans		
(1)	A registered interested and affected party is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.	All registered I&APs will be provided with an opportunity to comment on the DSR and Draft EIA Report and will be provided further opportunity to comment on the revised/ final documents. Potential I&APs will be requested to complete a Registration and Comment Form which requests disclosure of their interests in the applications in terms of Regulation 43(1). All comments received will be included in a Comments and Responses Table.

Public Participation Requirements in terms of Chapter 6 of the Amended 2014 EIA Regulations (Regulations 39 - 44) (GN 326, 07 April 2017)		EAC Chlor-alkali EIA Public Participation Process
(2)	In order to give effect to section 240 of the Act, any State department that administers a law relating to a matter affecting the environment must be requested, subject to regulation 7(2), to comment within 30 days.	All relevant state departments will be requested by the EAP to comment on the reports within 30 days.
44. Comments of interested and affected parties to be recorded in reports and plans		
(1)	The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.	All comments of I&APs will be recorded in a Comments and Responses Table and written comments, including responses to such comments and records of meetings will be attached to the final report.
(2)	Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to- (a) a lack of skills to read or write; (b) disability; or (c) any other disadvantage; reasonable alternative methods of recording comments must be provided for.	This will be undertaken if required.

12 Issues

This chapter meets the requirements of Item 2.(1)(g)(iii) in Appendix 2 of GN 326, by providing a summary of the issues raised by interested and affected parties (I&APs) and an indication of the manner in which the issues will be incorporated, or the reasons for not including them.

Potential issues which may be raised by I&APs during the public participation process are:

- Health and safety – risks associated with the use, storage, production and transport of chemicals classified as hazardous substances or dangerous goods i.e. toxic and flammable gases and corrosive substances with potential health and safety effects in the event of an accidental release.
- Air quality – the release of atmospheric emissions.
- Water – potential surface and groundwater contamination.
- Socio-economic – the social and economic benefits associated with the project.
- Traffic – potential increase in traffic associated with the project.
- Visual – aesthetic impact on the visual landscape.
- Noise – potential increase in ambient noise associated with operation of the chlor-alkali plant.
- Biodiversity – potential loss of biodiversity in terms flora, fauna and wetlands.
- Heritage – potential loss of cultural heritage resources during construction.
- Soils – potential impacts to soils and change in land capability.
- Services – provision of the required services to the site.

This list of issues will be updated after distribution of the DSR and receipt of comments from I&APs.

Refer to **Chapter 14** for the preliminary assessment undertaken and an indication of the manner in which the issues will be incorporated in the EIA Report or the reasons for not including them.

13 Assessment Methodology

This chapter meets the requirements of Item 2.(1)(g)(vi) in Appendix 2 of GN 326, by providing the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives.

The methodology to be utilised to assess and rank each of the potential environmental impacts and risks identified has been formulated to comply with the scope of assessment and content of EIA Reports as specified in Appendix 3 of the Amended 2014 EIA Regulations (refer to item 3(j) of Appendix 3 in Government Notice R326).

The required scope of assessment is provided in the box below:

> 3. An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include –
> ……
> (j) an assessment of each identified potentially significant impact and risk, including –
> (i) cumulative impacts;
> (ii) the nature, significance and consequences of the impact and risk;
> (iii) the extent and duration of the impact and risk;
> (iv) the probability of the impact and risk occurring;
> (v) the degree to which the impact and risk can be reversed;
> (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and
> (vii) the degree to which the impact and risk can be avoided, managed or mitigated;
> ……

In line with the requirements outlined in the box above, each potentially significant impact /risk identified must be assessed in terms of the following:

- **Nature** (description): will the impact have a positive or negative outcome on the biophysical and/or social environment?
- **Extent** (spatial scale): will the impact affect the national, regional or local environment, or only that of the site?
- **Duration** (temporal scale): how long will the impact last?
- **Magnitude** (severity): will the impact be of high, moderate or low severity?
- **Probability** (likelihood of occurring): how likely is it that the impact may occur?

The impact assessment is to be based on sound validated scientific information and professional judgement in the context of the specific project and site conditions.

To enable a scientific approach for the determination of the environmental consequence and significance (importance) of each identified potential impact, a numerical value must be linked to each factor. The ranking scales below are applicable.

Ranking Scales:

Occurrence	**Duration:**	**Probability:**
	5 – Permanent	5 – Definite/don't know
	4 - Long-term (ceases with the operational life)	4 – Highly probable
	3 - Medium-term (5-15 years)	3 – Medium probability
	2 - Short-term (0-5 years)	2 – Low probability
	1 – Immediate	1 – Improbable
		0 – None
Severity	**Extent/scale:**	**Magnitude:**
	5 – International	10 - Very high/uncertain
	4 – National	8 – High
	3 – Regional	6 – Moderate
	2 – Local	4 – Low
	1 – Site only	2 – Minor

Each potential impact identified must be ranked in terms of the above ranking scales and the environmental consequence and significance of each impact calculated using the following formula:

Risk = Consequence x Probability
Consequence = Duration + Extent + Magnitude
Significance = (Duration + Extent + Magnitude) x Probability

The environmental significance of each identified potential impact must then be rated as follows:

Significance Rating	Score
High	> 60 – 100
Moderate	30 – 60
Low	< 30 - 0

Each potential impact must also be rated in terms of the following:

Reversibility:

In order to assess the degree to which the potential impact can be managed and /or mitigated, each impact is to be assessed twice, as follows:

- Firstly, the potential impact is to be assessed and rated prior to implementing any mitigation and management measures.
- Secondly, the potential impact is to be assessed and rated after the proposed mitigation and management measures have been implemented.

The purpose of this dual rating of the impact is to enable comparison of the pre- and post- mitigation significance ratings and to calculate the percentage change, which indicates the degree to which the impact may be avoided, managed, mitigated and /or reversed.

Irreplaceable Loss:

In order to assess the degree to which the potential impact could cause irreplaceable Loss of Resources (LoR), one of the following classes (%) is to be selected based on the specialist's informed decision:

5	100% - permanent loss
4	75% - 99% - significant loss
3	50% - 74% - moderate loss
2	25% - 49% - minor loss
1	0% - 24% - limited loss

The Loss of Resources aspect should not affect the overall significance rating of the impact.

Cumulative Impacts:

Impacts cannot be assessed in isolation. An integrated approach to impact assessment requires that cumulative impacts be included in the assessment of individual impacts. Cumulative impacts must therefore be assessed de facto. A brief description of the cumulative nature of each impact will be provided.

14 Preliminary Assessment

This chapter meets the requirements of Item 2.(1)(g): (vii), (v), (viii), (ix) and (xi) in Appendix 2 of GN 326 relating to the potential impacts and risks which have informed the identification of the preferred alternatives.

An indication of the manner in which the potential issues identified in **Chapter 12** will be incorporated into the EIA Report is provided in **Table 14-1.**

Table 14-1 Issues and Impacts

Potential Issues	Response
Noise	The project will be located in an industrial area and will be subject to noise monitoring in accordance with OHSA Regulations. Based on information from similar facilities, the facility is not regarded as a noise nuisance in the context of its environmental setting, namely in an industrial area.
Biodiversity	Various wetland and ecological studies were undertaken to inform the EMPr for the RBIDZ 1F which includes a wetland management plan for the wetlands within RBIDZ 1F. No wetlands or significant ecological resources were identified on the EAC site.
Heritage	A heritage impact assessment was undertaken for RBIDZ 1F and no cultural heritage resources were identified within the EAC site.
Soils	Land capability and agricultural potential was assessed as part of the EIA for RBIDZ 1F and it was confirmed that the site is suitable for industrial development. A geotechnical assessment has been undertaken for the project.
Services	Most of the required services (water, electricity, sewer, stormwater, roads, rail) have already been supplied to site. Evaluation of the alternative options of disposal of the industrial liquid effluent either via sewer or marine outfall pipeline is being undertaken as part of Feasibility Study and will inform the EIA Report. RBIDZ SOC will be responsible for the pipeline connecting RBIDZ 1F to the A-line sea outfall.
Specialist Studies to be undertaken during the Assessment Phase	
Health and safety	Health and safety risk assessment.
Air Quality	Air quality impact assessment.
Water	Surface and groundwater impact assessment.
Socio-economic	Socio-economic impact assessment.
Traffic	Traffic impact assessment.
Visual	Visual impact assessment.

Table 14-2 provides a concluding statement indicating the preferred alternatives.

Table 14-2 Preferred Alternatives

Alternatives	Preferred Option
Technology	Membrane electrolysis cell technology.
Power supply	Energy mix of municipal electrical and hydrogen fuel cell.
Desalination	Salt to be purchased from commercial sources.
Site location	Erf 16672 and Erf 17456 with the RBIDZ 1F.
Layout	Refer to **Figure 6-4.** Alternative layouts may be recommended by specialists.
Effluent disposal	Sewer or sea outfall – to be determined in the EIA Report.
No-go	To be assessed in the EIA Report.

15 Plan of Study for EIA

In accordance with Item 2.(1)(g) in Appendix 2 of GN 326, this chapter provides a plan of study for the EIA process to be undertaken, including—

(i) A description of the alternatives to be considered and assessed within the preferred site, including the option of not proceeding with the activity.

The following alternatives are to be assessed during the EIA:

- The preferred location alternative on Erf 16672 and Erf 17456 with the RBIDZ 1F (refer to **Figure 1-1**, **Figure 5-1** and **Figure 6-4**).
- Potential layout alternatives as recommended by specialists.
- The No-go option.
- Disposal of the industrial liquid effluent via either municipal sewer or via the Mhlathuze Water A-line sea outfall pipeline.

(ii) A description of the aspects to be assessed as part of the environmental impact assessment process.

The following aspects will be assessed during the EIA:

- Health and safety risk.
- Air quality.
- Water resources.
- Socio-economic.
- Traffic.
- Visual.
- Noise.
- Biodiversity.
- Heritage.
- Soils.
- Services.

(iii) Aspects to be assessed by specialists.

The following aspects will be assessed by specialists:

- Health and safety risk.
- Air quality.
- Water resources.
- Socio-economic.
- Traffic.
- Visual.

(iv) A description of the proposed method of assessing the environmental aspects, including aspects to be assessed by specialists.

Refer to **Chapter 13** for a description of the proposed assessment methodology.

The proposed scope of work for the specialist studies is provided below.

Health and Safety Risk Assessment:

The health and safety risk assessment specialist study will be undertaken by Riscom (Pty) Ltd and will include the following:

1) Review of preliminary designs of proposed processing units, inventories, routing and transport conditions for all alternatives.
2) Development of accidental spill and fire scenarios for the facility. Incident scenarios and emission rates will be calculated for chlorine, hydrogen and hydrochloric acid for both individual and societal risk.
3) Using generic failure rate data (for tanks, pumps, valves, flanges, pipework, gantry, couplings and so forth), determination of the probability of each accident scenario.
4) For each incident developed in Step 3, determination of consequences (such as thermal radiation, domino effects, toxic-cloud formation and so forth).
5) For scenarios with off-site consequences (greater than 1% fatality off-site), calculation of maximum individual risk, taking into account all generic failure rates, initiating events (such as ignition), meteorological conditions and lethality.
6) Identification of any shortcomings and ranking of risks for possible risk reduction programmes.

Air Quality Impact Assessment:

The AQIA specialist study will be undertaken by SRK and will include the following:

1) A detailed analysis of existing air quality monitoring data for the Richards Bay area.
2) Prepare meteorological data for inclusion in a suitable atmospheric dispersion model.
3) Prepare an emissions inventory, using calculated measurements, to include all potential emissions such as:
   - Chlorine (Cl_2).
   - Hydrogen chloride (HCl).
   - Hydrogen (H_2).
   - Particulate matter (PM).
   - Sulfur dioxide (SO_2).
4) Simulate dispersion of stack emissions and calculate ground level concentrations for various averaging periods, including hourly, daily and annual averages.
5) Prepare a comprehensive report to include the following:
   - A summary of all baseline monitoring results.
   - A list of assumptions and limitations.
   - Emissions inventory.
   - Model input parameter description.
   - Discussion of model results, with specific reference to the motivation for the AEL.
   - Provide recommendations for monitoring and management /mitigation plans.

Surface and Groundwater Impact Assessment:

The surface and groundwater impact assessment specialist study will be undertaken by SRK and will include the following:

1) Review of the existing geotechnical, geohydrological and hydrological information for the site.
2) Describe the surface and groundwater regime for the proposed plant location.
3) Identify and assess potential impacts associated with the construction and operation of the proposed facility in terms of the quantity and quality of surface and groundwater resources, including potential increase in peak surface water flow and potential contamination from salts, heavy metals, caustic soda and hydrochloric acid.
4) Management and mitigation measures, including a Stormwater Management Plan and a Water Quality Monitoring Plan for the site.

Socio-economic Impact Assessment:

The socio-economic impact assessment specialist study will be undertaken by Graham Muller and Associates and will include the following:

1) Define the socio-economic impact study area:
   - Describe the development site.
   - Research factors impacting on the economy in the area.
2) Describe the socio-economic characteristics of the impact area:
   - Profile the demographic and economic characteristics of the area.
   - Review planning and Local Economic Development Frameworks, including spatial development and economic development plans, as well as planned and proposed development projects.
3) Identify and assess the potential significant social and economic impacts associated with the project.
4) Recommend practicable mitigation measures to avoid and/ or minimise/ reduce impacts and enhance benefits.
5) Address, as required, further social issues raised by stakeholders during the stakeholder engagement process.

Traffic Impact Assessment:

The site traffic impact assessment specialist study will be undertaken by Aurecon Group and will include the following:

1) Review available literature including the SMEC 2013 traffic impact assessment, site visit and identification of data requirements, including the commissioning of a traffic count at the access intersection, observing public transport, road safety and pedestrian flows along the road or roads passing the proposed access intersection (these will be visual assessments).
2) Liaise with the project team, local officials and the relevant road authorities if required.
3) Identify any existing road infrastructure, road safety or public transport related issues on the road or roads from which access will be taken for this development.
4) Assess the traffic likely to be generated by the proposed development during construction and during full operations and analyse the access intersection to establish the geometric layout required based on forecast traffic flows in accordance with the manual.
5) Assess whether any site-specific pedestrian, public transport or road safety interventions are required for this development for both construction and full operations.

6) Assess the road condition at the access to identify whether any rehabilitation is required by the municipality.
7) Liaise with the municipal and road authority officials if need required.
8) Prepare a report including layout drawings in the required format.

Visual Impact Assessment:

The visual impact assessment specialist study will be undertaken by SRK and will include the following:

9) Base data collection.
10) Visual baseline assessment:
    - The visual character of the area and sense of place.
    - The visual exposure of the area to the development.
    - The distance of visual receptors from the development.
    - The visual absorption capacity of the landscape to reduce visual intrusion from the development.
    - The landscape's compatibility with the development.
    - The sensitivity of potential visual receptors.
11) Development of spatial models:
    - A binary viewshed.
    - A visibility viewshed.
    - A fuzzy viewshed.
12) Visual impact assessment.
13) Management and mitigation measures.

(v) A description of the proposed method of assessing duration and significance.

Refer to **Chapter 13** for a description of the proposed assessment methodology, including the proposed method of assessing duration and significance.

(vi) An indication of the stages at which the competent authority will be consulted.

The stages at which EDTEA will be consulted are:

- Pre-application meeting – held on 08 December 2017.
- Consultation during the comment period on the Draft Scoping Report.
- Consultation during the comment period on the Draft EIA Report.

(vii) Particulars of the public participation process that will be conducted during the environmental impact assessment process.

Refer to **Chapter 11** for the particulars of the public participation process during the EIA process.

(viii) A description of the tasks that will be undertaken as part of the environmental impact assessment process.

The following tasks will be undertaken as part of the EIA process:

- Undertake the following specialist studies:
  - Health and safety risk assessment.
  - Air quality impact assessment.
  - Surface and groundwater impact assessment.
  - Socio-economic impact assessment.
  - Traffic impact assessment.
  - Visual impact assessment.
- Prepare the Draft EIA Report and Draft EMPr.
- Distribute the Draft EIA Report and Draft EMPr for review and comment.
- Notify registered I&APs of the availability of the Draft EIA Report and Draft EMPr for review and comment.
- Undertake consultation with I&APs as required.
- Prepare a Comments and Responses Table for inclusion in the Final EIA Report.
- Finalise the EIA Report and EMPr based on the comments received.
- Submit the Final EIA Report and EMPr to EDTEA for a decision on the application.
- Notify registered I&APs of the availability of the final report for review and comment.
- Notify I&APs of EDTEA's decision and the appeal process.

(ix) Identify suitable measures to avoid, reverse, mitigate or manage identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

Suitable management and mitigation measures will be identified during the EIA and included in the EMPr.

16 EAP Affirmation

In accordance with Items 2.(1)(i) and 2.(1)(j) in Appendix 2 of GN 326, this chapter provides an undertaking under oath or affirmation by the EAP in relation to—

(i) The correctness of the information provided in the report.

(ii) The inclusion of comments and inputs from stakeholders and interested and affected parties.

(iii) Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.

(iv) The level of agreement between the EAP and interested and affected parties on the plan of study for undertaking the environmental impact assessment.

17 Other Requirements

In accordance with Items 2.(1)(k) and 2.(1)(l) and Item 2.(2) in Appendix 2 of GN 326, this chapter provides:

(i) Where applicable, any specific information required by the competent authority.

(ii) Any other matter required in terms of section 24(4)(a) and (b) of the Act.

(iii) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a scoping report, the requirements as indicated in such notice will apply.

No additional requirements have been identified.

18 Conclusions and Recommendations

Based on the investigations undertaken during Scoping, SRK is of the opinion that the proposed activity is not in conflict with any prohibition contained in legislation. Furthermore, the Scoping Report complies substantially with Appendix 2 of Government Notice 362 (07 April 2017) and all identified applicable protocols and minimum information requirements and the applicant is willing and able to ensure compliance with these requirements within the prescribed timeframe.

SRK therefore recommends that the Scoping Report be accepted, with or without conditions, and that the applicant be allowed to continue with the tasks contemplated in the Plan of Study.

Prepared by

Kirsten King *CEAPSA*

Principal Environmental Scientist

Reviewed by

Wouter Jordaan *Pr.Sci.Nat*

Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Appendices

Appendix A: EAP CV

Kirsten King

Principal Environmental Scientist

Profession	Environmental Scientist
Education	B.Soc.Sci. (Hons), Environmental Science, Natal, 1995
Registrations/ Affiliations	Certified Environmental Assessment Practitioner (EAP) with the Interim Certification Board for Environmental Assessment Practitioners, South Africa
	International Qualification, Environmental Auditing, Aspects International, 2012
	Member, International Association for Impact Assessment South Africa (IAIAsa)

Specialisation

Environmental assessment and management; environmental monitoring and auditing; environmental screening and planning; integrated waste, water and atmospheric emissions licencing and management; environmental management for mining, industry and state enterprises

Expertise

Kirsten King has been involved in the field of environmental science for the past 22 years. Her expertise includes:

- environmental process management;
- environmental impact assessment;
- environmental management programmes;
- environmental monitoring and auditing;
- environmental screening and planning;
- integrated environmental application management;
- waste, water and atmospheric emissions licencing;
- environmental management for mining, industrial and state enterprises;
- stakeholder engagement;
- environmental legislation.

Employment

2012 - present	SRK Consulting (Pty) Ltd, Principal Environmental Scientist, Durban
2003 - 2012	SRK Consulting (Pty) Ltd, Senior Environmental Scientist, Pietermaritzburg
1999 - 2003	UWP Consulting, Senior Environmental Scientist / GIS Specialist, Pietermaritzburg
1997 - 1998	Walmsley Environmental Consultants, Environmental Scientist, Johannesburg
1995 - 1997	Human Sciences Research Council, Chief GIS Analyst, Durban

Languages

English – read, write, speak (Excellent)
Afrikaans – read, write, speak (Fair)

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	Democratic Republic of Congo
Project duration & year:	6 months – 2017
Client:	Kamoto Copper Company
Name of the Project:	KCC Environmental Impact Study (EIS)
Project Description:	Update of the EIS, including environmental management plan for the project, for the KCC operation in Kolwezi in the DRC
Job Titles and Duties:	Project Coordinator and Reporting

Location:	Umbogintwini, Durban
Project duration & year:	3 months – 2017
Client:	AECI
Name of Project:	Stakeholder Engagement Protocol for the Umbogintwini Industrial Complex
Project Description:	Stakeholder Engagement Protocol
Job Title and Duties:	Project Manager and Reviewer

Location:	Richards Bay, KwaZulu-Natal
Project duration & year:	2017-18
Client:	Elegant Afro Chemicals
Name of Project:	Proposed Development of a Chlor-Alkali Plant at Richards Bay Industrial Development Zone
Project Description:	Environmental Impact Assessment and Application for Environmental Licences
Job Title and Duties:	Environmental Assessment Practitioner

Location:	Mtubatuba, KwaZulu-Natal
Project duration & year:	Annual audits 2015 – 17
Client:	Umfolozi Sugar Mill
Name of Project:	Filter Cake Ash Temporary Storage Facility
Project Description:	Operational environmental auditing in terms of the Waste Management Licence
Job Title and Duties:	Project Reviewer

Location:	Pietermaritzburg
Project duration & year:	3 months - 2017
Client:	Msunduzi Municipality
Name of Project:	Development of Hollingwood Cemetery
Project Description:	Application for a Water Use Licence
Job Title and Duties:	Reporting

Location:	Mpola, Durban
Project duration & year:	3 months – 2017
Client:	eThekwini Municipality
Name of Project:	Mpola Phase 3 Bulk Services Infrastructure Installation
Project Description:	Water Use Licence Application
Job Title and Duties:	Reporting

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	Pinetown
Project duration & year:	3 months – 2017
Client:	eThekwini Metropolitan Municipality
Name of Project:	Application for Amendment of the Environmental Authorisation for the Upgrade of the Bulk Sewer Infrastructure in the Dassenhoek Area Informal Settlement
Project Description:	Application for Amendment of Environmental Authorisation
Job Title and Duties:	Environmental Assessment Practitioner - client and authority liaison, report compilation and review, public participation.

Location:	Pietermaritzburg
Project duration & year:	3 months – 2017
Client:	Msunduzi Municipality
Name of Project:	Water Use Licence Application
Project Description:	Application for a Water Use Licence for the Hollingwood Cemetery
Job Title and Duties:	Senior Environmental Scientist - management and review of specialist studies, report compilation, public participation.

Location:	Mtunzini, near Richards Bay
Project duration & year:	1 year – 2016
Client:	Tronox
Name of Project:	Environmental Applications for the proposed Everglades Residue Storage Facility at Tronox Fairbreeze Mine
Project Description:	Environmental Impact Assessment, Integrated Water, Waste & Air Applications
Job Title and Duties:	Project Manager - site visits, client and authority liaison, management and review of specialist studies, report compilation and review, public participation, budget management & invoicing, etc.

Location:	Phalaborwa, Limpopo
Project duration & year:	1 year – 2016
Client:	Palabora Copper
Name of Project:	Environmental applications for the proposed Copper Smelter Retrofit at Palabora Copper Mine
Project Description:	Application for Postponement of the Minimum Emission Standards in terms of the National Environmental Management Air Quality Act and application for Environmental Authorisation in terms of a Basic Assessment and Environmental Management Programme submitted to the Department of Mineral Resources
Job Title and Duties:	Project Manager - proposal, site visits, client and authority liaison, management and review of specialist air quality study, report compilation, public participation, budget management & invoicing, etc.

Location:	Umbogintwini, Durban
Project duration & year:	2 years – 2016-17
Client:	AECI
Name of Project:	Remediation of Contaminated Sites within the Umbogintwini Industrial Complex
Project Description:	Environmental Management Programmes & Plans for various sites
Job Title and Duties:	Senior Environmental Scientist – review of proposal, site visits, review of specialist contamination report, client liaison, compilation and review of programmes and plans.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	Lubombo, Northern KZN
Project duration & year:	1 year – 2014/2015
Client:	Gumede Rural Development
Name of Project:	Proposed New Quarry in Lebombo
Project Description:	Preparation of an Environmental Management Plan in terms of the mining permit application to the Department of Mineral Resources and an application for Environmental Authorisation in terms of a Basic Assessment process to the KZN Department of Environmental Affairs
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, report compilation and review, management of specialists, public involvement, budget management & invoicing, database management.

Location:	Richards Bay area
Project duration & year:	2 year – 2014 – 2015
Client:	Phangela Projects
Name of Project:	Proposed New Storage Tank Farm in the Richards Bay Area
Project Description:	Environmental Screening & Environmental Advice and Input
Job Title and Duties:	Senior Environmental Scientist - proposal, client & authority liaison, site visits, report compilation, legal review, project team environmental advice and input.

Location:	Isipingo, Durban
Project duration & year:	2 years - 2014 - 2015
Client:	eThekwini Municipality
Name of Project:	Environmental Control Officer for the upgrade of the Stormwater Management System along Rana Road/R103 in Isipingo, Durban
Project Description:	ECO for construction audits in terms of the Environmental Authorisation
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, public involvement, report review, compliance monitoring, budget management & invoicing, database management.

Location:	Mseleni, Northern KZN
Project duration & year:	1 year – 2014
Client:	Gumede Rural Development
Name of Project:	Proposed New Fuel Depot in Mseleni
Project Description:	Preparation of an Environmental Management Programme for the Proposed New Fuel Depot in Mseleni
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, report review, closure and rehabilitation estimates, budget management & invoicing, database management.

Location:	Edendale, Pietermaritzburg
Project duration & year:	1 year – 2014
Client:	Msunduzi Municipality
Name of Project:	Environmental Impact Assessment of the Existing Sinathing Cemetery
Project Description:	Compilation of an EIA Report to investigate, evaluate and assess the impacts of the existing Sinathing Cemetery on the environment in terms of a compliance notice issued by KwaZulu-Natal Department of Environmental Affairs
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, public involvement, management of specialists, review of specialist studies, report compilation, compliance monitoring, budget management & invoicing, database management.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	Edendale, Pietermaritzburg
Project duration & year:	1 year – 2014
Client:	Msunduzi Municipality
Name of Project:	Environmental Impact Assessment of the Existing Azalea Cemetery
Project Description:	Compilation of an EIA Report to investigate, evaluate and assess the impacts of the existing Azalea Cemetery on the environment in terms of a compliance notice issued by KwaZulu-Natal Department of Environmental Affairs
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, public involvement, management of specialists, review of specialist studies, report compilation, compliance monitoring, budget management & invoicing, database management.
Location:	La Mercy, Durban
Project duration & year:	4 months – 2014
Client:	Airports Company South Africa
Name of Project:	Integrated Water and Waste Management Plan for King Shaka International Airport
Project Description:	Compilation of an Integrated Water and Waste Management Plan for King Shaka International Airport
Job Title and Duties:	Project Manager, Senior Environmental Scientist - client & authority liaison, report compilation, budget management & invoicing, database management.
Location:	Durban Harbour
Project duration & year:	1 year – 2013
Client:	Transnet
Name of Project:	Upgrade of the Fire Fighting System in Durban Harbour
Project Description:	Identification of Environmental Potential Impacts and Legal Requirements for the proposed upgrade of the firefighting system in Durban Harbour
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, report preparation, legal review, budget management & invoicing, database management.
Location:	Pietermaritzburg
Project duration & year:	2 years – 2012 - 2013
Client:	Msunduzi Municipality
Name of Project:	Msunduzi Municipality Environmental Management Framework (EMF)
Project Description:	Preparation of the Msunduzi EMF
Job Title and Duties:	Project Manager & Senior Environmental Scientist – proposal, client liaison, research, specialist appointment & review of specialist studies, report writing, public involvement.
Location:	Cato Ridge, Durban
Project duration & year:	1 year - 2013
Client:	Safal Steel
Name of Project:	Environmental Control Officer
Project Description:	Preparation of Operational EMPr, Waste Management Plan & facilitating Environmental Forum Meetings
Job Title and Duties:	Senior Environmental Scientist – proposal, client liaison, site visits & audits, document review, waste license application, client & forum meetings.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	Durban
Project duration & year:	1 year – 2013
Client:	Transnet
Name of Project:	Durban Rail in Port Project
Project Description:	Identification of suitable land for the construction and operation of new railway sidings.
Job Title and Duties:	Senior Environmental Scientist – site visits, data collection & analysis, environmental screening & ranking of sites, reporting.
Location:	Ndumo, KZN
Project duration & year:	1 month – 2013
Client:	Henwood & Nxumalo Consulting Engineers
Name of Project:	Operational Waste Management Plan for Ndumo School of Excellence
Project Description:	Preparation of the WMP
Job Title and Duties:	Project Manager & Senior Environmental Scientist – proposal, client liaison, data collection & analysis, meetings, reporting, budgeting & invoicing.
Location:	Cato Ridge, Durban
Project duration & year:	On-going - 2012 - current
Client:	Assmang Limited
Name of Project:	Environmental Assessment Practitioner and Environmental Control Officer for various operational projects at Assmang Manganese Cato Ridge Works, e.g: New & Historical Slag Disposal Facilities, New Dust & Slimes Disposal Facility, Upgrade of the Stormwater System, Fugitive Fume & Dust Control Project, New Briquetting Plant, Hazardous Waste Activities, Stormwater Treatment Plant
Project Description:	EAP for compilation of Operational EMPrs & ECO for operational audits in terms of WML & EAs
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, public involvement, report writing, compliance monitoring, budget management & invoicing, database management.
Location:	Ingwe Municipality
Project duration & year:	1 year – 2012/2013
Client:	Ingwe Municipality
Name of Project:	Integrated Waste Management Plan
Project Description:	Preparation of the IWMP
Job Title and Duties:	Project Manager & Senior Environmental Scientist – proposal review, client liaison, site visits, report review, public involvement, budgeting & invoicing.
Location:	Empangeni
Project duration & year:	2 years – 2012/2013
Client:	Greenville Renewable Projects
Name of Project:	Construction & Operation of a Waste Recycling and Recovery Centre
Project Description:	EIA & EMPr for construction & operation of the facility
Job Title and Duties:	Project Manager & Senior Environmental Scientist – proposal review, client & authority liaison, site visits, public involvement, report review, meetings, budgeting & invoicing.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	Richards Bay
Project duration & year:	2 years – 2012/2013
Client:	Richards Bay Minerals
Name of Project:	Construction of a New Clarifier Tailings Facility
Project Description:	Amendment to EMPr & Water Use License Application
Job Title and Duties:	Senior Environmental Scientist – proposal review, client & authority liaison, site visits, public involvement, report writing, meetings.

Location:	Richards Bay
Project duration & year:	3 months – 2012
Client:	Rio Tinto / BHP Billiton
Name of Project:	Waste Audit & Licensing Requirements Project
Project Description:	Determine the waste licensing requirements for Hillside & Bayside Aluminium Smelters
Job Title and Duties:	Project Manager & Senior Environmental Scientist – proposal, client liaison, site visit, data collection & analysis, meetings & workshops, reporting, budgeting & invoicing.

Location:	KwaZulu-Natal
Project duration & year:	2 years – 2011-2013
Client:	KZN Department of Agriculture & Environmental Affairs
Name of Project:	KZN Hazardous Waste Management Plan
Project Description:	Preparation of the KZN HWMP
Job Title and Duties:	Project Manager & Senior Environmental Scientist – proposal, client liaison, data collection & analysis, meetings & workshops, reporting, public involvement, budgeting & invoicing.

Location:	uMvoti Municipality
Project duration & year:	1 year – 2011
Client:	uMvoti Municipality
Name of Project:	Integrated Waste Management Plan
Project Description:	Preparation of the IWMP
Job Title and Duties:	Project Manager & Senior Environmental Scientist – proposal, client liaison, data collection & analysis, GIS, site visits, reporting, public involvement, budgeting & invoicing.

Location:	Cato Ridge
Project duration & year:	2 years – 2009/2010
Client:	Cato Ridge Development Corporation
Name of Project:	Environmental Screening of CRDC landholdings
Project Description:	Preparation of an Environmental Screening Report & review & comments on various EIA applications in the area for the client
Job Title and Duties:	Project Manager & Senior Environmental Scientist – proposal, client & authority liaison, data collection & analysis, site visits, reporting, budgeting & invoicing.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	North West Province
Project duration & year:	1 year – 2008
Client:	Samancor
Name of Project:	Construction & Operation of the Samancor North West Greenfields Ferrochrome Smelter
Project Description:	EIA & EMP for the construction & operation of the Samancor North West Greenfield Ferrochrome Smelter
Job Title and Duties:	Environmental Scientist – site visit, research, report writing, public participation.
Location:	Mkondeni, Pietermaritzburg
Project duration & year:	1 year – 2008
Client:	Eskom Ltd
Name of Project:	Construction of a New Transformer Plinth, Oil Storage & Vehicle Parking in Mkondeni for Eskom
Project Description:	ECO environmental compliance monitoring & auditing during construction
Job Title and Duties:	Project Manager & Senior Environmental Scientist – proposal, EMPr, client liaison, public involvement, site visits, pre-construction audit, monthly audits during construction, site meetings, post-construction audit reporting, budget control & invoicing.
Location:	uBuhlebezwe Municipality
Project duration & year:	2 years – 2007/2008
Client:	uBuhlebezwe Municipality
Name of Project:	Identification & Development of a New Municipal Waste Disposal Facility in Ixopo
Project Description:	Site Identification & Ranking & EIA
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, public involvement, report writing, budget management & invoicing.
Location:	Richards Bay
Project duration & year:	2 years – 2007/2008
Client:	Alfluorco (Pty) Ltd
Name of Project:	New Fluorochemical Plant in Richards Bay
Project Description:	Site Identification & Ranking & EIA
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, public involvement, report writing, compliance monitoring, budget management & invoicing.
Location:	Pietermaritzburg
Project duration & year:	2 years – 2006/2008
Client:	Msunduzi Municipality
Name of Project:	Development of the Hollingwood Cemetery
Project Description:	Site Identification & Ranking, EIA, EMPr & ECO
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, public involvement, report writing, compliance monitoring, budget management & invoicing.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	Dannhauser Municipality
Project duration & year:	1 year - 2006
Client:	Eskom Distribution
Name of Project:	Proposed Ingangane-Craigside-Fort Mistake Suite of Electrification Projects
Project Description:	EIA & EMP for the identification of substation sites & powerline corridors
Job Title and Duties:	Senior Environmental Scientist – proposal, management & review.

Location:	Cato Ridge, Durban
Project duration & year:	7 years - 2005 - 2012
Client:	Assmang Limited
Name of Project:	Environmental Assessment Practitioner for various projects at Assmang Manganese Cato Ridge Works, including: Construction & Operation of 2 New Furnaces, New Slag Disposal Facility, New Dust & Slimes Disposal Facility, Rehabilitation of the Historical Dust Disposal Area, Upgrade of the Stormwater System, Fugitive Fume & Dust Control Project, New Effluent Treatment Plant, New Sewage Treatment Plant, Rehabilitation of Existing Sewage Treatment Plant, Upgrading of the Gas Scrubbing Plants for Furnaces 3, 4 & 6, New Briquetting Plant, Upgrade of the Existing Access Road, Construction of a New Heavy Vehicle Access Road, Decommissioning of the Hostel, Construction & Operation of the New Ore Export Facility, Strategic Environmental Assessment, Environmental Data Management System
Project Description:	EAP for EIAs, EMPrs, waste management licence applications & ECO for the construction, operation and /or decommissioning of the above projects
Job Title and Duties:	Project Manager, Senior Environmental Scientist - proposal, client & authority liaison, site visits, public involvement, report writing, compliance monitoring, budget management & invoicing, database management.

Location:	Cathkin/Mandabeni, Northern Drakensburg, KZN
Project duration & year:	2 years - 2005/2006
Client:	Eskom Distribution
Name of Project:	Proposed Cathkin-Mandabeni Suite of Electrification Projects
Project Description:	Powerline corridor & sub-station site identification, EIA & EMP for 3 separate EIA applications within the suite of projects
Job Title and Duties:	Project Manager, Senior Environmental Scientist & GIS Manager – proposal, client & authority liaison, site visits, public involvement, report writing, GIS analysis & mapping.

Location:	Wild Coast, Eastern Cape
Project duration & year:	1 year - 2005
Client:	Wilderness Foundation South Africa
Name of Project:	Wild Coast Conservation & Sustainable Development Project
Project Description:	Strategic Environmental Assessment for the Wild Coast
Job Title and Duties:	Senior Environmental Scientist & GIS Manager: client liaison, attending meetings & workshops, management of GIS, review.

Location:	Pietermaritzburg
Project duration & year:	1 year – 2005
Client:	Msunduzi Municipality
Name of Project:	Upgrade of Pietermaritzburg Powerlines
Project Description:	ECO environmental compliance monitoring & auditing
Job Title and Duties:	Project Manager & Senior Environmental Scientist - client liaison, attending site visits & meetings, review, budget management & invoicing.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	uMgungundlovu District Municipality
Project duration & year:	1 year – 2005
Client:	Isibongu siAfrica Development Planners
Name of Project:	Identification of Suitable Land for Housing in the uMgungundlovu District Municipality
Project Description:	Identification of land suitable for housing through the use of GIS and environmental screening
Job Title and Duties:	Senior Environmental Scientist – Project & GIS Manager, client liaison, proposal, data collection, database management & GIS analysis, negative mapping, ground-truthing, analysis, environmental screening, site ranking, reporting & mapping, budget management & invoicing.
Location:	Newcastle
Project duration & year:	1 year – 2005
Client:	Independent Power Corporation
Name of Project:	Proposed Replacement of coal-fired boilers with a gas-fired co-generation plant at the KarboChem Plant
Project Description:	EIA, EMP, ECO for the proposed construction & operation of the gas power plant
Job Title and Duties:	Senior Environmental Scientist – Proposal, client liaison, review.
Location:	Richards Bay
Project duration & year:	1 year – 2005
Client:	Afrox Oxygen Limited
Name of Project:	Replacement of the Air Separation Unit at Mondi Business Paper
Project Description:	EIA & EMP for the replacement of the air separation unit
Job Title and Duties:	Project Manager, Senior Environmental Scientist – proposal, client & authority liaison, site visits, public involvement, report writing.
Location:	Chase Valley, Pietermaritzburg
Project duration & year:	2 years – 2004/2005
Client:	KZN Department of Works
Name of Project:	Replacement of the existing Incinerator at the Allerton Veterinary Clinic
Project Description:	EIA, EMP, waste licence & atmospheric emissions applications & ECO for the construction phase.
Job Title and Duties:	Project Manager, Senior Environmental Scientist – proposal, client & authority liaison, site visits, public involvement, report writing, compliance monitoring, budget management & invoicing.
Location:	uMshwathi Municipality
Project duration & year:	1 year – 2004
Client:	iBhongo Civil Engineers
Name of Project:	Extension of the Cool Air Cemetery
Project Description:	EIA, EMP& ECO for the extension of the cemetery
Job Title and Duties:	Project Manager, Senior Environmental Scientist – proposal, client & authority liaison, site visits, public involvement, report writing, compliance monitoring, budget management & invoicing.
Location:	Pietermaritzburg
Project duration & year:	1 month - 2004
Client:	Creo Manufacturing
Name of Project:	Due Diligence Audit of a lithographic plate printing and chemical manufacturing facility
Project Description:	Due Diligence Audit & Report for Creo Manufacturing
Job Title and Duties:	Senior Environmental Scientist – site visit & audit, client liaison, proposal, reporting.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	uMgungundlovu District Municipality
Project duration & year:	6 months – 2004
Client:	uMgungundlovu District Municipality
Name of Project:	Integrated Waste Management Plan
Project Description:	Preparation of the 2nd Edition/Revision of the IWMP
Job Title and Duties:	Senior Environmental & GIS Specialist – proposal, client liaison, data collection & analysis, GIS, site visits, reporting, public involvement.

Location:	uMgungundlovu District Municipality
Project duration & year:	3 years: 2003/2006
Client:	uMgungundlovu District Municipality
Name of Project:	Implementation of the Integrated Cemeteries & Crematoria Plan for the uMgungundlovu District Municipality
Project Description:	Creation of detailed financial schedules, implementation of a multi-tariff system and death register, awareness and training programmes for operators, the Identification and Development of Additional Formal Cemetery Space within each of the 7 Local Municipalities.
Job Title and Duties:	Project Manager, Senior Environmental Scientist & GIS Manager - Implement Projects, Manage CMIP funding budget, undertake EIAs, EMPs & ECO work, arrange & facilitate Steering Committee meetings and public meetings in each of the 7 Local Municipalities, training, auditing, permit applications, managing specialists & liaison with engineers for design, tender & construction management.

Location:	uMgungundlovu District Municipality
Project duration & year:	3 years: 2003/2006
Client:	uMgungundlovu District Municipality
Name of Project:	Implementation of the Integrated Waste Management Plan for the uMgungundlovu District Municipality
Project Description:	The creation of a Waste Information System, Waste Minimisation Pilot Projects for Industry, Implementation of Waste Recycling Projects, Database Design & Maintenance & Recordkeeping, Capacity Building, Education & Awareness Training, Landfill Training for Operators, Landfill Auditing, Landfill Closure & Rehabilitation, the Identification & Development of New Waste Disposal Facilities and/or the Upgrade of Existing Facilities in each of the 7 Local Municipalities.
Job Title and Duties:	Project Manager, Senior Environmental Scientist & GIS Manager - Implement Projects, Manage CMIP funding budget, undertake EIAs, EMPs & ECO work, arrange & facilitate Steering Committee meetings and public meetings in each of the 7 Local Municipalities, training, auditing managing specialists & liaison with engineers for design, tender & construction management.

Location:	Underberg Himeville area, KZN
Project duration & year:	2 years – 2003/2004
Client:	KwaSani Municipality
Name of Project:	Identification & Development of a New Waste Disposal Facility & the Closure & Rehabilitation of the Existing Landfill & Incinerator Site
Project Description:	Site identification, EIA & EMP for New Site. Closure & Rehabilitation Plan for Existing Site
Job Title and Duties:	Senior Environmental & GIS Specialist – site visits & groundtruthing, GIS analysis, public involvement, report writing, public involvement, client liaison.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	Zululand District Municipality
Project duration & year:	1 year – 2003
Client:	Zululand District Municipality
Name of Project:	2 Regional Water Supply Schemes: Nkonjeni RWSS & Mandlakazi RWSS
Project Description:	EIA, EMP & ECO services for the construction & operation of the 2 RWSS
Job Title and Duties:	Senior Environmental & GIS Specialist – project management, site visits, research, report writing, public participation, GIS analysis & mapping, construction monitoring & auditing.

Location:	uThungulu District Municipality
Project duration & year:	1 year – 2003
Client:	uThungulu District Municipality
Name of Project:	5 Community Water Supply Schemes (CWSS): Ntembeni CWSS, Zigagayi CWSS, Ndlovu/Ntuli CWSS, Nteneshana/Mzimela CWSS & Kholweni CWSS
Project Description:	EIA, EMP & ECO services for the construction & operation of the 5 CWSS
Job Title and Duties:	Senior Environmental & GIS Specialist – project management, site visits, research, report writing, public participation, GIS analysis & mapping, construction monitoring & auditing.

Location:	uMlalazi Municipality
Project duration & year:	1 year – 2003
Client:	uMlalazi Municipality
Name of Project:	uMlalazi GIS Implementation & Training Project
Project Description:	Provision of GIS services & training
Job Title and Duties:	Senior GIS Specialist – data collection & verification, data creation & management, mapping, preparation for and undertaking training in terms of the GIS system.

Location:	Entumeni, KZN
Project duration & year:	1 year – 2003
Client:	KZN Department of Agriculture & Environmental Affairs
Name of Project:	Proposed Upgrading on the Infield Agricultural Roads for the Entumeni Small Cane Grower Development Project
Project Description:	EIA, EMP & ECO for the proposed upgrading of the agricultural roads
Job Title and Duties:	Senior Environmental & GIS Specialist – site visits, research, report writing, public participation, GIS analysis & mapping, construction monitoring & auditing.

Location:	KwaZulu-Natal
Project duration & year:	1 year – 2003
Client:	KZN Department of Agriculture & Environmental Affairs
Name of Project:	Formation of Livestock Associations & Rehabilitation of Communal Dip Tanks in KZN Project
Project Description:	Provision of GIS & database management services for management purposes
Job Title and Duties:	Senior GIS Specialist & Database Designer – data collection & verification, data creation & management, mapping, preparation for and undertaking training in terms of the GIS system.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	Eshowe & Nkandla areas
Project duration & year:	1 year – 2003
Client:	uMlalazi Municipality & KZN DoT
Name of Project:	Proposed Construction of 8 Low Level Vented Causeways in the Eshowe & Nkandla Areas
Project Description:	EIA, EMP & ECO for the proposed construction of 8 low level vented causeways in the Eshowe & Nkandla areas
Job Title and Duties:	Senior Environmental & GIS Specialist – site visits, research, report writing, public participation, GIS analysis & mapping, construction auditing.
Location:	Pietermaritzburg & Richards Bay
Project duration & year:	2 years – 2002/2003
Client:	ISCOR Heavy Minerals, FFS Refineries & the Pietermaritzburg Air Quality Forum
Name of Project:	Air Quality Monitoring & Analysis
Project Description:	Passive & real time monitoring of ambient dust, emissions, pollutants & dispersion conditions
Job Title and Duties:	Senior Environmental Scientist – site visit, setting up & maintaining monitoring equipment, analysis of results, report writing, meeting with client.
Location:	Hillcrest, KZN
Project duration & year:	1 year – 2002
Client:	Mr. S. Kedian
Name of Project:	Proposed Housing development on Erf 1193, Hillcrest
Project Description:	EIA & EMP for the proposed housing development
Job Title and Duties:	Senior Environmental Scientist – project management, site visit, research, report writing, public participation.
Location:	Northern Zululand
Project duration & year:	1 year – 2002
Client:	District Municipalities
Name of Project:	4 Water Supply Schemes (WSS): Nondabuya Phase 1 WSS, Dukuza WSS, Sindinsi WSS, Yanguye WSS
Project Description:	GIS services
Job Title and Duties:	Senior GIS Specialist – data collection & verification, data creation & management, data analysis & mapping.
Location:	Camperdown, KZN
Project duration & year:	6 months – 2002
Client:	KZN Department of Agriculture
Name of Project:	Camperdown Dip Tank Repair & Monitoring Project
Project Description:	GIS services for the repair & monitoring of dip tanks in the Camperdown area
Job Title and Duties:	Senior Environmental & GIS Specialist – data collection & verification, data creation & management, mapping, preparation for and undertaking training in terms of the GIS system.
Location:	Nondabuya, Zululand
Project duration & year:	1 year – 2002
Client:	Zululand District Municipality
Name of Project:	Nondabuya Phase 2 Community Water Supply Scheme
Project Description:	EIA, EMP & ECO services for the Nondabuya Water Scheme
Job Title and Duties:	Senior Environmental & GIS Scientist – project management, site visit, research, report writing, public participation, compliance monitoring & auditing.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	uMzinyathi District Municipality
Project duration & year:	1 year – 2001
Client:	uMzinyathi District Municipality
Name of Project:	Provision of GIS Specialist Services
Project Description:	Provision of GIS services for Integrated Development Planning
Job Title and Duties:	Senior GIS Specialist – data collection & verification, data creation & management, mapping, preparation for and undertaking training in terms of the GIS system.

Location:	KwaZulu-Natal
Project duration & year:	1 year – 2001
Client:	BDP KZN
Name of Project:	BDP KZN Services Condition & Customer Information Survey
Project Description:	GIS services for water & sewer reticulation planning & development
Job Title and Duties:	Senior GIS Specialist – data collection & verification, data creation & management, mapping, preparation for and undertaking training in terms of the GIS system.

Location:	Pietermaritzburg
Project duration & year:	1 year – 2001
Client:	Sappi, Mondi, UCL, NCT & CTC Forestry Companies
Name of Project:	Provision of GIS Specialist Services
Project Description:	Mapping and database creation for forestry units to aid forestry management
Job Title and Duties:	Senior GIS Specialist – site visits, data collection & formatting, mapping & database creation, data analysis, client meetings.

Location:	uMkhanyakude District Municipality
Project duration & year:	1 year – 2001
Client:	uMkhanyakude District Municipality
Name of Project:	Provision of GIS Specialist Services
Project Description:	Provision of GIS services for Integrated Development Planning
Job Title and Duties:	Senior GIS Specialist – data collection & verification, data creation & management, mapping, preparation for and undertaking training in terms of the GIS system.

Location:	Pietermaritzburg
Project duration & year:	6 months – 2000
Client:	KZN Department of Education
Name of Project:	GIS Training for Geography School Teachers
Project Description:	Providing GIS training to geography teachers in state schools within the Pietermaritzburg area
Job Title and Duties:	Senior GIS Specialist – preparation of a training manual & training sessions, undertaking training in terms of GIS.

Location:	North-East Region of KZN
Project duration & year:	6 months – 2000
Client:	KZN Department of Agriculture
Name of Project:	GIS Implementation & Training Project
Project Description:	Preparation of a GIS system & undertaking training for officials
Job Title and Duties:	Senior GIS Specialist – data collection & verification, data creation & management, mapping, preparation for and undertaking training in terms of the GIS system.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	uThungulu District Municipality
Project duration & year:	6 months - 2000
Client:	uThungulu District Municipality
Name of Project:	Implementation of a GIS System & GIS Training for the Municipality
Project Description:	Preparation of a GIS system & undertaking training for officials
Job Title and Duties:	Senior GIS Specialist – data collection & verification, data creation & management, mapping, preparation for and undertaking training in terms of the GIS system.

Location:	Northern KZN
Project duration & year:	3 years - 1999-2002
Client:	KZN Department of Transport
Name of Project:	Road Management for KZN Department of Transport Region 1
Project Description:	Undertaking management of road contracts for KZN DoT
Job Title and Duties:	Senior Environmental & GIS Specialist – site visits, report writing, GIS analysis & mapping, database management.

Location:	Zululand District Municipality
Project duration & year:	2 years – 1999/2000
Client:	Zululand District Municipality
Name of Project:	Development of an Integrated Planning Model (Dalisu) for the Zululand District Municipality
Project Description:	Development of a database/GIS programme to assist the Zululand District Municipality in terms of prioritisation & planning for social and environmental projects
Job Title and Duties:	Senior Environmental & GIS Specialist – client meetings & presentations, data collection, GIS analysis, database management, preparation of a programme manual.

Location:	Oranjemund, Namibia
Project duration & year:	1 year – 1998
Client:	Kudu Gas
Name of Project:	Proposed Gas Power Station in Oranjemund, Namibia
Project Description:	EIA & EMPr for the proposed gas power station in Oranjemund
Job Title and Duties:	Environmental Scientist – site visit, research, report writing, public participation.

Location:	Secunda
Project duration & year:	1 year – 1998
Client:	Sasol
Name of Project:	Proposed Extension to the Sasol Open Cast Mining Operation in Secunda
Project Description:	EIA & EMPr for the proposed extension to the Sasol open cast mining operation in Secunda
Job Title and Duties:	Environmental Scientist – site visit, research, report writing, public participation & socio-economic study.

Location:	KwaZulu-Natal
Project duration & year:	1 year – 1998
Client:	SAPREF
Name of Project:	Proposed Replacement of the Oil Pipeline along the KZN Coast
Project Description:	EIA & EMPr for the proposed replacement of the oil pipeline along the KZN coast
Job Title and Duties:	Environmental Scientist – research & report writing.

Kirsten King

Principal Environmental Scientist

Key Experience: Environmental Science

Location:	Chai, Mozambique
Project duration & year:	1 year – 1998
Client:	Chai Tourism
Name of Project:	Proposed Chai Tourism Resort, Mozambique
Project Description:	EIA & EMPr for the proposed Chai Tourism Resort in Mozambique
Job Title and Duties:	Environmental Scientist – research & report writing.
Location:	Berlin, East London
Project duration & year:	1 year – 1998
Client:	Sanachem
Name of Project:	Proposed Extension to the Sanachem Herbicide Factory in Berlin, East London
Project Description:	EIA & EMP for the proposed extension to the Sanachem herbicide factory, East London
Job Title and Duties:	Environmental Scientist – site visit, research, report writing, public participation.
Location:	Brits, North West Province
Project duration & year:	1 year – 1997
Client:	Vametco Vanadium Mines
Name of Project:	Proposed Extension to Vanadium Mining Operation, Brits
Project Description:	EIA & EMPr for the proposed extension to the Vametco vanadium mining operation in Brits
Job Title and Duties:	Environmental Scientist – site visit, research, report writing, public participation.
Location:	Namibia
Project duration & year:	1 year – 1997
Client:	Skorpion Zinc Mining
Name of Project:	Proposed Extension to Mining Operations for Skorpion Zinc Mine, Namibia
Project Description:	EIA & EMPr for the proposed extension to mining operations at Skorpion Zinc Mine
Job Title and Duties:	Environmental Scientist – site visit, research, report writing, public participation.
Location:	Assuenkehr, Namibia
Project duration & year:	1 year - 1997
Client:	Transhex International Diamond Mining
Name of Project:	Proposed Bulk Sample Test Diamond Mining in Assuenkehr, Namibia
Project Description:	EIA & EMPr for the bulk sample testing for diamond mining in Assuenkehr
Job Title and Duties:	Environmental Scientist – site visit, research, report writing, public participation.
Location:	Durban
Project duration & year:	2 years – 1996/1997
Client:	South African Police Services & The Centre for Social & Development Studies
Name of Project:	Indicator Analysis of Crime & Poverty in South Africa
Project Description:	Analysis of Crime & Poverty in South Africa
Job Title and Duties:	Chief GIS Analyst – assist researchers at the Human Science Research Centre to design their research methodology in order to incorporate GIS into their research, analysis & mapping of data & preparation of maps & plans for reports.

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