Environmental Impact Assessment of the Used Fuel Transient Interim Storage Facility at Koeberg Nuclear Power Station

Scoping Report

Report Prepared for

Order Reference Number: 4600057255

Report Number 478317/*04*

Project Location: Cape Farm Duynefontyn No. 1552

Report Prepared by

srk consulting

July **2016**

Environmental Impact Assessment of the Used Fuel Transient Interim Storage Facility at Koeberg Nuclear Power Station

Scoping Report

Eskom

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July **2016**

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Note:

This report was updated following the end of the comment period on the Draft Scoping Report (470715/03, dated March 2016) released during the Pre-Application Phase.

This Scoping Report is identical in most respects to the draft version. Changes made to the Scoping Report are underlined and italicised in this report for ease of reference.

EXECUTIVE SUMMARY: SCOPING REPORT ENVIRONMENTAL IMPACT ASSESSMENT OF THE USED FUEL TRANSIENT INTERIM STORAGE FACILITY AT KOEBERG NUCLEAR POWER STATION

July 2016 SRK Project Number: 478317

This Executive Summary is identical in most respects to the previous draft version. Changes made to the Executive Summary are underlined and italicised for ease of reference

1 INTRODUCTION

Eskom proposes to construct a Transient Interim Storage Facility (TISF) for the temporary storage of dry casks at the Koeberg Nuclear Power Station (KNPS) (Figure 1). These casks will store used nuclear fuel from the reactors of the power station.

The TISF will comprise of concrete pad(s) within a site footprint of approximately 12 800 m^2 and will be designed to accommodate storage of not more than 160 casks, for used nuclear fuel generated at the KNPS up to the end of operational life of plant.

SRK Consulting (South Africa) Pty Ltd (SRK) has been appointed by Eskom to undertake the Scoping and Environmental Impact Reporting (S&EIR, also referred to as Environmental Impact Assessment [EIA]) process required in terms of the National Environmental Management Act 107 of 1998, as amended (NEMA), and the EIA Regulations, 2014.

See page 7 for details on how you can participate in the process.

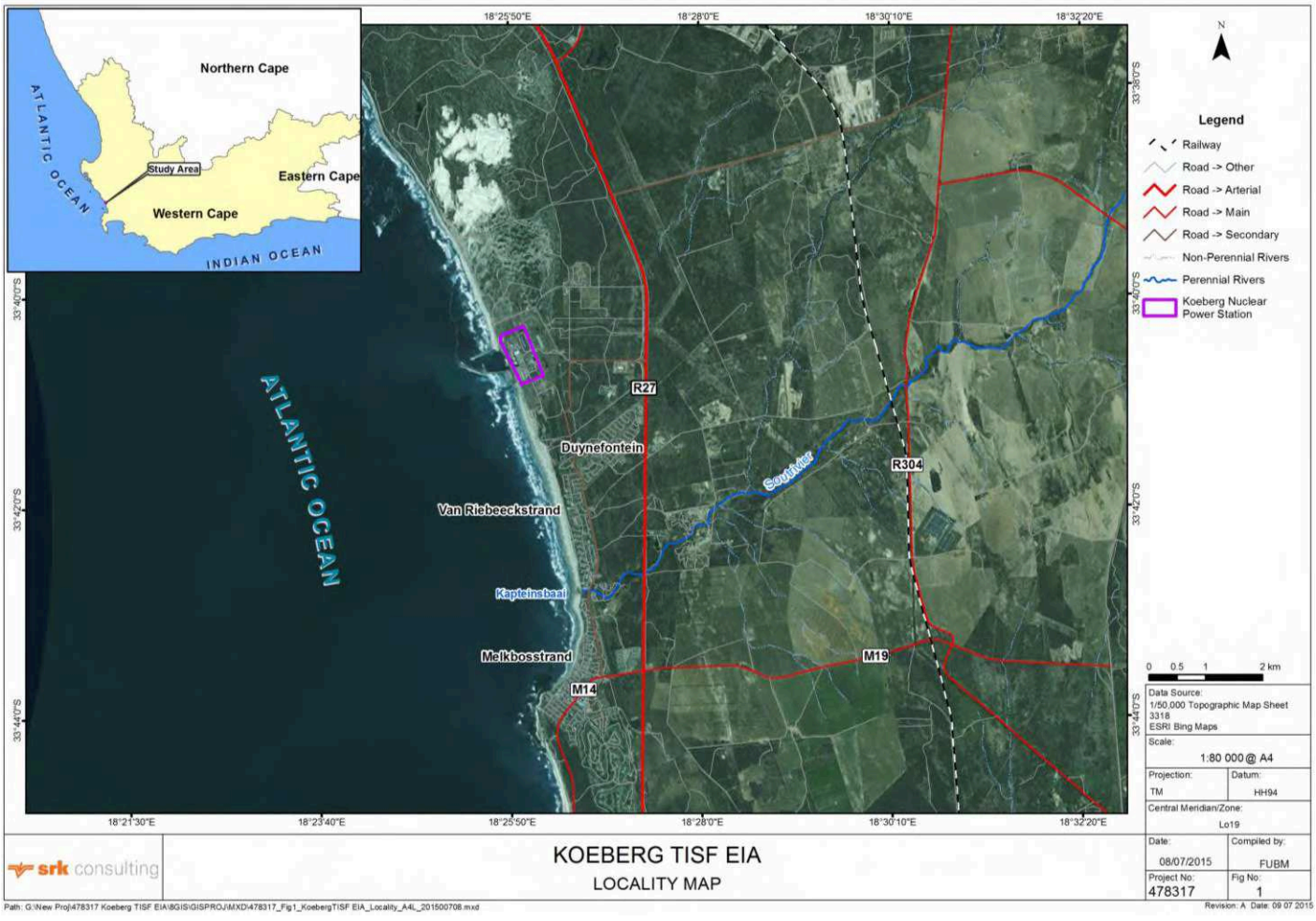

Figure 1: Locality Map

2 GOVERNANCE FRAMEWORK

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an Environmental Authorisation (EA) issued by the competent authority, in this case, the National Department of Environment Affairs (DEA). The EIA Regulations, 2014 (Government Notice (GN) R982), promulgated in terms of NEMA, govern the process, methodologies and requirements for the undertaking of EIAs in support of EA applications. The EIA Regulations are accompanied by Listing Notices (LN) 1-3 that list activities that require EA.

The EIA Regulations, 2014, lays out two alternative authorisation processes. Depending on the type of activity that is proposed, either a Basic Assessment (BA) process or a S&EIR process is required to obtain EA. LN 1 lists activities that require a BA process, while LN 2 lists activities that require S&EIR. LN 3 lists activities in certain sensitive geographic areas that require a BA.

SRK has determined that the proposed project triggers activities listed in terms of LN 1, LN 2 and LN 3 of the EIA Regulations, 2014, requiring a S&EIR. The equivalent activities in terms of the EIA Regulations, 2014, are included in Table 1.

Table 1: Listed activities triggered by the project

No	Description
LN1 (requiring BA)	
27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation.
LN2 (requiring S&EIR)	
3	The development and related operation of facilities or infrastructure for nuclear reaction including energy generation, the production, enrichment, processing, reprocessing, storage or disposal of nuclear fuels, radioactive products, nuclear waste or radioactive waste.
LN3 (requiring BA in the sensitive areas)	
12	The clearance of an area of 300 square metres or more of indigenous vegetation. (a) In Western Cape: (i) Within any critically endangered or endangered ecosystem.

Consequently, the proponent is obliged to apply for EA for the project. Since activities listed under LN 2 apply to the project, an S&EIR process is required.

In addition to the EA, various other key authorisations, permits or licences may be required before the project may proceed (see Table 2).

Table 2: Key authorisations, permits and licences required for the project

Application	Authority	Status
Heritage Application	Heritage Western Cape (HWC)	*HWC confirmed no further heritage studies required (Ref 16022313AS0224E, 16 March 2016)*
Water Use Licence (WUL)	Department of Water and Sanitation (DWS)	*DWS confirmed no WUL will be required for the project (Ref. 16/2/7G200/A/8, 10 May 2016)*
NNR Licence Amendment	National Nuclear Regulator (NNR)	*Planned to be submitted ~ September 2017*

3 ENVIRONMENTAL PROCESS

The EIA Regulations, 2014, define the detailed approach to the S&EIR process, which consists of two phases: the Scoping Phase (the current phase) and the Impact Assessment Phase (see Figure 2).

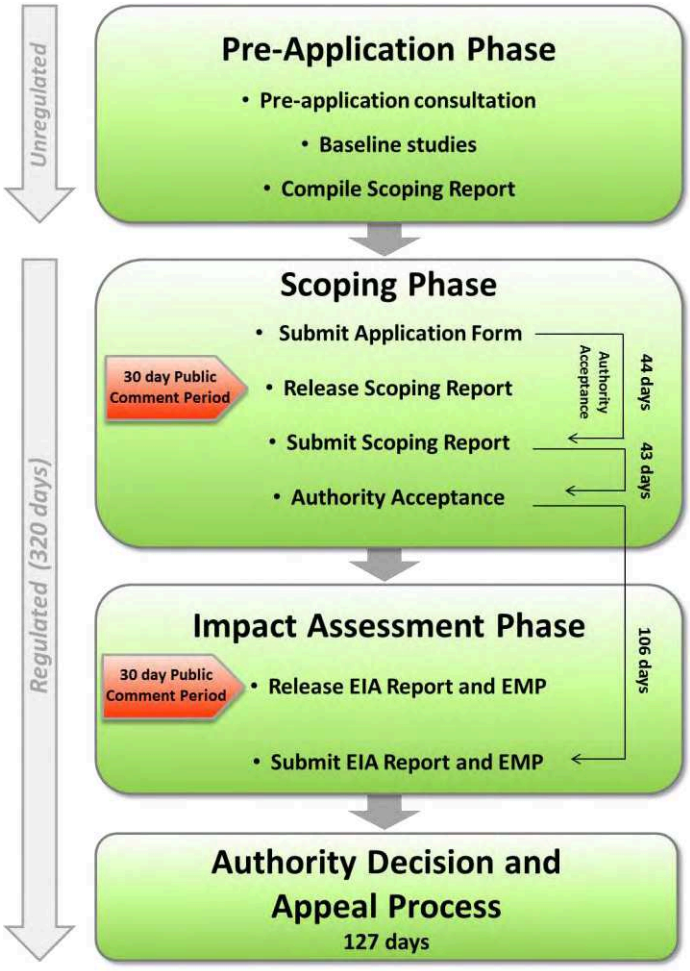

Figure 2: S&EIR Process

The objectives of the Scoping Phase are to:

- Identify stakeholders and inform them of the proposed activity, feasible alternatives and the S&EIR process;
- Describe the affected environment and potential environmental issues and benefits arising from the

proposed project that may require further investigation in the Impact Assessment Phase;

- Develop terms of reference for specialist studies to be undertaken in the Impact Assessment Phase;
- Provide stakeholders with the opportunity to participate in the process and identify any issues or concerns; and
- Produce a Scoping Report for submission to the relevant authorities.

Once the Scoping Phase has been completed, the Impact Assessment Phase will commence, in which the significance of potential impacts will be assessed and measures to avoid and /or mitigate negative impacts and enhance benefits will be determined.

4 DESCRIPTION OF THE SITE AND ENVIRONMENT

The KNPS is located on *Cape* Farm Duynefontyn No. 1552 along the sandy coastline of the West Coast, approximately 27 km north of the Cape Town Central Business District and 1.5 km north of the residential area of Duynefontein (Figure 1). Access to the KNPS is via the R27 which runs along the property's eastern boundary or alternatively via Otto du Plessis Drive.

The topography of the area is relatively flat with an active dunefield extending north of the KNPS. A stabilised primary dune inland of the KNPS screens many of the KNPS buildings although the two nuclear reactor units are prominent landmarks in the region (Figure 3).

Figure 3: The KNPS as viewed from the Duynefontein residential area

The vegetation of the area consists of low coastal shrub (Cape Dune Strandveld and Atlantis Fynbos), typical of much of the West Coast region (Figure 3). The KNPS is located within the Koeberg Nature Reserve, a 3 000 ha reserve managed by the Koeberg Managing Authority. The Atlantic Ocean forms the western boundary of the KNPS.

There are a variety of land uses immediately surrounding the KNPS including the Duynefontein residential area to the south, the Koeberg Nature Reserve to the north, south and east.

The KNPS is located within a predominantly natural environment, although there are existing built elements throughout the property including powerlines, office buildings, a visitors centre, weather station, roads and parking areas.

The TISF will be located within the *Security* Protected Area (*SPA*) of the KNPS (Figure 5), a flat area disturbed by previous construction activities and by current operations at the KNPS.

5 PROJECT MOTIVATION

At the KNPS, the majority of used fuel assemblies from the nuclear reactors are stored under water in spent fuel pools (SFPs) for cooling. These SFPs are nearing capacity – the KNPS Reactor Unit 1 and Reactor Unit 2 will have filled their SFPs by March 2018 and September 2018, respectively.

Due to the uncertainty regarding the development of a Central Interim Storage Facility (CISF), only likely to be in operation by 2025, it has become imperative for Eskom to investigate interim options for the storage of used fuel on the KNPS site. Additional storage capacity will be required to accommodate any further used fuel generated at the KNPS. Eskom consequently developed the Koeberg Spent Fuel Storage Project strategy which caters for the KNPS' used fuel storage needs until 2025 and comprises of three phases described below:

- **Phase 1**:
  - *Phase 1A*: Procurement of seven metal dry storage casks to ensure the Reactor Units can operate beyond 2018, without exceeding the SFP capacity. A number of used fuel assemblies will be transferred from the SFPs into the new dry storage casks. These casks will be stored with the four existing metal dry storage casks in the on-site cask storage building (CSB).
  - *Phase 1B*: Procurement and placement of spent fuel inserts to gain back the currently unoccupied storage cells in the SFPs due to a checker-boarding arrangement. This will open up previously unusable storage cells in the

SFPs, allowing for an increase in the total number of used fuel assemblies that can be stored in the SFPs.

- **Phase 2**: Procurement of approximately 30 - 40 additional dry storage casks to allow ongoing operation of the KNPS until 2025.
- **Phase 3**: Establishment of the TISF for the storage of the casks procured in Phase 2.

Used fuel assemblies generated beyond 2025 will also be stored in casks at the TISF should the CISF not be available.

6 PROJECT DESCRIPTION

The TISF will be constructed on a portion of vacant land within the KNPS *SPA*. The TISF will comprise of concrete pad(s) within a site footprint of approximately 12 800 m^2.

The **Security** ***Protected Area*** *is a restricted area surrounding the reactor units to which only authorised personnel have access. The SPA is distinct from the protected area status of Koeberg Nature Reserve.*

The TISF will be constructed to accommodate up to 160 dry storage casks, which will be placed on the pad(s) in a modular manner over time.

Dry cask storage *is a method of storing used fuel that has already been cooled in the SFP. Casks are typically concrete or steel cylinders which are either welded or bolted closed to provide leak-tight containment of the used fuel. The used fuel assemblies within the casks are surrounded by inert gas and each cylinder is surrounded by additional steel, concrete, or other material to provide radiation shielding to workers and members of the public. Heat generated from used fuel radioactive decay will dissipate through the external surface of the dry casks.*

The dry storage casks will be either metal or concrete casks or concrete assemblies and will be approximately 6 m in height and 3 m in diameter (Figure 4). Each cask can hold up to 37 assemblies depending on the cask design. *The dry storage casks are robust and can withstand significant external impact forces such as an aircraft crash.*

The design of the concrete pad(s) of the TISF lends itself to various types of dry storage casking systems.

The TISF site will also include an auxiliary building to house ancillary equipment.

A secure perimeter fence will be erected around the TISF site with controlled access.

The TISF will meet the requirements of the NNR and will be built and managed in accordance with the International Atomic Energy Agency safety standards. Construction of the TISF will commence in 2018 and will take approximately 12 months to complete. The construction laydown area will be located within the proposed TISF site to reduce the disturbance footprint.

Figure 4: Example of a TISF

Source:http://gttsi.com/wp-content/uploads/2015/01/DryCaskStorage.jpg

Figure 5: Example of a TISF

Source : http://berniesteam.com/wp-content/uploads/2012/12/DSC02774.jpg

Note*: These images are provided as examples and are not intended to indicate the selected technology.*

Temporary site offices and a parking area for construction vehicles and equipment will also be located in this area.

The dry storage casks will be transferred from the SFP to the TISF on the existing KNPS internal road network. A new site access road of approximately 100 m *and between 4 m and 8 m in width* will be required for Alternative 1.

The TISF will be decommissioned in accordance with the KNPS decommissioning plan.

7 ALTERNATIVES

Appendix 2 Section 2 (h)(i) of the EIA Regulations, 2014, requires that all S&EIR processes must identify and describe feasible and reasonable alternatives. Different types or categories of alternatives can be identified, e.g. location alternatives, type of activity, design or layout alternatives, technology alternatives and operational alternatives. Not all categories of alternatives are applicable to all projects.

Eskom identified six potential sites at Koeberg for the location of the TISF, which were evaluated against various criteria. The site selection process identified two viable site locations for the TISF (refer to Figure 5) - the CSB site, the preferred alternative (Alternative 1), and the Ekhaya site (Alternative 2). Alternative 1 is located adjacent to the CSB on the northern boundary of the KNPS and Alternative 2 is located along the southern boundary of the KNPS next to the Ekhaya Building.

Figure 6: TISF Location alternatives

Alternative 1 is Eskom's preferred alternative because:

- *It is situated adjacent to an existing radiological zone (low level waste facility);*
- *It is located within a more ecologically disturbed area compared to Alternative 2; and*
- *Less extensive haul road upgrades will be required than for Alternative 2.*

The No Go alternative will be considered in the EIA in accordance with the requirements of the EIA Regulations, 2014. The No Go alternative entails no change to the status quo, in other words the proposed TISF will not be built.

8 STAKEHOLDER ENGAGEMENT

Stakeholder engagement forms a key component of the S&EIR process and is being undertaken in accordance with Chapter 6 of the EIA Regulations, 2014. The stakeholder engagement activities related to the Pre-Application and Scoping Phases are summarised in Table 3.

Relevant local, provincial and national authorities, conservation bodies, local forums and surrounding

landowners and occupants have been notified of the S&EIR process.

An initial stakeholder registration and comment period was allowed during the Pre-Application Phase, following the release of a Background Information Document (BID).

In March 2016 a (Pre-Application) Draft Scoping Report was released for a 30 day comment period. All registered stakeholders were notified of the release of the Draft Scoping Report for comment.

Following submission of the Application Forms to the DEA, the Scoping Report, addressing issues raised during the Pre-Application Phase, will once again be released for a 30 day comment period.

Table 3: Stakeholder engagement during Pre-Application and Scoping Phases

Activity	Date
Pre-Application	
Advertise release of BID for I&AP registration	08 October 2015
Public comment period	09 October - 09 November 2015
Public Open Day	27 October 2015
Release Draft Scoping Report for comment	16 - 18 March 2016
Public comment period	18 March - 25 April 2016
Scoping	
Advertise commencement of EIA process and release Scoping Report to the public	*4 – 7 July 2016*
Public comment period	*8 July – 8 August* 2016
Public Open Day	*21* July 2016

9 POTENTIAL IMPACTS

The impacts of a project are mostly linked to the sensitivity of the receiving environment and proximity of receptors, the extent or footprint and nature of the development, potential risks in an emergency situation and stakeholders' perceptions.

Based on the above considerations as well as the professional experience of the Environmental Assessment Practitioner, the following potential negative impacts and potential benefits of the project in its proposed setting – have been identified.

Geohydrology – The construction of the TISF may potentially impact on groundwater levels and quality although this is unlikely as groundwater at the project site is deeper than the proposed TISF excavation depth. Dewatering of excavations will probably not be required during construction;

Terrestrial ecology – Due to the ecological sensitivity of both TISF site alternatives and the presence of sensitive vegetation types, the project may negatively impact threatened and/or protected floral species. The project does not pose a threat to threatened or protected faunal species;

Socio-economic – Potential negative impacts on the surrounding communities would be associated with an increase in nuisance factors (e.g. poor noise and air quality conditions during construction). Potential economic benefits are expected due to increased employment opportunities during the construction phase. The TISF will also ensure the continued operation of the KNPS, a significant electricity producer in the Western Cape;

Radiation and Human Health – The potential exposure of Eskom employees as well as individuals in surrounding communities to radiation due to the handling and storage of used fuel at the TISF and the potential negative impacts on human health of is expected to be a key concern to stakeholders;

Heritage – Although the West Coast is known for its wealth of fossil and shell middens, both TISF site alternatives are considered significantly disturbed by previous construction activities and in terms of the heritage landscape, the possibility of finding sites of archaeological or palaeontological importance is highly unlikely; and

Visual – The sense of place of the study area is determined by the KNPS infrastructure located in a predominantly natural setting and influenced by the proximity to the coast. The TISF will be located in the KNPS Protected Area, a substantially modified landscape and is therefore unlikely to have significant negative visual impacts for receptors.

Certain impacts are considered likely to be less significant, including land use, air quality, noise, traffic, surface water and stormwater impacts.

10 PLAN OF STUDY FOR THE IMPACT ASSESSMENT

To address the potential issues and impacts identified thus far, the following **specialist studies** are proposed:

- Geohydrology Specialist Study;
- Terrestrial Ecology Specialist Study;
- Socio-economic Specialist Study;
- Review of Radiological Assessment;
- Human Health Specialist Study;
- Heritage Specialist Study; and
- Visual Specialist Study.

The update of the Emergency Response Plan for KNPS falls outside the scope of the EIA and Environmental Management Programme (EMPr) and will be undertaken/commissioned at a later stage.

Specialists will be required to provide detailed baseline information and to identify and assess the potential impacts of the proposed project within their particular field of study. In addition, specialists will be required to identify practicable mitigation and optimisation measures to avoid or minimise potential negative impacts and/or enhance any benefits. SRK's standard impact rating methodology will be employed in the assessment of impacts.

Once specialist studies have been completed, the results will be collated into an EIA Report and EMPr. The EIA Report and EMPr will be released for public comment through notifications to registered Interested and Affected Parties (I&APs). Key authorities will also be consulted as part of the process.

All comments received will be incorporated into a Comments and Responses Summary which will be appended to the EIA Report. The EIA Report and EMPr will then be submitted to the DEA for their consideration in decision-making.

HOW CAN YOU PARTICIPATE IN THE EIA PROCESS?

The Draft Scoping Report is not a final report and can be amended based on comments received from stakeholders. Issues and concerns identified in the Scoping Study will assist in focussing the EIA and will be used to refine the terms of reference for specialist investigations. Stakeholders are therefore urged to participate:

REVIEW THE REPORT

Copies of the complete report are available for public review at the following locations:

- Koeberg Public Library, Duynefontein;
- Wesfleur Public Library, Atlantis;
- Cape Town Public Library;
- KNPS Visitors Centre; and
- SRK's office in Rondebosch; and
- SRK's website: www.srk.co.za – click on the 'Library' and then 'Public Documents' links.

I&APs are invited to comment, and/or to register on the project database. I&APs must provide their comments together with their name, contact details (preferred method of notification, e.g. email), and an indication of any direct business, financial, personal or other interest which they have in the application, to the contact person below, by ***8 August* 2016.**

Relevant Organs of State have been automatically registered as stakeholders. According to the EIA Regulations, 2014 all other **persons must request in writing to be placed on the register, submit written comments or attend meetings in order to be registered as stakeholders** and be included in future communication for the project.

REGISTER OR PROVIDE YOUR OPINION

Register or send written comment to:

Jessica du Toit

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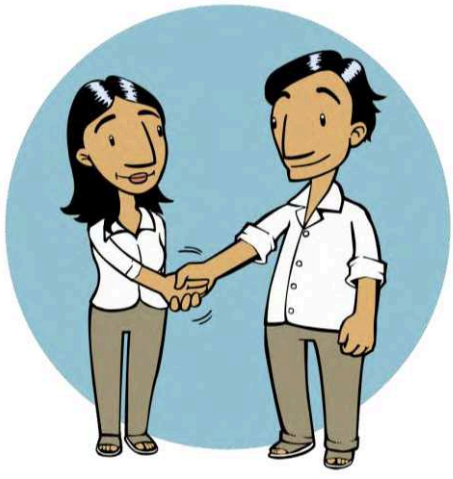
Postnet Suite #206, Private Bag X18,
Rondebosch, 7701

Tel: + 27 21 659 3060

Fax: +27 21 685 7105

Email: jedutoit@srk.co.za

Comments must reach SRK no later than ***8 August 2016*** to be included in the Final Scoping Report. Only registered I&APs will be notified of future opportunities to provide comments.



Profile and Expertise of EAPs

SRK Consulting (South Africa) Pty Ltd (SRK) has been appointed by the Koeberg Operating Unit of Eskom (Eskom) to undertake the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act 107 of 1998 (NEMA).

SRK Consulting comprises over 1 500 professional staff worldwide, offering expertise in a wide range of environmental and engineering disciplines. SRK's Cape Town environmental department has a distinguished track record of managing large environmental and engineering projects, extending back to 1979. SRK has rigorous quality assurance standards and is ISO 9001 accredited.

As required by NEMA, the qualifications and experience of the key independent Environmental Assessment Practitioners (EAPs) undertaking the EIA are detailed below and Curriculum Vitae provided in Appendix A.

Project Director and Reviewer: Christopher Dalgliesh, BBusSc (Hons); MPhil (EnvSci)

Certified with the Interim Board for Environmental Assessment Practitioners South Africa (CEAPSA)

Chris Dalgliesh is a Partner and Principal Environmental Consultant with over 22 years' experience, primarily in South Africa, Southern Africa, West Africa and South America (Suriname). Chris has worked on a wide range of projects, notably in the natural resources, Oil & Gas, waste, infrastructure (including rail and ports) and industrial sectors. He has directed and managed numerous Environmental and Social Impact Assessments (ESIAs) and associated management plans, in accordance with international standards. He regularly provides high level review of ESIAs, frequently directs Environmental and Social Due Diligence studies for lenders, and also has a depth of experience in Strategic Environmental Assessment (SEA), State of Environment Reporting and Resource Economics. He holds a BBusSci (Hons) and M Phil (Env) and is a CEAPSA.

Project Manager: Sharon Jones, BSc Hons (Env. Sci); MPhil (EnviroMan)

Certified with the Interim Board for Environmental Assessment Practitioners South Africa

Sharon Jones is a Principal Environmental Consultant with over 18 years' experience. Sharon has managed a broad range of projects in South Africa, Mozambique, Angola, Suriname, Namibia and the DRC, with particular experience in Port and marine-based projects, mining and large infrastructure projects (e.g. airports and dams). In addition to managing various ESIAs, her experience includes the development of Environmental Management Frameworks, Environmental Management Plans and due diligence reviews and gap analysis studies against IFC and World Bank Standards. Sharon holds a BSc (Hons) and MPhil (Env) and is a registered Professional Natural Scientist (Environmental Science) with SACNASP and a CEAPSA.

Statement of SRK Independence

Neither SRK nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK has no beneficial interest in the outcome of the assessment which is capable of affecting its independence.

Disclaimer

The opinions expressed in this report have been based on the information supplied to SRK by Eskom. SRK has exercised all due care in reviewing the supplied information, but conclusions from the review are 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.

Environmental Impact Assessment of the Transient Interim Storage Facility at Koeberg: EAP Affirmation

Section 16 (1) (b) (iv), Appendix 1 Section 3 (1) (r), Appendix 2 Sections 2 (j) and (k) and Appendix 3 Section 3 (s) of the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of the National Environmental Management Act 107 of 1998, as amended - NEMA), require an undertaking under oath or affirmation by the Environmental Assessment Practitioner (EAP) in relation to:

- The correctness of the information provided in the report;
- The inclusion of comments and inputs from stakeholders and interested and affected parties;
- 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; and
- The level of agreement between the EAP and interested and affected parties on the Plan of Study for undertaking the Environmental Impact Assessment.

SRK and the EAPs managing this project hereby affirm that:

- To the best of our knowledge the information provided in the report is correct, and no attempt has been made to manipulate information to achieve a particular outcome. Some information, especially pertaining to the project description, was provided by the applicant and/or their sub-contractors. In this respect, SRK's standard disclaimer (inserted in this report) pertaining to information provided by third parties applies.
- To the best of our knowledge all comments and inputs from stakeholders and interested and affected parties have been captured in the report and no attempt has been made to manipulate such comment or input to achieve a particular outcome. Written submissions are appended to the report while other comments are recorded within the report. For the sake of brevity, not all comments are recorded verbatim and are mostly captured as issues, and in instances where many stakeholders have similar issues, they are grouped together, with a clear listing of who raised which issue(s).
- Information and responses provided by the EAP to interested and affected parties are clearly presented in the report. Where responses are provided by the applicant (not the EAP), these are clearly indicated.
- With respect to EIA Reports, SRK will take account of interested and affected parties' comments on the Plan of Study and, insofar as comments are relevant and practicable, accommodate these during the Impact Assessment Phase of the EIA process.

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Appendices

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Acronyms and Abbreviations

ACP	Access Control Point
BA	Basic Assessment
BID	Background Information Document
Ca	Calcium
CBA	Critical Biodiversity Area
CISF	Centralised Interim Storage Facility
Cl	Chloride
CoCT	City of Cape Town
CSB	Cask Storage Building
DEA	National Department of Environmental Affairs
DEA:O&C	Department of Environmental Affairs: Oceans and Coasts
DEA&DP	Department of Environmental Affairs and Development Planning (Western Cape)
DoE	Department of Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
ERP	Emergency Response Plan
ESA	Ecological Support Area
GDP	Gross Domestic Product
GDPR	Regional Gross Domestic Product
GN	Government Notice
GRU	Groundwater Resource Unit
GWh	GigaWatt hours
HCO_3	Bicarbonate
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
HWM	High Water Mark
IAEA	International Atomic Energy Agency
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
KIPTS	Koeberg Insulator Pollution Testing Station
KNEP	Koeberg Nuclear Emergency Plan
KNPS	Koeberg Nuclear Power Station
kWh	Kilowatt hour
LAA	Limited Access Area
LPZ	Long-term Protective Action Planning Zone

L/s	Litres per second
MAP	Mean Annual Precipitation
mbgl	Metres Below Ground Level
m/d	Metres per day
Mg	Magnesium
Mm^3/a	Million cubic metres per annum
msl	Mean Sea Level
mS/m	Millisiemens per metre
MW (e)	MegaWatt (electrical)
Na	Sodium
NEA	Nuclear Energy Act 46 of 1999
NEMA	National Environmental Management Act 107 of 1998 as amended
NEM:BA	National Environmental Management: Biodiversity Act 10 of 2004
NEM:PAA	National Environmental Management: Protected Areas Act 57 of 2003
NEM:WA	National Environmental Management: Waste Act 59 of 2008
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act 25 of 1999
NID	Notice of Intent to Develop
NNR	National Nuclear Regulator
NNRA	National Nuclear Regulator Act 47 of 1999
NRWDI	National Radioactive Waste Disposal
NRWDIA	National Radioactive Waste Disposal Institute Act 53 of 2008
NWA	National Water Act 36 of 1998
OCA	Owner Controlled Area
OHSA	Occupational Health and Safety Act 85 of 1993
PAZ	Precautionary Action Planning Zone
PGWC	Provincial Government of the Western Cape
PSA	Probabilistic Safety Assessment
PSDF	Provincial Spatial Development Framework
S&EIR	Scoping and Environmental Impact Reporting
SABAP	South African Bird Atlas Project
SAHRA	South African Heritage Resources Agency
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SES	Socio-economic Status
SFP	Spent Fuel Pool
SHEQ	*Safety, Health, Environmental and Quality*
SPA	*Security Protected Area (Inside Access Control Point 2)*
SO_4	Sulfate
SRK	SRK Consulting (South Africa) (Pty) Ltd
StatsSA	Statistics South Africa
ToR	Terms of Reference

TISF	Transient Interim Storage Facility
UPZ	Urgent Protective Action Planning Zone
WCNCLAA	Western Cape Nature Conservation Laws Amendment Act 3 of 2000
WUL	Water Use Licence

Glossary

Aquifer	An underground body of permeable rock or unconsolidated materials (gravel, sand or silt) which can contain or transmit groundwater.
Avifauna	The collective birds of a given region.
Baseline	Information gathered at the beginning of a study which describes the environment prior to development of a project and against which predicted changes (impacts) are measured.
Benguela Current	The broad, northward flowing ocean current that forms the eastern portion of the South Atlantic Ocean.
Biodiversity	The diversity, or variety, of plants, animals and other living things in a particular area or region. It encompasses habitat diversity, species diversity and genetic diversity
Community	Those people who may be impacted upon by the construction and operation of the project. This includes neighbouring landowners, local communities and other occasional users of the area
Construction Phase	The stage of project development comprising site preparation as well as all construction activities associated with the development.
Consultation	A process for the exchange of views, concerns and proposals about a project through meaningful discussions and the open sharing of information.
Cumulative Impacts	Direct and indirect impacts that act together with current or future potential impacts of other activities or proposed activities in the area/region that affect the same resources and/or receptors.
Electrical Conductivity (in water)	Reflects the capacity of water to conduct electrical current, and is directly related to the concentration of salts dissolved in water.
Ecology	The study of the interrelationships of organisms with and within their physical surroundings.
Ecosystem	The interconnected assemblage of all living organisms that occupy a given area and the physical environment with which they interact.
Environment	The external circumstances, conditions and objects that affect the existence of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Environmental Impact Assessment	A process of evaluating the environmental and socio-economic consequences of a proposed course of action or project.
Environmental Impact Assessment Report	The report produced to relay the information gathered and assessments undertaken during the Environmental Impact Assessment.
Environmental Management Programme	A description of the means (the environmental specification) to achieve environmental objectives and targets during all stages of a specific proposed activity.
Ephemeral (watercourse)	A water body that does not flow or contain water year-round, in response to seasonal rainfall and run-off.

Fauna	The collective animals of a particular region, habitat or geological period.
Feasibility study	The determination of the technical and financial viability of a proposed project.
Fossil	Rare objects that are preserved due to unusual circumstances.
Flora	The collective plants of a particular region, habitat or geological period.
Fuel assemblies	Bundles of fuel rods, containing nuclear fuel.
Fuel rods	Pellets of enriched uranium dioxide encased in long metal tubes.
Geohydrology	The study of the character, source and mode of occurrence of groundwater
Heritage Resources	Refers to something tangible or intangible, e.g. a building, an area, a ritual, etc. that forms part of a community's cultural legacy or tradition and is passed down from preceding generations and has cultural significance.
Hydrology	(The study of) surface water flow.
Impact	A change to the existing environment, either adverse or beneficial, that is directly or indirectly due to the development of the project and its associated activities.
Independent EAP	An independent person with the appropriate qualifications and experience appointed by the Applicant to manage the Environmental Impact Assessment process on behalf of the Applicant.
Integrated Environmental Management	The practice of incorporating environmental management into all stages of a project's life cycle, namely planning, design, implementation, management and review.
Kilowatt hour	The kilowatt-hour is a unit of energy equivalent to one kilowatt (1 kW) of power expended for one hour
Koeberg Nature Reserve	A 3000ha nature reserve surrounding the KNPS, managed by the Koeberg Managing Authority.
Limited Area Access	The area inside the Access Control Point 1 (ACP 1) barrier and includes the entire intake basin area.
Long-term Protective Action Zone	A pre-designated area, within an 80km radius of the KNPS, where preparations for effective implementation of protective actions to reduce the risk of deterministic and stochastic health effects from long term exposure to deposition and ingestion must be developed in advance.
MegaWatt	A unit of power equivalent to one million watts.
Mitigation measures	Design or management measures that are intended to avoid and / or minimise or enhance an impact, depending on the desired effect. These measures are ideally incorporated into a design at an early stage.
Operational Phase	The stage of the works following the Construction Phase, during which the development will function or be used as anticipated in the Environmental Authorisation.
Owner Controlled Area	The total area owned by Eskom SOC Limited at the Koeberg Nuclear Power Station. Access to this area is controlled by the West Coast and Duynefontein entrances. This area includes the Limited Access Area (LAA) and *Security* Protected Area (*SPA*).

Precautionary Action Zone	A designated area, within a 5km radius of the KNPS, where the risk of deterministic effects is sufficiently high to warrant the establishment of plans for the implementation of pre-emptive protective actions based on plant conditions, before a release or shortly thereafter.
Radioactive waste	Waste that contains, or is contaminated with, radionuclides at concentrations or activities greater than clearance levels as established by the regulatory body.
Reactor Units	Nuclear reactor units in which nuclear fuel is used to generate heat used for the generation of electricity. The KNPS has two Reactor Units.
Recharge	The addition of water to the zone of saturation, either by the downward percolation of precipitation or surface water and / or the lateral migration of groundwater from adjacent aquifers.
Release	When referring to the PAZ, UPZ and LPZ, it is a radiological release in an accident that can give rise to an off-site public exposure of 1 milliSievert.
Scoping	A procedure to consult with stakeholders to determine issues and concerns and for determining the extent of and approach to an EIA and EMPr (one of the phases in an EIA and EMPr). This process results in the development of a scope of work for the EIA, EMPr and specialist studies.
Security Protected Area	A restricted area surrounding the reactor units to which only authorised personnel have access. This is the area within the ACP 2 security fence. *The SPA is distinct from the protected area status of the Koeberg Nature Reserve in terms of the NEM:PAA.*
Specialist study	A study into a particular aspect of the environment, undertaken by an expert in that discipline.
Stakeholders	All parties affected by and/or able to influence a project, often those in a position of authority and/or representing others.
Sustainable development	Sustainable development is generally defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. NEMA defines sustainable development as the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.
Transfer	The movement of filled dry storage casks from the nuclear reactors to the TISF, inside the boundaries of the Owner Controlled Area.
Urgent Protective Action Planning Zone	A pre-designated area, within a 16 km radius of the KNPS, where the risks for stochastic effects is sufficiently high to warrant the establishment of plans to implement protective actions based on environmental monitoring or on plant conditions.
Used fuel	Nuclear fuel that has been used in the fission process to the point where it is no longer useful in sustaining a nuclear reaction.

1 Introduction

1.1 Background and Introduction

Eskom proposes to construct a Transient Interim Storage Facility (TISF) for the temporary storage of dry casks at the Koeberg Nuclear Power Station (KNPS) (Figure 1-1) to accommodate used nuclear fuel from the reactors of the power station (now referred to as the "project"), thereby ensuring the continued operation of the KNPS. The TISF will comprise of concrete pad(s) within a site footprint of approximately 12 800 m^2 and will be designed to accommodate storage of not more than 160 casks, for used nuclear fuel generated at Koeberg up to the end of operational life of plant.

The National Environmental Management Act 107 of 1998, as amended (NEMA), and the Environmental Impact Assessment (EIA) Regulations, 2014 (promulgated in terms of NEMA) warrant that listed activities require Environmental Authorisation (EA) from the National Department of Environmental Affairs (DEA). A Scoping and Environmental Impact Reporting (S&EIR, also referred to as an EIA) process is required to support an application for EA.

SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed by Eskom to undertake the S&EIR process required in terms of the NEMA and the EIA Regulations, 2014.

1.2 Purpose of the Report

This document is intended to guide the EIA process and specialist studies by:

- Providing an overview of the legal requirements with regard to the proposed project, the proposed project description and anticipated environmental and social issues and impacts that will be further investigated in the EIA; and
- Setting out the scope of the EIA process and the Terms of Reference (ToR) for specialist studies and outlining the approach and methodologies to be used in the EIA process, e.g. the proposed impact rating methodology.

This report will be submitted to DEA for their acceptance.

1.3 Structure of this Report

This report describes the proposed activity and its context, details the stakeholder engagement process, presents the results of the Scoping Phase and sets out the Plan of Study for the Impact Assessment Phase. The report consists of the following sections:

Section 1: Introduction

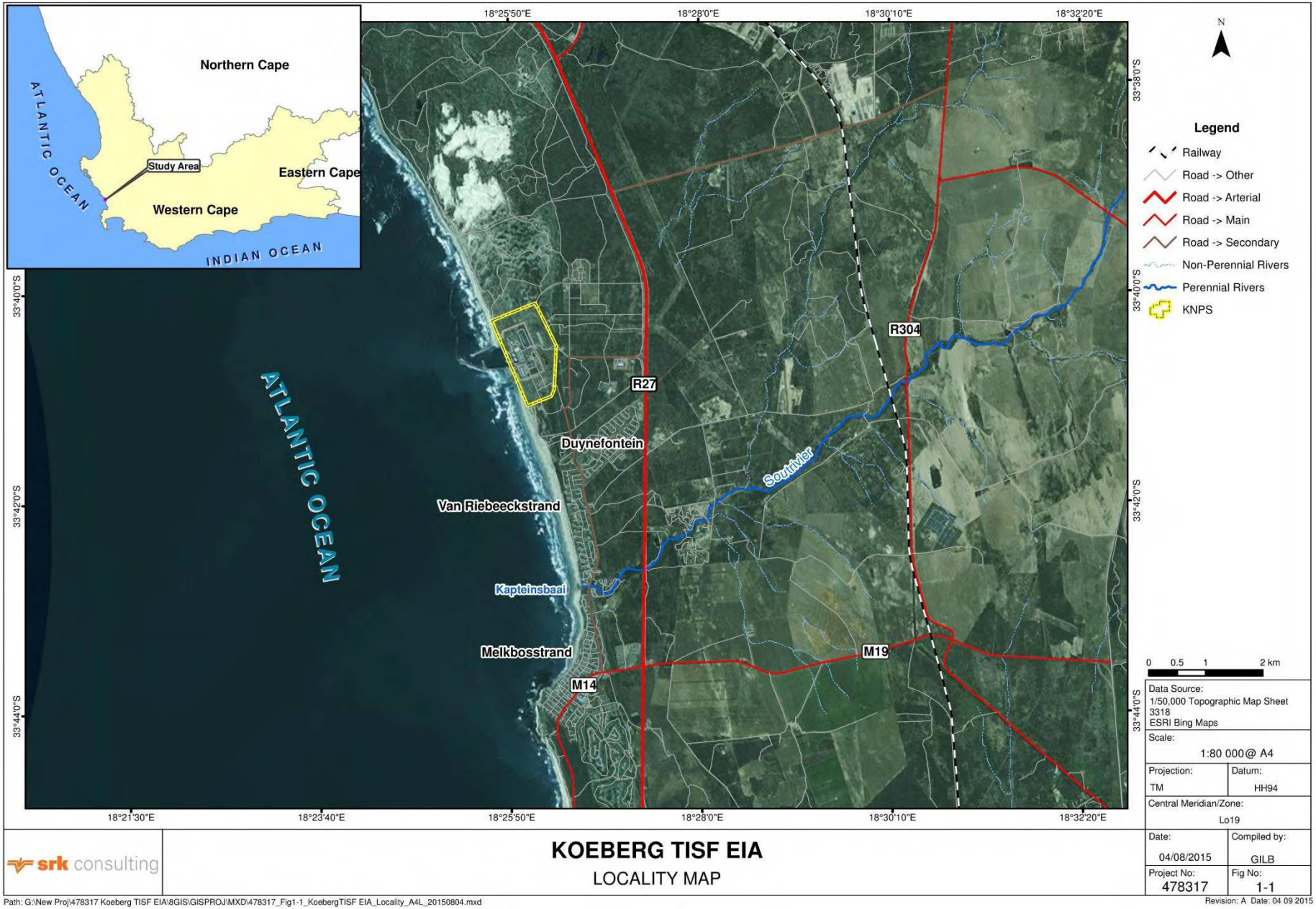
Provides an introduction and background to the proposed project and outlines the purpose of this document and the assumptions and limitations applicable to the study.

Section 2: Governance Framework and Environmental Process

Provides a brief summary and interpretation of the relevant legislation as well as pertinent strategic planning documents, and outlines the approach to the environmental process.

Section 3: Project Description

Describes the location and current status of the site and provides a brief summary of the surrounding land uses as well as background to and a motivation for the project.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Eastern Cape
Western Cape
Study Area
ATLANTIC OCEAN
INDIAN OCEAN
18°25'50"E
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18°30'10"E
18°32'20"E
33°38'0"S
33°40'0"S
33°42'0"S
33°44'0"S
18°21'30"E
18°23'40"E
N
Legend
Railway
Road -> Other
Road -> Arterial
Road -> Main
Road -> Secondary
Non-Perennial Rivers
Perennial Rivers
KNPS
R304
R27
M19
M14
Duynefontein
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Section 4: Description of the Affected Environment

Briefly describes the biophysical and socio-economic characteristics of the affected environment that will be considered in the assessment of potential project impacts.

Section 5: Stakeholder Engagement

Details the stakeholder engagement activities conducted during the Pre-Application Phase and planned for the Scoping Phase.

Section 6: Potential Environmental and Social Impacts

Identifies the potential impacts associated with the project that will require investigation during the Impact Assessment Phase.

Section 7: Plan of Study for the EIA

Presents the proposed approach to the Impact Assessment Phase, outlines the methodology that will be adopted in assessing the potential impacts during the Impact Assessment Phase, identifies the specialist studies that are required and proposes the preliminary ToR for these studies.

Section 8: Conclusions and Recommendations

Summarises the key findings of the Scoping Phase and outlines the way forward in the Impact Assessment Phase.

The Scoping Report has been prepared in accordance with Section 21 of the EIA Regulations, 2014.

1.4 Content of Report

The EIA Regulations, 2014 (Government Notice (GN) 982, Appendix 2), prescribe the required content in a Scoping Report. These requirements and the sections of this Scoping Report in which they have been addressed, are summarised in Table 1-1.

Table 1-1: Content of Scoping Report as per EIA Regulations, 2014

GN 982, App 2 Ref.:	Requirement	Section Ref.:
(2) (a)	Details of:	
(2) (a) (i)	The EAP who prepared the report	Page i
(2) (a) (ii)	The expertise of the EAP, including a Curriculum vitae	Page i and Appendix A
(2) (b)	Location of the activity, including:	
(2) (b) (i)	21 digit Surveyor General code of the property	3.3
(2) (b) (ii)	Physical address and farm name (where available)	3.3
(2) (b) (iii)	The coordinates of the boundary of the property (where (2) (b) (i) and (2) (b) (ii) are not available)	n/a
(2) (c)	A plan indicating the location of the proposed activity and associated infrastructure, or:	3
(2) (c) (i)	For linear activities: a description and coordinates of the corridor in which the proposed activity is to be undertaken	n/a
(2) (c) (ii)	On land where the property has not been defined, the coordinates within which the activity is to be undertaken	n/a
(2) (d)	A description of the scope of the proposed activity, including	
(2) (d) (i)	All listed and specified activities triggered	2.1.2
(2) (d) (ii)	A description of activities to be undertaken, including associated infrastructure	3

GN 982, App 2 Ref.:	Requirement	Section Ref.:
(2) (e)	A description of the policy and legislative context	2
(2) (f)	Motivation for need and desirability for the proposed development	*To be provided in EIA Report*
(2) (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including	
(2) (h) (i)	Details of all alternatives considered	3.4
(2) (h) (ii)	Details of public participation process undertaken, including copies of the supporting documents and inputs	5 and associated Appendices
(2) (h) (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	*5.2 and Appendix J*
(2) (h) (iv)	The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	4
(2) (h) (v)	The impacts and risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be reversed, may cause irreplaceable loss of resources, and can be avoided, managed or mitigated	*To be provided in EIA Report*
(2) (h) (vi)	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks	7.9
(2) (h) (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	6
(2) (h) (viii)	Possible mitigation measures that could be applied and level of residual risk	*To be provided in EIA Report*
(2) (h) (ix)	Outcome of the site selection matrix	3.4
(2) (h) (x)	If no alternative development locations for the activity were investigated, the motivation for not considering such	n/a
(2) (h) (xi)	A concluding statement indicating the preferred alternative development location within the approved site	3.5
(2) (i)	A plan of study for the EIA, including:	
(2) (i)	A description of the alternatives to be considered and assessed including the option of not proceeding	3.5
(2) (i) (ii)	A description of the aspects to be assessed as part of the environmental impact assessment process	7.7 & 7.8
(2) (i) (iii)	Aspects to be assessed by specialists	7.7
(2) (i) (iv)	A description of the proposed method of assessing the environmental aspects, including a description of the proposed method of assessing the environmental aspects including aspects to be assessed by specialists.	7.9
(2) (i) (v)	A description of the proposed method of assessing duration and significance	
(2) (i) (vi)	An indication of the stages at which the competent authority will be consulted	
(2) (i) (vii)	Particulars of the public participation process that will be conducted during the environmental impact assessment process	
(2) (i) (viii)	A description of the tasks that will be undertaken as part of the environmental impact assessment process	
(2) (i) (x)	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	*To be provided in EIA Report*
(2) (j)	Undertaking under oath or affirmation by the EAP in relation to:	Page ii
(2) (j) (i)	The correctness of the information provided in the report	

GN 982, App 2 Ref.:	Requirement	Section Ref.:
(2) (j) (ii)	The inclusion of comments and inputs from stakeholders and interested and affected parties	
(2) (j) (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	
(2) (k)	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	Page iii
(2) (l)	Any specific information required by the competent authority	*To be confirmed*

1.5 Assumptions and Limitations

As is standard practice, this Scoping Report is based on a number of assumptions and is subject to certain limitations. These are as follows:

- It is assumed that information provided by Eskom and other consultants and specialists is accurate;
- A more detailed project description will be presented in the EIA Report;
- Detailed assessment of the potential positive and negative environmental impacts of the proposed development will only be undertaken during the Impact Assessment Phase;
- The EIA does not constitute a risk assessment addressing e.g. risk of rupture, explosion and/or fire; and
- This facility will be decommissioned in accordance with the approved Koeberg Decommissioning Plan. Decommissioning of the facility has not been considered in this EIA.

Notwithstanding the above, SRK is confident that these assumptions and limitations do not compromise the overall findings of this report.

2 Governance Framework and Environmental Process

2.1 South African Legislation

There are a number of regulatory requirements at local, provincial and national level with which the proposed project must conform. Some of the key environmental legal requirements include the following:

- National Environmental Management Act 107 of 1998, as amended (NEMA);
- EIA Regulations 2014, promulgated in terms of NEMA;
- National Water Act 36 of 1998 (NWA);
- National Heritage Resources Act 25 of 1999 (NHRA);
- National Environmental Management: Biodiversity Act 10 of 2004 (NEM:BA);
- National Environmental Management: Protected Areas Act 57 of 2003 (NEM:PAA);
- National Nuclear Regulator Act 47 of 1999 (NNRA);
- Nuclear Energy Act 46 of 1999 (NEA); and
- National Radioactive Waste Disposal Institute Act 53 of 2008 (NRWDIA).

The National Environmental Management: Waste Act 59 of 2008 (NEM:WA) aims to (amongst other things) regulate waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation. NEM:WA does not apply to radioactive waste, which is regulated by the NNRA and the NEA, and is thus not discussed further below.

A brief summary of SRK's understanding of the relevant Acts and Regulations that are applicable to this study is provided below. Note that other legislative requirements may also pertain to the project. As such, the summary provided below is not intended to be definitive or exhaustive, and serves only to highlight key environmental legislation and obligations.

2.1.1 National Environmental Management Act 107 of 1998, as Amended

NEMA establishes a set of principles which all authorities have to consider when exercising their powers. These include the following:

- Development must be sustainable;
- Pollution must be avoided or minimised and remedied;
- Waste must be avoided or minimised, reused or recycled;
- Negative impacts must be minimised; and
- Responsibility for the environmental consequences of a policy, project, product or service applies throughout its life cycle.

Section 28(1) states that "*every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring*". If such degradation/pollution cannot be prevented, then appropriate measures must be taken to minimise or rectify such pollution.

These measures may include:

- Assessing the impact on the environment;
- Informing and educating employees about the environmental risks of their work and ways of minimising these risks;
- Ceasing, modifying or controlling actions which cause pollution/degradation;
- Containing pollutants or preventing movement of pollutants;
- Eliminating the source of pollution; and
- Remedying the effects of the pollution.

***Legal requirements for this project**:*

Eskom (the proponent) has a responsibility to ensure that the proposed activities and the S&EIR process conform to the principles of NEMA. The proponent is obliged to take actions to prevent pollution or degradation of the environment in terms of Section 28 of NEMA, and to ensure that the environmental impacts associated with the project are considered, and mitigated where possible.

2.1.2 EIA Regulations, 2014

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an EA issued by the competent authority (DEA). In this context, the EIA Regulations, 2014 (GN R982, which came into effect on 8 December 2014), promulgated in terms of NEMA, govern the process, methodologies and requirements for the undertaking of EIAs in support of EA applications. Listing Notices 1-3 in terms of NEMA list activities that require EA ("NEMA listed activities").

GN R982 of the EIA Regulations lays out two alternative authorisation processes. Depending on the type of activity that is proposed, either a Basic Assessment (BA) process or a S&EIR process is required to obtain EA. Listing Notice 1[1] lists activities that require a BA process, while Listing Notice 2[2] lists activities that require S&EIR. Listing Notice 3[3] lists activities in certain sensitive geographic areas that require a BA process.

The regulations for both processes – BA and S&EIR - stipulate that:

- Public participation must be undertaken as part of the assessment process;
- The assessment must be conducted by an independent EAP;
- The relevant authorities must respond to applications and submissions within stipulated time frames;
- Decisions taken by the authorities can be appealed by the proponent or any other Interested and Affected Party (I&AP); and
- A draft Environmental Management Programme (EMPr) must be compiled and released for public comment.

GN R982 sets out the procedures to be followed and content of reports compiled during the BA and S&EIR processes.

[1] GN R983 of 2014
[2] GN R984 of 2014
[3] GN R985 of 2014

The NEMA National Appeal Regulations[4] make provision for appeal against any decision issued by the relevant authorities. In terms of the Regulations, an appeal must be lodged with the relevant authority in writing within 20 days of the date on which notification of the decision (EA) was sent to the applicant or I&AP (as applicable). The applicant, the decision-maker, interested and affected parties and organ of state must submit their responding statement, if any, to the appeal authority and the appellant within 20 days from the date of receipt of the appeal submission.

The project includes activities that are listed in terms of the EIA Regulations, 2014 and thus need EA (see Table 2-1).

Table 2-1: NEMA listed activities applicable to the project

No.	Listed activity
Listing Notice 1	
27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation.
Listing Notice 2	
3	The development and related operation of facilities or infrastructure for nuclear reaction including energy generation, the production, enrichment, processing, reprocessing, storage or disposal of nuclear fuels, radioactive products, nuclear waste or radioactive waste.
Listing Notice 3	
12	The clearance of an area of 300 square metres or more of indigenous vegetation. (a) In Western Cape: (i) Within any critically endangered or endangered ecosystem.

***Legal requirements for this project**:*

As such, the proponent is obliged to apply for EA for these listed activities and to undertake an S&EIR process in support of the application, in accordance with the procedure stipulated in GN R982 under NEMA.

2.1.3 National Water Act 36 of 1998

Water use in South Africa is controlled by the NWA. The executive authority is the Department of Water and Sanitation (DWS). The NWA recognises that water is a scarce and unevenly distributed national resource in South Africa. Its provisions are aimed at achieving sustainable and equitable use of water to the benefit of all users and to ensure protection of the aquatic ecosystems associated with South Africa's water resources. The provisions of the Act are aimed at discouraging pollution and wastage of water resources.

In terms of the Act, a land user, occupier or owner of land where an activity that causes or has the potential to cause pollution of a water resource has a duty to take measures to prevent pollution from occurring. If these measures are not taken, the responsible authority may do whatever is necessary to prevent the pollution or remedy its effects, and to recover all reasonable costs from the responsible party.

Section 21 of the NWA specifies a number of water uses, including:

(a) taking water from a water resource; and

(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.

[4] GN R993 of 2014, as amended by GN R205 of 2015.

These water uses require authorisation in terms of Section 22 (1) of the Act, unless they are listed in Schedule 1 of the NWA, are an existing lawful use, fall under a General Authorisation issued under section 39 or if the responsible authority waives the need for a licence.

***Legal requirements for this project**:*

The proposed project activities may trigger water use activities in terms of Section 21 (j) of the NWA for the dewatering of the excavations during construction. If part of the water removed for this reason is not disposed of or discharged into a water resource, but used for some purpose, this water use may also be considered to be taking of water from a water resource in terms of Section 21 (a). It is expected that a Water Use Licence (WUL) may be required for the project from the competent authority, in this case DWS.

*In a letter dated 10 May 2016, DWS confirmed that the proposed project activities do not trigger a water use in terms of Section 21 of the NWA, and therefore a WUL is not required (**Appendix B**).*

2.1.4 National Heritage Resources Act 25 of 1999

The protection and management of South Africa's heritage resources are controlled by the NHRA. The enforcing authority for this act is the South African National Heritage Resources Agency (SAHRA). In the Western Cape, SAHRA has delegated this authority to Heritage Western Cape (HWC). In terms of the Act, historically important features such as graves, trees, archaeological artefacts/sites and fossil beds are protected. Similarly, culturally significant symbols, spaces and landscapes are also afforded protection.

Section 38 of the NHRA requires that any person who intends to undertake certain categories of development must notify SAHRA and/or HWC at the very earliest stage of initiating such a development and must furnish details of the location, nature and extent of the proposed development. HWC has designed a Notification of Intent to Develop (NID) to assist the developer in providing the necessary information to enable HWC to decide whether a Heritage Impact Assessment (HIA) will be required.

Section 38 also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that, if such an assessment is deemed adequate, a separate HIA is not required. There is, however, the requirement in terms of Section 38 (8) for the consenting authority (in this case the DEA) to ensure that the evaluation of impacts on the heritage resources fulfils the requirements of the relevant heritage resources authority (HWC), and that the comments and recommendations of the heritage resources authority are taken into account prior to the granting of the consent.

Section 38(1) of the NHRA specifies activities that trigger the need for a NID. The proposed project triggers a number of these activities, including:

(c) Any development or activity that will change the character of a site (i) exceeding 5 000 m^2 in extent.

***Legal requirements for this project**:*

A NID was submitted to HWC in February 2016. The proposed development will change the character of the project site, in addition to which transfer routes will be required to move casks to the TISF. These are, however, likely to follow existing roads.

*Since there is no reason to believe that the proposed development will impact on heritage resources, HWC confirmed that a further application process under Section 38 of NHRA will not be required (**Appendix C**).*

2.1.5 National Environmental Management: Biodiversity Act 10 of 2004

The purpose of the NEM:BA is to provide for the management and conservation of South Africa's biodiversity and the protection of species and ecosystems that warrant national protection. The NEM:BA makes provision for the publication of bioregional plans and the listing of ecosystems and species that are threatened or in need of protection. Threatened or Protected Species Regulations (2007), Guidelines for the determination of bioregions and the preparation and publication of bioregional plans (2009) and a National List of Ecosystems that are Threatened and in Need of Protection (2011) have been promulgated in terms of NEM:BA.

A published bioregional plan is a spatial plan indicating terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning. These areas are referred to as Critical Biodiversity Areas (CBAs) in terms of NEM:BA. Bioregional plans provide guidelines for avoiding the loss or degradation of natural habitat in CBAs with the aim of informing EIAs and land-use planning (including Environmental Management Frameworks [EMFs], Spatial Development Frameworks [SDFs], and Integrated Development Plans [IDPs]).

Permits to carry out a restricted activity involving listed threatened or protected species or alien species may only be issued after an assessment of risks and potential impacts on biodiversity has been undertaken.

Legal requirements for this project:

Although no CBAs or Ecological Support Areas (ESAs) are located in the project area, the KNPS is located in the original extent of an endangered ecosystem and the impacts of the project on the biodiversity of the area will need to be assessed.

2.1.6 National Environmental Management: Protected Areas Act 57 of 2003

The protection and management of South Africa's protected areas are controlled by the NEM:PAA. The Act provides for:

- Declaration of nature reserves and determination of the type of reserve declared;
- Cooperative governance in the declaration and management of nature reserves;
- A system of protected areas to manage and conserve biodiversity; and
- The utilization and participation of local communities in the management of protected areas.

In designating a protected area, the relevant competent authority is obliged to follow an appropriate consultation process. The Act requires that local protected areas must be managed by the relevant Management Authority. A management plan for the protected area must be approved by the provincial MEC.

Legal requirements for this project:

The KNPS is located within the Koeberg Nature Reserve, proclaimed as a private nature reserve in 1991. The Koeberg Nature Reserve Management Plan has been submitted to CapeNature for approval by the MEC. The construction and operational phases of the TISF will adhere to the conditions of the Koeberg Nature Reserve Management Plan (once approved by CapeNature).

2.1.7 National Nuclear Regulator Act 47 of 1999

The NNRA establishes and enforces procedures to protect people who work with radioactive materials.

The National Safety Standards and Regulatory Practices of South Africa require that authorised practices involved in nuclear related activities shall perform a prospective radiological public hazard assessment. Radiological protection standards are criteria set to ensure compliance with the basic principles of radiation safety. The National Nuclear Regulator (NNR) of South Africa adopted these standards and promulgated regulations to ensure the protection of individual members of the public and their surrounding environment.

All used fuel storage facilities fall under the regulatory authority of the NNR. The Regulator‘s responsibilities include exercising regulatory control related to safety over the siting, design, construction, operation, manufacture of component parts, and decontamination, decommissioning and closure of nuclear installations.

***Legal requirements for this project**:*

Eskom operates the KNPS in accordance to the existing NNR license NIL-001. The proponent must amend their existing NNR licence to include the TISF and must undertake a radiological assessment (safety case) to determine the potential radiological effects on the public. Following the approval of the licensing strategy for the development of the TISF, it is anticipated that the licence amendment application will be submitted to the NNR in September 2017. The stakeholder engagement processes associated with this application will take place following completion of the preliminary review by the NNR of the safety case submitted by Eskom, approximately 24 months after submission of the application.

2.1.8 Nuclear Energy Act 46 of 1999

The NEA stipulates that the Minister of Energy has the authority over the management and disposal of radioactive waste and the storage of used nuclear fuel.

Section 34 (b) (v) stipulates that authorisation by the Minister is required for any person, institution, organisation or body to be in possession of a nuclear-related equipment and material.

***Legal requirements for this project**:*

*Eskom received written permission (ref E2/5/9/3) from the Minister of Energy (on 21 April 2011) in terms of the Nuclear Energy Act, to establish the TISF at Koeberg, to store used fuel and for the transfer of used fuel between the Spent Fuel Pools (SFPs) and the TISF (**Appendix D**).*

2.1.9 National Radioactive Waste Disposal Institute Act 53 of 2008

The NRWDIA provides for the establishment of a National Radioactive Waste Disposal Institute to manage radioactive waste disposal on a national basis. According to the NRWDIA, the proposed establishment of a Centralised Interim Storage Facility (CISF)[5] for the storage of all radioactive waste generated in South Africa at a high level waste disposal facility is the responsibility of the National Radioactive Waste Disposal Institute.

Legal requirements for this project:

Eskom has no legal requirement for the CISF associated with disposal of radioactive waste in terms of this Act. However, since the establishment of a CISF is the responsibility of the NRWDI, Eskom has no control over the timing of this, and as such needs to make allowance for the storage of used fuel in the interim.

[5] *It is possible that a CISF may be constructed in the foreseeable long term future. If constructed, high level nuclear waste and used nuclear fuel from the KNPS may in future be stored at the CISF.*

2.2 Planning Policy Framework

This section discusses a number of key formal planning policies relevant to the project. The policies and plans briefly discussed below include key industry related policies and regional and local development and spatial plans, including the:

- Energy Security Master Plan – Electricity (2007 – 2025);
- White Paper on the Energy Policy of the Republic of South Africa (1998) and the Nuclear Energy Policy for the Republic of South Africa (2008);
- Radioactive Waste Management Policy and Strategy for the Republic of South Africa (2005);
- International Atomic Energy Agency Safety Standards;
- Western Cape Provincial Spatial Development Framework (2014);
- City of Cape Town Integrated Development Plan (2012 - 2017); and
- City of Cape Town Spatial Development Framework (2012).

2.2.1 Energy Security Master Plan – Electricity (2007 – 2025)

The Energy Security Master Plan addresses all aspects of the electricity sector including generation, transmission, distribution and energy efficiency initiatives for the period 2007 - 2025.

The goals of the Master Plan are to:

- Support economic growth and development;
- Improve the reliability of electricity infrastructure;
- Provide a reasonably priced electricity supply;
- Ensure the security of electricity supply as set by a security of supply standard;
- Diversify the primary energy sources of electricity;
- Meet the renewable energy targets as set in the White Paper on Energy Policy;
- Increase access to affordable energy services;
- Reduce energy usage through energy efficiency interventions;
- Accelerate household universal access to electricity; and
- Clarify some of the policy issues in the context of an evolving electricity sector.

2.2.2 White Paper on the Energy Policy of the Republic of South Africa (1998) and the Nuclear Energy Policy for the Republic of South Africa (2008)

Nuclear Energy Policy of the Republic of South Africa is guided by the White Paper on Energy Policy (1998), where nuclear energy was retained as one of the policy options for electricity generation. In order to achieve a balance between energy demand and resource availability, the Energy Policy identifies the need to undertake an Integrated Energy Planning process, while also taking into account health, safety and environmental parameters. In terms of the White Paper, the Government is responsible for investigating the long-term contribution nuclear power can make to the country's energy economy and, secondly, how the existing nuclear industrial infrastructure can be optimised.

Some of the main policy objectives of the White Paper relate to decisions regarding:

- Possible new nuclear power stations;
- The management of radioactive waste;

- Safety monitoring of the nuclear industry;
- Effectiveness and adequacy of regulatory oversight; and
- Review of bodies associated with the nuclear industry.

The Nuclear Energy Policy presents a framework within which prospecting, mining, milling and the use of nuclear materials as well as the development and utilisation of nuclear energy for peaceful purposes by South Africa takes place. Through this Policy, the South African Government aims to achieve the following objectives:

- Promotion of nuclear energy as an important electricity supply option through the establishment of a national industrial capability for the design, manufacture and construction of nuclear energy systems;
- Establishment of the necessary governance structures for an extended nuclear energy programme;
- Creation of a framework for safe and secure utilisation of nuclear energy with minimal environmental impact;
- Contribution to the country's national programme of social and economic transformation, growth and development;
- To guide in the actions to develop, promote, support, enhance, sustain and monitor the nuclear energy sector in South Africa;
- Attainment of global leadership and self-sufficiency in the nuclear energy sector in the long term;
- Exercise control over un-processed uranium ore for export purposes for the benefit of the South African economy;
- Establishing of mechanisms to ensure the availability of land (nuclear sites) for future nuclear power generation;
- Allow for the participation of public entities in the uranium value chain;
- Promoting energy security for South Africa;
- Improvement of the quality of human life and to support the advancement of science and technology;
- Reduction of greenhouse gas emissions; and
- Skills development related to nuclear energy.

The Nuclear Energy Policy states that radioactive waste, including used nuclear fuel is to be managed in terms of the Radioactive Waste Management Policy and Strategy for South Africa.

2.2.3 Radioactive Waste Management Policy and Strategy for the Republic of South Africa (2005)

The Radioactive Waste Management Policy and Strategy for the Republic of South Africa (2005) establishes a national radioactive waste policy framework setting out the principles and structures for the management of radioactive waste in a coordinated and cooperative manner.

The Policy acknowledges that the disposal of high level waste presents the greatest challenges and investigations into the best long-term option for the management of used fuel are ongoing. In the interim, the Policy states that used nuclear fuel is and shall continue to be stored in authorised facilities within the generator's sites. The Policy does recognise that such storage is finite and storing used fuel on these sites is not sustainable.

The Policy states that Government is responsible for ensuring that investigations are conducted within set timeframes to consider the various options for safe management of used fuel and high level radioactive waste in South Africa. Included in the options for investigation are the following:

- Long-term above ground storage at a central off-site storage facility, e.g. a CISF;
- Reprocessing, conditioning and recycling; and
- Deep geological disposal.

2.2.4 International Atomic Energy Agency Safety Standards

South Africa has been a member state of the International Atomic Energy Agency (IAEA) since it was established in 1957. The Agency works with its member states worldwide to promote the safe, secure and peaceful use of nuclear technologies.

The IAEA safety standards provide a system of Safety Fundamentals, Safety Requirements and Safety Guides, which reflect an international consensus on what constitutes a high level of safety for protecting people and the environment from harmful effects of ionising radiation. The IAEA safety standards are applicable throughout the lifetime of nuclear facilities.

The Safety Fundamentals, General Safety Requirements and General Safety Guides are applicable to all nuclear facilities and activities. These are complemented by Specific Safety Requirements and Specific Safety Guides applicable to specific facilities and activities including:

- Nuclear power plants;
- Fuel cycle facilities;
- Research reactors;
- Radioactive waste disposal facilities;
- Mining and milling;
- Application of radiation sources; and
- Transport of radioactive material.

The TISF will be designed and operated to comply with the relevant general and specific safety requirements applicable to used fuel storage facilities and safe transport of radioactive material in accordance to the IAEA safety standards. Since the TISF will be located within the KNPS, it will also comply with requirements applicable to nuclear power plants.

2.2.5 Western Cape Provincial Spatial Development Framework (2014)

The Western Cape Provincial Spatial Development Framework (SDF) is a spatial planning document that guides district and local spatial initiatives such as Integrated Development Plans (IDPs) and SDFs. The Western Cape Provincial SDF sets out to put in place a coherent framework for the Province's urban and rural areas that:

- Gives spatial expression to the national and provincial development agendas;
- Serves as basis for coordinating, integrating and aligning 'on the ground' delivery of national and provincial departmental programmes;
- Supports municipalities in fulfilling their municipal planning mandate in line with the national and provincial agendas; and
- Communicates government's spatial development intentions to the private sector and civil society.

The Western Cape Provincial SDF does not discuss the KNPS, but it is assumed that as an approved nuclear facility, consideration is given to the KNPS, its operations and related exclusion zones.

2.2.6 City of Cape Town Integrated Development Plan (2012-2017)

The City of Cape Town's (CoCT's) IDP (2012-2017) is a strategic plan that is used to guide the development of the City for a specific period. It guides the planning, budgeting, implementation, management and future decision making processes of the CoCT.

The strategic focus areas (or pillars) of the CoCT's IDP include:

1. The opportunity city;
2. The safe city;
3. The caring city;
4. The inclusive city; and
5. The well-run city.

These five pillars help focus the City's purpose of delivery. The IDP is the City's principal strategic planning instrument, from which various other strategic documents will flow. It informs planning and development in the City.

The CoCT IDP does not discuss the KNPS, but it is assumed that as an approved nuclear facility, consideration is given to the KNPS, its operations and related exclusion zones.

2.2.7 City of Cape Town Spatial Development Framework (2012)

The CoCT SDF (2012) is a long-term plan to guide and manage urban growth, and to balance competing land use demands, by putting in place a "logical development path that will shape the spatial form and structure of Cape Town".

In the medium- to long-term, the CoCT would like to reduce the development impediments and safety risks associated with the KNPS. Specific actions related to this objective include:

- The CoCT, in conjunction with Eskom and the Provincial Government of the Western Cape (PGWC), must update the Integrated Koeberg Nuclear Emergency Plan (KNEP) as required;
- The CoCT, in conjunction with Eskom and the PGWC, must continue to optimise, with a view to sustainability, the requirements in respect of the KNEP; and
- The CoCT must review and update the town planning assessment criteria to ensure that the processing and assessment of development applications within the KNPS emergency planning zones do not compromise the effective implementation of the KNEP.

Key strategies have been identified to guide the preparation of sector plans, lower-order spatial plans, detailed policies, guidelines and implementation plans, and are used to assess development applications. A sub-strategy within Key Strategy 2 is relevant to this EIA: "*Appropriately protect the citizens of Cape Town from hazardous areas/activities*" in which Policy 24 advises to: "*Direct urban growth away from hazardous areas/activities"*.

Relevant guidelines to the KNPS within Policy 24 are:

- All development within the KNPS exclusion zones: Precautionary Action Planning Zone (PAZ): 5 km and Urgent Protective action planning Zone (UPZ): 5-16km from the nuclear reactors must comply with the development controls (Policy 24.4); and

- Any new nuclear power station being developed in Cape Town must be located on the Eskom controlled area at the Koeberg site, and its exclusion zones must be smaller or equal to the existing KNPS' 5 km exclusion zone (Policy 24.5).

Development controls on development in exclusion zones around the KNPS:

- *No new development is permissible within the PAZ other than development that is directly related to the siting, construction, operation and decommissioning of the KNPS or that is a result of the exercising of existing zoning rights.*
- *New development within the UPZ may only be approved subject to demonstration that the proposed development will not compromise the adequacy of disaster management infrastructure required to ensure the effective implementation of the Koeberg Nuclear Emergency Plan.*

These development controls will be superseded by the national regulations on development in the Formal Emergency Planning Zone of the KNPS, when approved.

2.3 Environmental Assessment Process

The general approach to this study is guided by the principles contained in Section 2 of NEMA and those of Integrated Environmental Management (IEM).

NEMA lists a number of principles that apply to the actions of organs of state and that also serve as reference for the interpretation of environmental legislation and administration of environmental processes. The principles most relevant to environmental assessment processes and projects for which authorisation is required are summarised below.

Principles relevant to the EIA process:

- *Adopt a risk-averse and cautious approach;*
- *Anticipate and prevent or minimise negative impacts;*
- *Pursue integrated environmental management;*
- *Involve stakeholders in the process; and*
- *Consider the social, economic and environmental impacts of activities.*

Principles relevant to the project:

- *Place people and their needs at the forefront of concern and serve their needs equitably;*
- *Ensure development is sustainable, minimises disturbance of ecosystems and landscapes, pollution and waste, achieves responsible use of non-renewable resources and sustainable exploitation of renewable resources;*
- *Assume responsibility for project impacts throughout its life cycle; and*
- *Polluter bears remediation costs.*

This S&EIR process complies with these principles through its adherence to the EIA Regulations, 2014, and associated guidelines, which set out clear requirements for, *inter alia,* impact assessment and stakeholder involvement (see below), and through the assessment of impacts and identification of mitigation measures during the Impact Assessment Phase.

In accordance with the IEM Information Series (DEAT, 2004), an open, transparent approach, which encourages accountable decision-making, has been adopted.

Although various environmental authorisations, permits or licences are required before the proposed project may proceed, the regulatory authorities are committed to the principle of cooperative governance and, in order to give effect to this principle, a single S&EIR process is required to inform all applications.

The underpinning principles of IEM require:

- *Informed decision making;*
- *Accountability for information on which decisions are made;*
- *A broad interpretation of the term "environment";*
- *An open participatory approach in the planning of proposals;*
- *Consultation with interested and affected parties;*
- *Due consideration of alternatives;*
- *An attempt to mitigate negative impacts and enhance positive impacts of proposals;*
- *An attempt to ensure that the social costs of development proposals are outweighed by the social benefits;*
- *Democratic regard for individual rights and obligations;*
- *Compliance with these principles during all stages of the planning, implementation and decommissioning of proposals; and*
- *The opportunity for public and specialist input in the decision-making process.*

The study will also be guided by the requirements of the EIA Regulations, 2014 (see Section 2.1.2), which are more specific in their focus and define the detailed approach to the S&EIR process, as well as relevant guidelines published by the DEA and in the absence of national guidelines, the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP), including:

- DEA's Draft Companion to Environmental Impact Assessment Regulations of 2010 (DEA, 2010);
- DEA&DP's EIA Guideline and Information Document Series (DEA&DP, 2013), which includes guidelines on Generic ToR for EAPs and Project Schedules, Public Participation, Alternatives, Need and Desirability, Exemption Applications and Appeals, an information; and
- DEA&DP's "One Environmental Management System" and the 2014 EIA Regulations Circular (DEA&DP, 2014).

The lead authority for this project will be the DEA. Supplementary applications will be made as required for the remaining authorisations.

2.3.1 Submission of Applications

Various environmental authorisations, permits or licences are required before the project may proceed. Some application forms must be submitted at the outset of the S&EIR process (e.g. in terms of the EIA Regulations and NHRA) while licences and permits in terms of the NWA and NNRA are only issued after EA and are submitted towards the end of the EIA process. The required authorisations and their status are listed in Table 2-2.

Table 2-2: EA, permits and licences required for the project

Application	Authority	Status
EA	DEA	Application will be submitted to the DEA in July 2016 in compliance with Section 16 of the EIA Regulations, 2014.
WUL	DWS	*DWS confirmed in May 2016 that no WUL will be required for the project (Appendix B).*
Heritage Application (NID)	HWC	A NID was submitted to HWC in February 2016. *HWC confirmed in March 2016 that no further heritage studies will be required (Appendix C).*

An amendment application to include the TISF in the KNPS' licence will be submitted to the NNR. The amendment application, as well as all stakeholder engagement processes required in terms of the NNRA will be separate from those undertaken for the EIA, and falls outside the scope of the EIA.

2.3.2 S&EIR Process and Phasing

The S&EIR process consists of three phases, namely the Pre-Application Phase, Scoping Phase *(the current phase)* and an Impact Assessment Phase (see Figure 2-1 below).

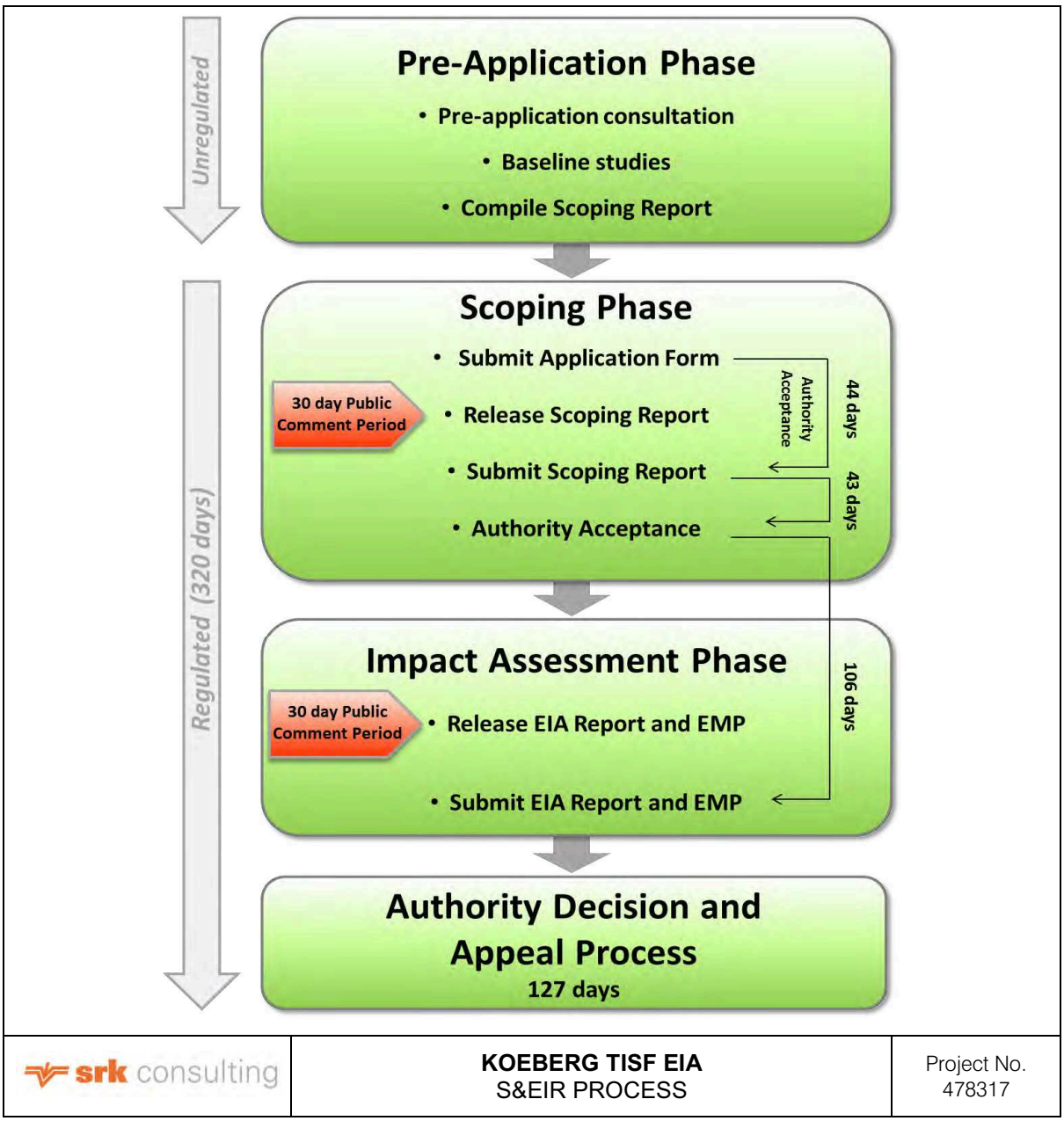


Figure 2-1: S&EIR process

The objectives of the Pre-Application Phase are to:

- *Identify stakeholders, including neighbouring landowners/ residents and authorities;*
- *Compile a Scoping Report describing the affected environment and present an analysis of the potential environmental issues and benefits arising from the proposed project that may require further investigation in the Impact Assessment Phase; and*
- *Develop ToR for specialist studies to be undertaken in the Impact Assessment Phase.*

The objectives of the Scoping Phase are to:

- *Inform stakeholders of the proposed activity, feasible alternatives and the S&EIR process;*
- *Provide stakeholders with the opportunity to participate effectively in the process and identify any issues and concerns associated with the proposed activity, review specialist study ToR and the Plan of Study for EIA; and*
- *Submit the Scoping Report to the relevant authorities (in this case, DEA, NNR, DEA&DP, HWC, DWS, Department of Energy (DoE), CoCT and CapeNature).*

The aims of the Impact Assessment Phase are to:

- *Inform and obtain contributions from stakeholders, including relevant authorities, the public and local communities and address their relevant issues and concerns;*
- *Build capacity amongst stakeholders during the S&EIR process so that they may actively and meaningfully participate;*
- *Document and contextualise the biophysical baseline conditions of the study area and the socio-economic conditions of affected communities;*
- *Assess in detail the potential environmental and socio-economic impacts of the project;*
- *Identify environmental and social mitigation measures to avoid and/or address the impacts assessed; and*
- *Develop and/or amend environmental and social management plans based on the mitigation measures developed in the EIA Report and EMPr.*

3 Project Description

3.1 Introduction

The Koeberg Nuclear Power Station (KNPS) is the only nuclear power station on the African continent. Commencing operations in 1984, it has operated safely for over 31 years and has a further active lifespan of 30 – 40 years.

Eskom's KNPS has two nuclear reactor units (Reactor Unit 1 and Reactor Unit 2) each generating in excess of 900 MW (e). The KNPS supplies approximately 6% of South Africa's total electricity needs and the majority of the requirements of the Western Cape (Eskom fact sheet: Koeberg Power Station). The KNPS has produced more than 81 000 million kWh of electricity since 1984.

How is electricity generated by a nuclear power station?

A nuclear reactor is essentially a heat source. Heat is generated through the nuclear fission process, making use of uranium which is slightly enriched in the isotope uranium-235. Heat is transferred by the primary coolant (water at the KNPS) to steam generators where water from a secondary loop is turned into steam. This steam drives a turbine which is connected to a generator, which uses the rotational energy to generate electricity (Eskom fact sheet: Koeberg Power Station).

Nuclear fuel in the reactor core consists of pellets of enriched uranium dioxide encased in about 4 m long metal tubes, called fuel rods. These fuel rods are bundled in an array to form fuel assemblies. Each reactor at the KNPS uses approximately 157 assemblies over a period of approximately 1.5 years. The KNPS refuels its reactors approximately every 18 months, at which stage approximately one third of the fuel is replaced with new fuel. On average, fuel stays in the reactor for three cycles (i.e. 5 years).

***Nuclear waste** is classified as low, intermediate or high level waste. Vaalputs, situated approximately 600 km north of Cape Town, is the national nuclear waste disposal site for low and intermediate level waste. (Eskom fact sheet: Nuclear Waste).There is currently no national nuclear waste disposal site for high level waste.*

Used fuel is nuclear fuel that has been used in the fission process to the point where it is no longer useful in sustaining a nuclear reaction. The KNPS generates approximately 32 tons of used fuel each year i.e. 1 280 tons over a 40 year lifetime. At the KNPS, the volume of used fuel generated is small by industrial standards and is stored safely so that it does not constitute a health risk to surrounding communities.

At the KNPS, used fuel assemblies are stored under water in storage racks in SPFs. Each reactor has a dedicated SFP which can hold approximately 1 500 assemblies. Water cools the used fuel assemblies and serves as an effective shield to protect workers from radiation in the fuel storage building. A limited number of used fuel assemblies are also stored in the Cask Storage Building (CSB) at the KNPS in 4 dry storage casks.

*The **Centralised Interim Storage Facility** is a proposed central storage facility for used nuclear fuel and waste, to be established by the National Radioactive Waste Disposal Institute.*

The used fuel will ultimately either be sent to a reprocessing facility when uranium and

plutonium extraction becomes economically viable, or it will be disposed of at an approved repository or the long-term off-site storage facility, such as the proposed CISF.

What is Radiation?

Radiation is the process whereby certain atoms emit energy in the form of electromagnetic waves or particles in order to become more stable. Radiation that can produce charged particles ("ions") in both inanimate and living matter can present a health hazard. There are various types of ionising radiation: alpha, beta, neutron and gamma radiation. Alpha radiation is unable to penetrate clothing or skin but can penetrate eyes and open wounds or alpha-emitting substances can be taken into the body by inhalation or with food/water. Beta radiation can pass through 1-2 cm of water or human flesh but a sheet of aluminium a few millimetres thick can stop beta radiation. Neutron radiation occurs inside a nuclear reactor, but efficient shielding against neutrons can be provided by, for example, water. Gamma radiation can pass through the human body but would be almost completely absorbed by one metre of concrete.

Radiation from used fuel assemblies starts decreasing immediately after the fission reaction has stopped and will have decreased by more than 95% within approximately 10 years. (Eskom fact sheet: Radiation).

3.2 Proponent's Project Motivation

The SFPs in which used fuel assemblies are stored at the KNPS are nearing capacity. The SFPs serving Reactor Unit 1 and Reactor Unit 2 will reach capacity by March 2018 and September 2018, respectively.

The Radioactive Waste Management Policy and Strategy for the Republic of South Africa (2005) states that Government is responsible for investigating long-term options for the "safe management of used fuel and high level radioactive waste in South Africa" including the option of a CISF.

***Dry cask storage** is a method of storing used fuel that has already been cooled in the SFP. Casks are typically concrete or steel cylinders which are either welded or bolted closed to provide leak-tight containment of the used fuel. The used fuel assemblies within the casks are surrounded by inert gas and each cylinder is surrounded by additional steel, concrete, or other material to provide radiation shielding to workers and members of the public (www.wikipedia.org).*

Due to the uncertainty regarding the development of the CISF, only likely to be in operation by 2025, it has become imperative for Eskom to investigate interim options for the storage of used fuel on the KNPS site. Additional storage capacity will be required to accommodate any further used fuel generated at the KNPS. Eskom consequently developed the *Koeberg Spent Fuel Storage Project* strategy to cater for the KNPS' needs until 2025 and comprises three phases described below:

- ***Phase 1:***
    - *Phase 1A*: Procurement of seven dry storage metal casks to ensure the Koeberg Reactor Units can operate beyond 2018, without exceeding SFP capacity. A number of used fuel assemblies will be transferred from the SFPs into the new dry storage casks. These casks will be stored with the four existing dry storage casks in the on-site CSB.

- *Phase 1B*: Procurement and placement of spent fuel inserts to gain back the currently unoccupied storage cells in the SFPs due to a checker-boarding arrangement. This will open up previously unusable storage cells in the SFPs, allowing for an increase in the total number of used fuel assemblies that can be stored in the SFPs.

- ***Phase 2:*** Procurement of approximately 30 - 40 additional dry storage casks to allow ongoing operation of the KNPS until 2025.
- ***Phase 3:*** Establishment of the TISF for the storage of the casks procured in Phase 2.

Used fuel assemblies generated beyond 2025 will also be stored in casks at the TISF should the CISF not be available.

The TISF will comprise of concrete pad(s) within a site footprint of approximately 12 800 m^2 and will be designed to accommodate storage of not more than 160 casks, for used nuclear fuel generated at the KNPS up to the end of operational life of the plant.

It is an objective of Phase 3 to commence construction of the TISF by 2018 for the storage of the above-mentioned casks. It is anticipated that the TISF will be operated under the existing KNPS NNR license in terms of the NNRA.

The facility may be established in a modular manner, depending on the availability of a CISF which is proposed for implementation by 2025. However, due to the uncertainty around the development of the CISF, the TISF may be required through to the end of the expected operational life of the KNPS.

It is important to note that the strategy above assumes the CISF is unavailable for use before 2025.

3.3 Description of the Project Area

3.3.1 Site Description

The KNPS is located on a sandy coastline of the West Coast, approximately 27 km north of the Cape Town Central Business District and 1.5 km north of the residential area of Duynefontein. The KNPS is situated on *Cape* Farm Duynefontyn No. 1552 (previously consisting of Farm Duynefontyn No. 34 and Farm No. 1375 which were consolidated by the City of Cape Town in 2015). Access to the KNPS is via the R27 which runs along the property's eastern boundary or alternatively via Otto du Plessis Drive (Figure 3-1).

Cape Farm Duynefontyn No. 1552 (Table 3-1) is owned by Eskom and measures approximately 1 294 ha and is zoned for *Risk Industry* and *Agricultural*.

Table 3-1: Property details

Farm Name/ Erf Number	*Cape* Farm Duynefontyn No. 1552
SG 21 Digit Code	C01600000000155200000
Physical Address	Koeberg Operating Unit, Trunk Road R27, Off West Coast Road, Melkbosstrand, Western Cape

The topography of the area is relatively flat with an active dunefield extending north of the KNPS. A stabilised primary dune inland of the KNPS screens many of the KNPS buildings although the two nuclear reactor units are prominent landmarks in the region.

The vegetation of the area consists of low coastal shrub (Cape Dune Strandveld and Atlantis Fynbos), typical of much of the West Coast. The KNPS is located within the Koeberg Nature Reserve, a 3 000 ha reserve managed by Koeberg Managing Authority. The Atlantic Ocean forms the western boundary of the KNPS.

The TISF will be located within the *Security* Protected Area (*SPA*) of the KNPS (Figure 3-3), a flat area disturbed by previous construction activities and by current operational activities at the KNPS.

*The **Security Protected Area** is a restricted area surrounding the reactor units to which only authorised personnel have access. The SPA is distinct from the protected area status of Koeberg Nature Reserve in terms of the NEM:PAA.*

3.3.2 Surrounding Land Use

There are a variety of land uses surrounding the KNPS including the Duynefontein residential area to the south (~ 1.4 km from the KNPS), the Koeberg Nature Reserve to the north, south and east, and the R27 along the property's eastern boundary (~ 1.8 km from the KNPS) with agricultural activities further east (Figure 3-2).

The KNPS is located within a predominantly natural environment, although there are existing built elements throughout the property including powerlines, office buildings, a visitors centre, weather station, roads and parking areas (Figure 3-2).

Koeberg Nature Reserve

The primary drive for proclaiming the Koeberg Nature Reserve (Figure 3-1) was to support the operation of the KNPS while conserving the natural habitat as far as possible; providing a buffer around the KNPS and maintaining land for future development.

The Koeberg Nature Reserve is surrounded by a private nature reserve, *viz*. Witzands Aquifer Nature Reserve (northeast), the R27 West Coast Road (east), the Duynefontein residential area (south) and the Atlantic Ocean (west). The area incorporates a number of environments which include small wetlands, coastal dune fields, strandveld dune vegetation, sand plain fynbos as well as areas infested with alien vegetation.

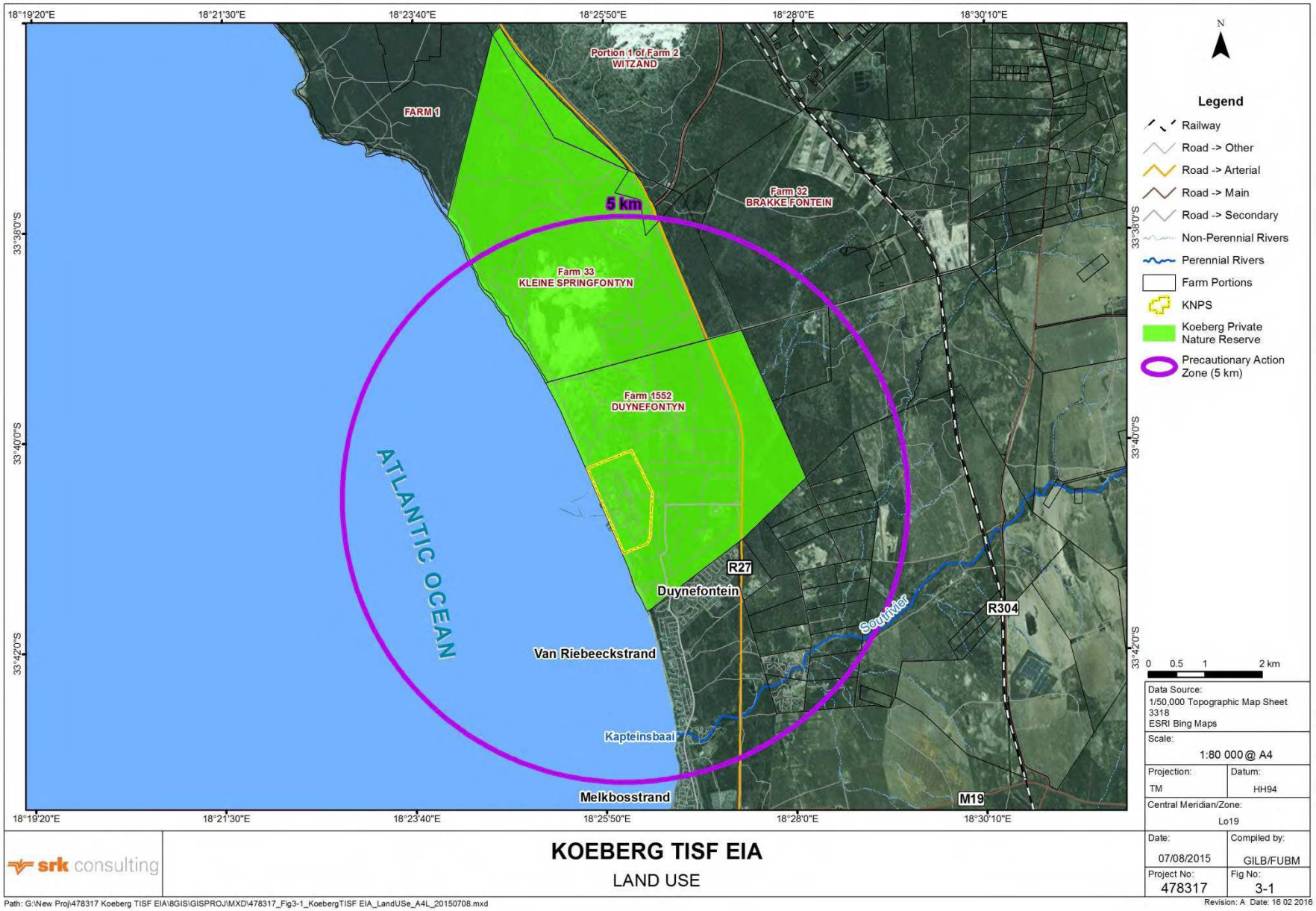
The KNPS Emergency Planning Zones

There are three emergency planning zones around the KNPS: the KNPS **Precautionary Action Zone (PAZ)** (area within a 5 km radius of the KNPS) (Figure 3-1) and the **Urgent Protective Action Zone (UPZ)** (area within a 16 km radius of the KNPS). All development within these emergency planning zones must comply with the relevant development controls (see Section 2.2.7) to ensure the integrity of the Koeberg Nuclear Emergency Plan. The **Long Term Protective Action Zone (LPZ)**, within a radius of 80 km of the KNPS has no specific development restrictions but preparations have been made for emergency procedures in this zone.

3.4 Project Alternatives

Appendix 2 Section 2 (h)(i) of the EIA Regulations, 2014, require that all S&EIR processes must identify and describe 'alternatives to the proposed activity that are feasible and reasonable'. Different types or categories of alternatives can be identified, e.g. location alternatives, type of activity, design or layout alternatives, technology alternatives and operational alternatives. The 'No Go' or 'No Project' alternative must also be considered.

Not all categories of alternatives are applicable to all projects. However, the consideration of alternatives is inherent in the detailed design and the identification of mitigation measures, and therefore, although not specifically assessed, alternatives have been and will be taken into account in the design and S&EIR processes.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33°38'0"S
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33°42'0"S
Portion 1 of Farm 2 WITZAND
FARM 1
Farm 32 BRAKKE FONTEIN
5 km
Farm 33 KLEINE SPRINGFONTYN
Farm 1552 DUYNEFONTYN
ATLANTIC OCEAN
R27
Duynefontein
R304
Southmar
Van Riebeeckstrand
Kapteinsbaai
Melkbosstrand
M19
N
Legend
Railway
Road -> Other
Road -> Arterial
Road -> Main
Road -> Secondary
Non-Perennial Rivers
Perennial Rivers
Farm Portions
KNPS
Koeberg Private Nature Reserve
Precautionary Action Zone (5 km)
0 0.5 1 2 km
Data Source: 1/50,000 Topographic Map Sheet 3318 ESRI Bing Maps
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Projection: TM
Datum: HH94
Central Meridian/Zone: Lo19
Date: 07/08/2015
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Revision: A Date: 16 02 2016

The KNPS from Duynefontein beach

Ridgeline of the primary dune with Duynefontein in the background

Land use east of the KNPS with the R27 in the background

Agricultural land east of the R27 (foreground), Duynefontein left of photo and the KNPS right of photo

Duynefontein right of photo and the KNPS property left of photo

Existing structures in the landscape including administration buildings, radio/cell masts and the KNPS

srk consulting	**KOEBERG TISF EIA** SITE DESCRIPTION AND LAND USES	Project No. 478317

Figure 3-2: Site description and land uses

Source: SRK, 2015

3.4.1 Location Alternatives

Six location alternatives on the Koeberg property were identified and considered during the early feasibility phase of the project, and evaluated in an informal matrix. These included (see Figure 3-3):

- Conservation Area Site;
- Old Car Park Site;

- Dog Kennels Site;
- Old KTC Site;
- CSB Site; and
- Ekhaya Site.

The feasibility of the location alternatives was evaluated against the following key criteria:

- Security and safeguards: the need for adequately controlled land with on-site security staff and procedures;
- Radiation protection: aiming to reduce radiation exposure to as low as reasonably achievable, and avoid, reduce or eliminate any adverse effects on the environment, the public and workers at the facility due to storage activities during the storage timeframe;
- Environmental impact and human factors: aiming to develop the TISF on disturbed land, with minimal impact on terrestrial ecology, and aiming to preserve groundwater and air quality. Human factors considered included human activities, cultural and historical land uses, heritage resources, political, socio-economic and aesthetic acceptability;
- Site characteristics: compatibility of the site with the construction and operation of the TISF without major constraints e.g. geological faults, flood plains, habitats for endangered species or exploitable mineral or energy resources;
- Land size: adequate land to accommodate storage facilities, infrastructure and heavy vehicle movement;
- Protection of used nuclear fuel: protection of the TISF against external threats and hazards including natural phenomena (e.g. earthquakes, potential tsunamis, ground stability, floods etc.) and man-made hazards (e.g. aircraft crashes and chemical explosions);
- Accessibility of the site: including availability of routes and modes of transport allowing for the stored fuel to be moved off-site in the long term; and
- Cost and development time: offering opportunities for cost effective design of the required infrastructure including radiation protection and security requirements.

The site selection process eliminated four sites and identified two viable site locations for the TISF i.e. the CSB site - the preferred alternative (Alternative 1) - and the Ekhaya site (Alternative 2) (Figure 3-3). Alternative 1 is located adjacent to the CSB on the northern boundary of the KNPS and Alternative 2 is located along the southern boundary of the KNPS next to the Ekhaya Building.

Key characteristics of the two sites that were selected as alternatives are that they are:

- Not situated in geological fault areas, or wetlands;
- Not situated in areas with industries presenting high physical risks;
- In areas meeting the national key point security requirements;
- In areas with existing radiological control infrastructure;
- Vacant unused land within the KNPS, zoned as Risk Industry; and
- Situated on the KNPS site[6].

Alternative 1 is Eskom's preferred alternative for the following reasons:

- *It is situated adjacent to an existing radiological zone (low level waste facility);*
- *It is located within a more ecologically disturbed area compared to Alternative 2; and*
- *Less extensive haul road upgrades will be required than for Alternative 2.*

[6] *The identified sites do not include any off-site alternatives.*


18°24'40"E
18°25'8"E
18°25'36"E
18°26'4"E
18°26'32"E
18°27'0"E
33°39'56"S
33°40'24"S
33°40'52"S
33°41'20"S
N
Legend
Access Control Points
Road -> Other
TISF Selected Location Alternatives
TISF Location Alternatives
Security Protected Area
Conservation Site
Alternative 1 (CSB)
ACP2
ACP1
Old Car Park Site
Alternative 2 (Ekhaya)
Dog Kennel Site
Old KTC Site
0 100 200 400 m
Data Source:
1/50,000 Topographic Map Sheet 3318
ESRI Bing Maps
Scale:
1:18 000 @ A4
Projection:
TM
Datum:
HH94
Central Meridian/Zone:
Lo19
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KOEBERG TISF EIA
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3.4.2 The No Go Alternative

The No Go alternative will be considered in the EIA in accordance with the requirements of the EIA Regulations, 2014. The No Go alternative entails no change to the status quo, in other words the proposed TISF will not be built.

3.5 Project Construction and Infrastructure

3.5.1 Introduction

The project design information in this section reflects the information available at the time of the compilation of the Scoping Report. However, since the detailed design and EIA are being undertaken concurrently, it is possible that the project description will evolve and be refined during the final stages of the EIA process.

3.5.2 The TISF

The TISF will be constructed on a portion of vacant land within the KNPS *(SPA).* The TISF will comprise of concrete pad(s) within a site footprint of approximately 12 800m^2. The TISF will be constructed to accommodate 160 dry storage casks, though the dry storage casks will be placed on the pad in a modular manner.

The dry storage casks will be either metal or concrete casks (see Figure 3-4) or concrete assemblies and will be approximately 6 m in length and 3 m in width or diameter. Each cask can hold up to 37 assemblies depending on the cask design. *The dry storage casks are robust and can withstand significant external impact forces such as an aircraft crash.*

The design of the concrete pad(s) of the TISF lends itself to various types of dry storage casking systems. The TISF will also have an auxiliary building to house ancillary equipment.

The TISF will meet the requirements of the NNR and will be built and managed in accordance with the IAEA safety standards.

3.5.3 Perimeter Fence and Security

A secure perimeter fence of approximately 2.3 m in height will be erected around the TISF site with controlled security access. The perimeter fence will be a clear view fence with concrete plinths for supporting poles.

3.5.4 Access Roads

The existing KNPS internal road network will be used to transfer casks from the SFP to the TISF. A portion of new haul road, approximately 100 m in length *and between 4 m and 8 m in width*, will need to be constructed at the entrance to Alternative 1 as indicated on Figure 3-5.

3.5.5 Construction Laydown Area

The construction laydown area will be located within the proposed TISF operational area to reduce the disturbance footprint. Temporary site offices and a parking area for construction vehicles and equipment will be located in this area.

3.5.6 Earthworks

Details of the earthworks (cut and fill) required are not yet available and will depend on site-specific conditions of the selected site alternative (once approved). Concrete piling may be required to comply with seismic requirements.

srk consulting	**KOEBERG TISF EIA** EXAMPLES OF A TISF	Project No. 478317

Figure 3-4: Examples of TISFs
Source (top figure): http://gttsi.com/wp-content/uploads/2015/01/DryCaskStorage.jpg
Source (bottom figure): http://berniesteam.com/wp-content/uploads/2012/12/DSC02774.jpg
Note: These images are provided as examples and are not intended to indicate the selected technology.

3.5.7 Stormwater Management

A conceptual stormwater management plan will be developed to ensure appropriate stormwater management during construction of the TISF. This information will be included in the EIA Report.

3.5.8 Water Supply

The volume of fresh water required for the construction of the TISF has not yet been determined. Required water volumes are not expected to be excessive. *Water will be supplied by the CoCT.*

3.5.9 Power Supply

The source of power during the construction phase has not yet been determined.

3.5.10 Waste Management

Waste produced during the Construction Phase will be typical construction rubble (rock, sand, soil, asphalt and concrete), general waste, dirty / used oil and grease, polluted material and soil and polluted water. Waste management during construction will be the responsibility of the contractor.

All construction waste will be removed from work areas and disposed of at approved and licensed waste disposal facilities. Where possible, options for the reuse or recycling of waste materials will be favoured over disposal.

General waste and waste classified as hazardous (as per Category A, Section 15 of Schedule 3 of the National Environmental Management: Waste Act, 2008) will be separated on site and stored temporarily before being transported to a licenced disposal facility.

3.5.11 Air Quality Management

Sources of emissions during the construction phase will include dust generated by the movement of construction vehicles on cleared areas, drilling and blasting (where required) and bulk earthworks (where required) as well as exhaust emissions from construction vehicles and diesel generators.

Emissions during the construction phase of the project will be limited as far as possible through stabilisation of any exposed areas and watering of cleared areas where dust becomes problematic. Construction vehicles and generators will be maintained in good working order to minimise emissions.

3.5.12 Noise and Vibration Management

Sources of noise and vibration during construction include construction vehicles and generators, as well as drilling and blasting where required. Nuisance impacts of noise, particularly closer to Duynefontein will need to be managed.

3.5.13 Construction Traffic

The construction haul routes will use the existing KNPS internal road network. Construction traffic will include large vehicles / trucks for material delivery. The access of passenger vehicles (for construction workers) will be in accordance with the KNPS security procedures within ACP 2. The number of construction vehicle trips per day is unknown at this stage.

The equipment expected during the construction phase is shown in Table 3-2. This equipment would be delivered to the site (via truck, where required) and will remain on the site for the duration of the construction phase.

Table 3-2: Estimated construction equipment

Equipment	Quantity
Mobile crane	2
Earth moving vehicle	1
Front end loader	2
Dump trucks	3
Pump trucks/batching plant	2
Site vehicle	2

3.5.14 Workforce

It is estimated that the construction of the TISF could create 40 direct temporary jobs. *Unskilled labour will be sourced from the surrounding communities. Workers will be trained to comply with the Eskom Safety, Health, Environmental and Quality (SHEQ) Policy.*

3.5.15 Construction Schedule

It is anticipated that construction of the TISF will commence in 2018 and will take approximately 12 months.

Construction activities are expected to occur during normal working hours of 07h30 to 16h35 and will largely be limited to Mondays to Fridays. Construction activities will only be allowed outside these times where unavoidable, subject to the contractor successfully motivating for an extension.

3.6 Project Operations

3.6.1 Transfer and Storage of Used Fuel

The TISF will accommodate the storage of dry storage casks established in a modular manner as and when required. The 30 - 40 casks procured in Phase 2 of the Koeberg Spent Fuel Storage Project will be progressively placed on the concrete pad(s) once each phase of the TISF construction is complete.

The dry storage casks will accommodate used fuel assemblies removed from the reactor units and cooled in the SFPs. The dry storage system is a passive system which is not reliant on human action or active components to maintain a suitable safety level. Heat generated from used fuel radioactive decay will dissipate through the external surface of the dry casks.

3.6.2 Transfer Routes

The dry storage casks will be transferred from the SFP to the TISF on the existing Koeberg internal road network (Figure 3-5) as well as the new site access road (Section 3.6.4).

3.6.3 Workforce

The number of additional job opportunities created during the operational phase is not known at this stage, however this is unlikely to be significant.

3.6.4 Radiation Management

The current safety case at the KNPS references dry storage casks as Type B(U) packages which are governed by IAEA Safety Standards that includes the implementation of shielding structures. The storage and surveillance of the casks are also performed in accordance with the KNPS RP standard GGS-1304, in order to ensure that the As Low As Reasonably Achievable (ALARA) principle for minimizing radiation exposure, is adhered to. The transportation of casks will

be governed by the IAEA Transport Regulations. The edition of the Transport Regulations approved by the NNR at the time of the establishment of the TISF shall be applied.

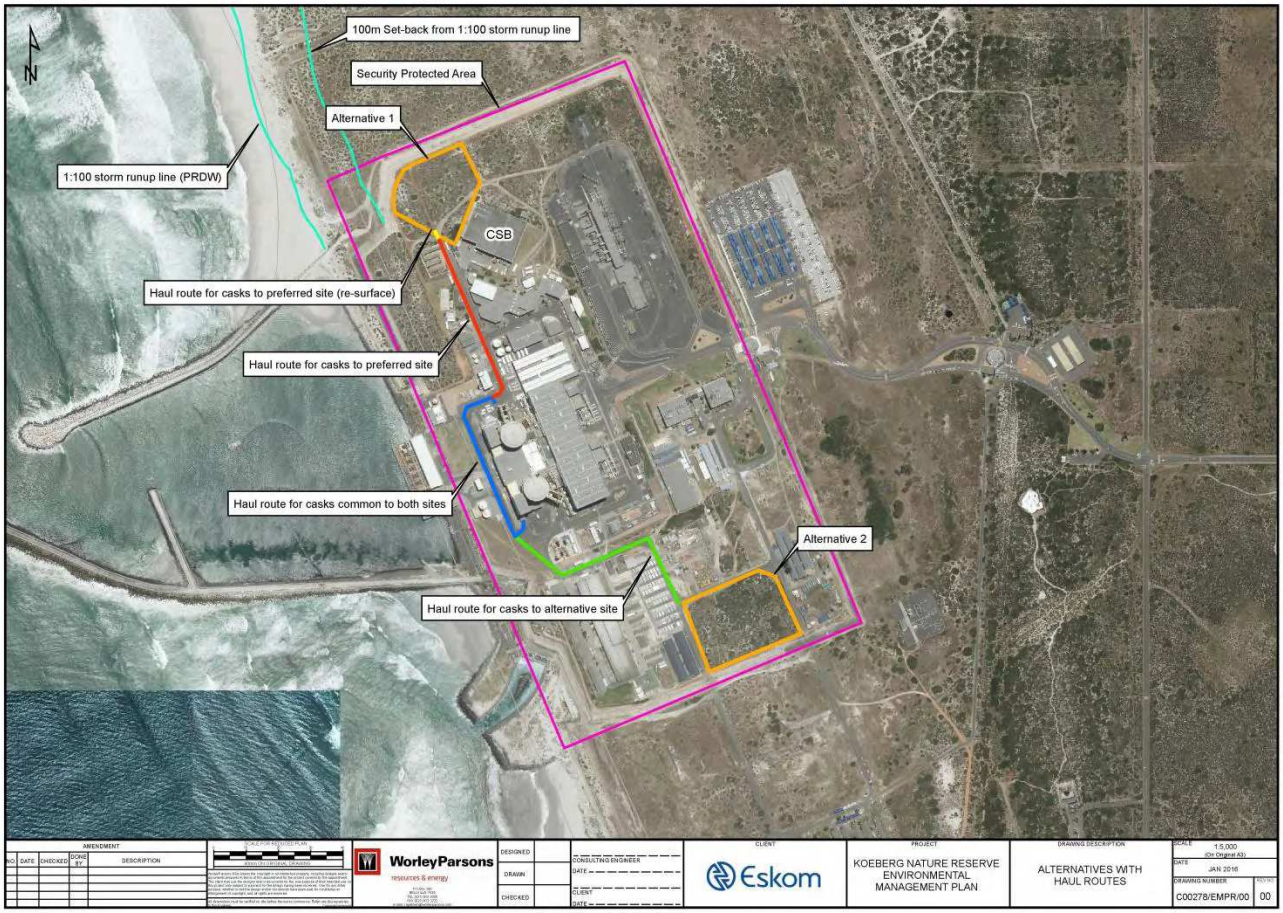


Figure 3-5: Transfer routes from the SFP to the TISF (Alternative 1 and 2)

3.6.5 Emergency Response

Eskom has a comprehensive Emergency Response Plan (ERP) for the KNPS, incorporating multiple procedures and interfaces with local authorities and international entities. The purpose of emergency response planning is to identify potential emergency situations and associated impacts and to define and document appropriate responses. The ERP is well documented and exercised/simulated regularly under the guidance of the NNR.

The introduction of the TISF project *requires* an update to the existing KNPS ERP. The ERP will address various types of emergency situations including security situations, human error and environmental disasters.

3.6.6 Stormwater Management

A conceptual stormwater management plan will be developed for each of the site alternatives and will be finalised once development of the preferred site alternative has received environmental authorisation.

Stormwater will be diverted into the existing KNPS stormwater management system, which was designed with spare capacity and which Eskom has indicated will be able to accommodate additional stormwater volumes generated by the TISF.

3.6.7 Waste Management

No waste will be generated at the TISF during operations, as the TISF is only a storage facility.

3.6.8 Operational Procedures

Eskom has implemented a number of environmental management procedures to prevent the uncontrolled release of pollutants (solid, liquid and gaseous) into the environment, which will continue to be applied during the operational phase. These procedures are implemented by Eskom and its contractors.

3.6.9 SHEQ Policy

Eskom has a SHEQ Policy in place, which is implemented and enforced on all Eskom sites (including KNPS). This policy ensures that SHEQ is an integral part of all operations at the KNPS and that no operating condition, or urgency of service, justifies exposing anyone to negative risks, causing an incident or damage to the environment.

3.6.10 Environmental Awareness

Eskom has an effective environmental awareness communication programme (Public Safety Information Forum) in place for KNPS, which ensures that the surrounding community is well informed of existing operations and future development projects at the KNPS. This system will be used to keep the surrounding community informed during the operation of the TISF.

3.7 Project Decommissioning

The TISF will be decommissioned in accordance with the approved KNPS decommissioning plan.

3.8 Environmental Factors Influencing Project Design

In addition to the potential impact of the proposed project on the surrounding environment, there are a number of environmental factors which could affect the project, and have thus been taken into consideration during the planning and design of the project. Key environmental factors which could influence the project include:

- Climate change and associated sea-level rise; and
- Geological and founding conditions.

These factors were considered during the early feasibility and design stages of the project. Eskom conducted a study to evaluate the feasibility of location alternatives against key criteria (Section 3.5.1) including the protection of the TISF against external environmental threats and hazards (e.g. earthquakes, potential tsunamis, ground stability, floods etc.) and man-made hazards.

Climate change is expected to raise sea level by approximately 1 m over the next century. The TISF will be located at least 150 m from the HWM (Figure 3-5) and inland of a dune system which provides a natural buffer to sea-level rise and potential storm surges/tsunamis.

The alternative sites for the TISF are both located in the KNPS *SPA*, for which the geological and related hazard conditions are well understood. The TISF will be constructed to withstand the maximum expected earthquake magnitude of the area.

4 Description of the Affected Environment

The following chapter presents an overview of the biophysical and socio-economic environment in which the proposed project is located, to:

- Understand the general sensitivity of and pressures on the affected environment;
- Inform the identification of potential issues and impacts associated with the proposed project, which will be assessed during the Impact Assessment Phase;
- Identify gaps in available information to inform specialist study requirements; and
- Start conceptualising practical mitigation measures.

Where site specific information is not available, information is reported on a regional scale, generally the CoCT municipal area.

4.1 Biophysical Environment

4.1.1 Topography

The topography of the KNPS site is relatively flat with a gentle slope towards the coast. The coastal strip is characterised by a sandy shoreline and a large dunefield (consisting of ancient dunes stabilised by vegetation, and more recent unconsolidated dunes) extending northward from the KNPS. From the coastline moving inland, the topography rises gently to a dominant north-south ridgeline of a vegetated primary dune approximately 900 m inland, with an elevation of approximately 35 m above mean sea level (msl). A coastal plain extends east beyond this landform.

The topographical landscape of the KNPS, located on the southern extent of the dunefield, has been significantly modified by previous construction activities. The KNPS site is relatively flat, varying in elevation from 5 m above msl near the coast to approximately 20 m above msl along the eastern boundary.

Both alternative sites currently under investigation for the placement of the TISF are relatively flat but site Alternative 1 has a more pronounced, albeit gentle, slope towards the coast.

4.1.2 Geology

The unconsolidated to semi-consolidated sediments underlying the KNPS site belong to the Sandveld Group, which is subdivided into the Elandsfontyn, Varswater, Velddrif, Langebaan, Springfontyn and Witzand formations. The lithostratigraphy of the Sandveld Group is summarised in Table 4-1 and the surface geology is shown in Figure 4-1. The sediment thickness varies considerably and reaches a maximum thickness of between 40 and 70 m (Dyke, 1992). Boreholes drilled at and around the KNPS indicate a sediment thickness of approximately 22 m.

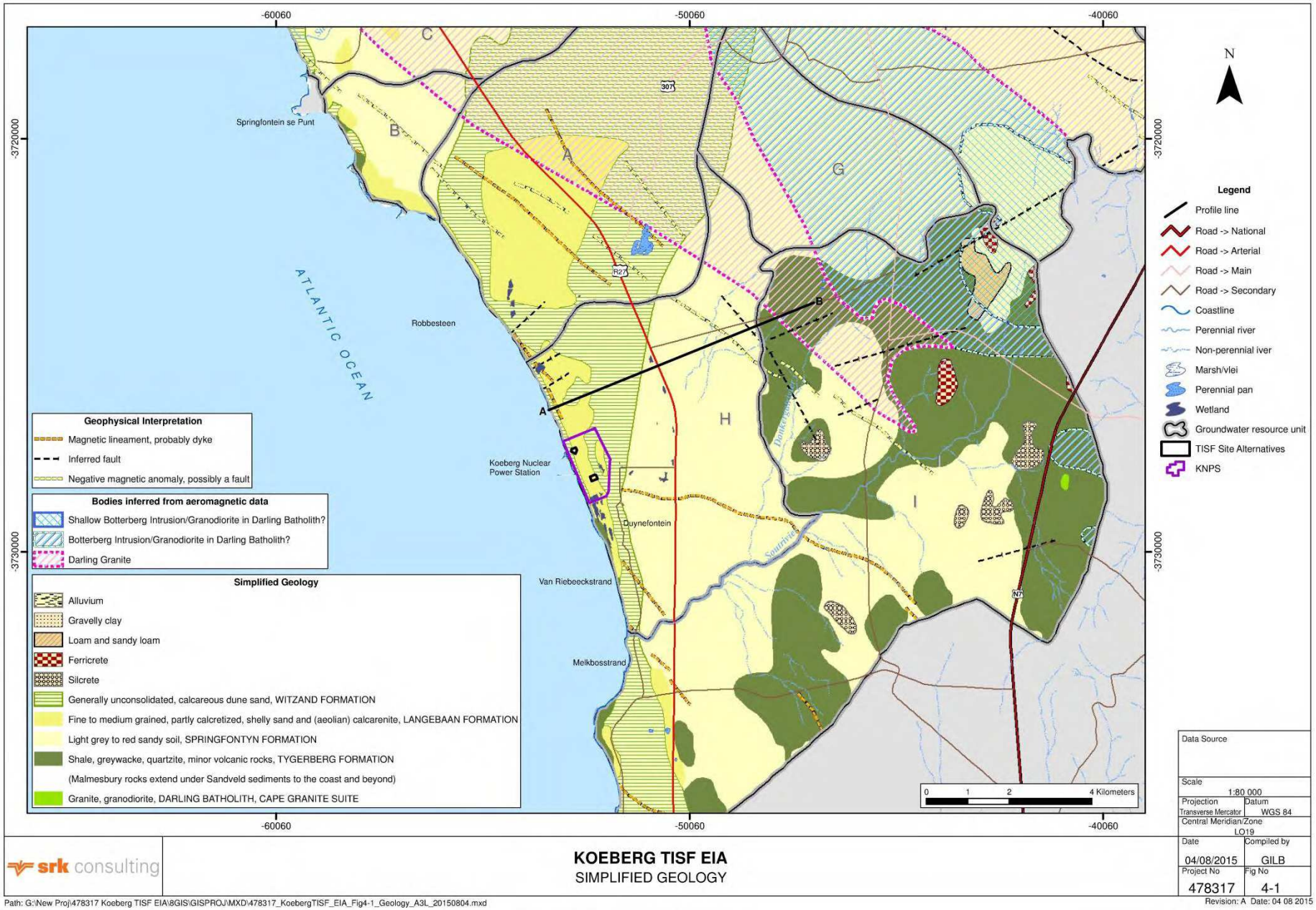
The sediments of the Sandveld Group are underlain by meta-sediments belonging to the Tygerberg Formation of the Malmesbury Group. The Tygerberg Formation consists mainly of alternating greyish, medium to fine grained greywacke and phyllitic shale. Where intruded by the Cape Granite Suite (not present on-site) and narrow dolerite dykes (present on-site), the sediments are baked to massive bluish-grey hornfels along their contacts. These dykes, as well as faults in the vicinity of the site, have been delineated by the Council for Geoscience. The bedrock at the KNPS consists of a steeply dipping, interlaminated and bedded succession of greywacke, siltstone and mudstone, with occasional shale interbeds of the Malmesbury Group. Gradational sequences and contacts are characteristic and the beds grade mainly from coarse to fine grained in upward-fining successions. The degree and depth of weathering varies considerably across the KNPS site. Unweathered greywacke is present within 6 m of the bedrock surface, while weathering of mudstone and siltstone

extends to 26 m below ground level (mbgl) in some places. The bedrock is brecciated along fault zones, and is intensely jointed and often sheared along such fault planes. Quartz veins, pyrite and clay gouges are ubiquitous in the joints and faults, especially where the wall-rocks of the faults are brecciated.

Table 4-1: Summary of the Sandveld Group lithostratigraphy

Formation	Origin	Type	Description	Epoch	Age (Ma)
Witzand	Aeolian	SAND	Fine- to medium-grained, whitish grey to slightly reddish, calcareous, cross-stratified, dune snails, echinoid spicules, forams and comminuted sea shells	Holocene	0.01 to 0
Springfontyn	Aeolian	SAND	Fine- to medium-grained, quartzitic sand, muddy and peaty in places	Pleistocene to Holocene	1.8 to 0.01
Langebaan	Aeolian	CALCAREOUS SANDSTONE	Cross-bedded, fine- to medium-grained, with calcrete layers	Late Pliocene to Late Pleistocene	2 to 0.2
Velddrif	Shallow marine	GRAVEL and SAND	Shelly and pebbly, cross-bedding	Plio-Pleistocene to Late Pleistocene	1.8 to 0.2
Varswater	Estuarine / shallow-marine	SAND	Phosphatic, quartz-sand	Miocene to Pliocene	23 to 5
	Estuarine / shallow-marine	SAND	Non-phosphatic, carbonaceous clay and lignite lenses	Miocene to Pliocene	23 to 5
	Shallow-marine	GRAVEL	Pebbles and cobbles	Miocene to Pliocene	23 to 5
	Estuarine	SAND	Argillaceous (clayey sand / silt)	Middle Miocene	14
Elandsfontyn	Fluvial	SAND and GRAVEL	Angular clasts, carbonaceous clay and lignite lenses	Early to Middle Miocene	23 to 14

Source: after Johnson et al., 2006 in SRK, 2015a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-50060
-40060
-3720000
-3730000
N
Springfontein se Punt
Robbesteen
ATLANTIC OCEAN
Koeberg Nuclear Power Station
Duynefontein
Van Riebeeckstrand
Melkbosstrand
Duine Fontein
Sourfontein
A
B
C
G
H
I
307
R27
N7
0 1 2 4 Kilometers
Legend
Profile line
Road -> National
Road -> Arterial
Road -> Main
Road -> Secondary
Coastline
Perennial river
Non-perennial iver
Marsh/vlei
Perennial pan
Wetland
Groundwater resource unit
TISF Site Alternatives
KNPS
Geophysical Interpretation
Magnetic lineament, probably dyke
Inferred fault
Negative magnetic anomaly, possibly a fault
Bodies inferred from aeromagnetic data
Shallow Botterberg Intrusion/Granodiorite in Darling Batholith?
Botterberg Intrusion/Granodiorite in Darling Batholith?
Darling Granite
Simplified Geology
Alluvium
Gravelly clay
Loam and sandy loam
Ferricrete
Silcrete
Generally unconsolidated, calcareous dune sand, WITZAND FORMATION
Fine to medium grained, partly calcretized, shelly sand and (aeolian) calcarenite, LANGEBAAN FORMATION
Light grey to red sandy soil, SPRINGFONTYN FORMATION
Shale, greywacke, quartzite, minor volcanic rocks, TYGERBERG FORMATION
(Malmesbury rocks extend under Sandveld sediments to the coast and beyond)
Granite, granodiorite, DARLING BATHOLITH, CAPE GRANITE SUITE
srk consulting
KOEBERG TISF EIA
SIMPLIFIED GEOLOGY
Data Source
Scale 1:80 000
Projection Transverse Mercator
Datum WGS 84
Central Meridian/Zone LO19
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4.1.3 Climate

The Western Cape has a semi-arid Mediterranean climate, which is strongly influenced by the cold Benguela Current and coastal winds. The Cape Town area is characterised by dry warm summer months (October to April) and wetter cool winter months (from May to September).

4.1.3.1 Rainfall

The average annual rainfall recorded at the KNPS from 1980 to 2014 is 382 mm per annum (Table 4-2), whilst a maximum of 640 mm was recorded in 1987 and a minimum of 242 mm in 2000 (Figure 4-2). Maximum average rainfall occurs during June (*c*.70 mm), July (*c*.65 mm) and August (*c*.57 mm), while the lowest average rainfall occurs during January (*c*.10 mm) and February (*c*.8 mm). Maximum monthly rainfall measured during this period occurred during June 1994 (157.4 mm), July 2001 (162.4 mm) and August 2013 (160.7 mm).

Fog is a regular occurrence along the West Coast during the summer months and can drift as far as 3 km inland.

Table 4-2: Monthly rainfall data recorded at the KNPS from 1980 to 2014

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	10.2	8.5	12.6	32.4	45.6	70.5	64.5	57.1	34.0	18.3	16.6	11.6	382.1
Minimum	0.0	0.0	0.0	2.8	1.3	12.0	22.8	12.8	2.5	0.6	0.4	0.3	242.4
Maximum	67.6	42.0	48.4	107.8	98.2	157.4	162.4	160.7	75.0	114.8	67.8	32.8	640.4
Median	5.5	5.5	7.2	29.0	38.9	68.5	57.3	54.2	30.0	13.4	13.0	8.6	365.0

Source: Eskom, 2014 in SRK, 2015

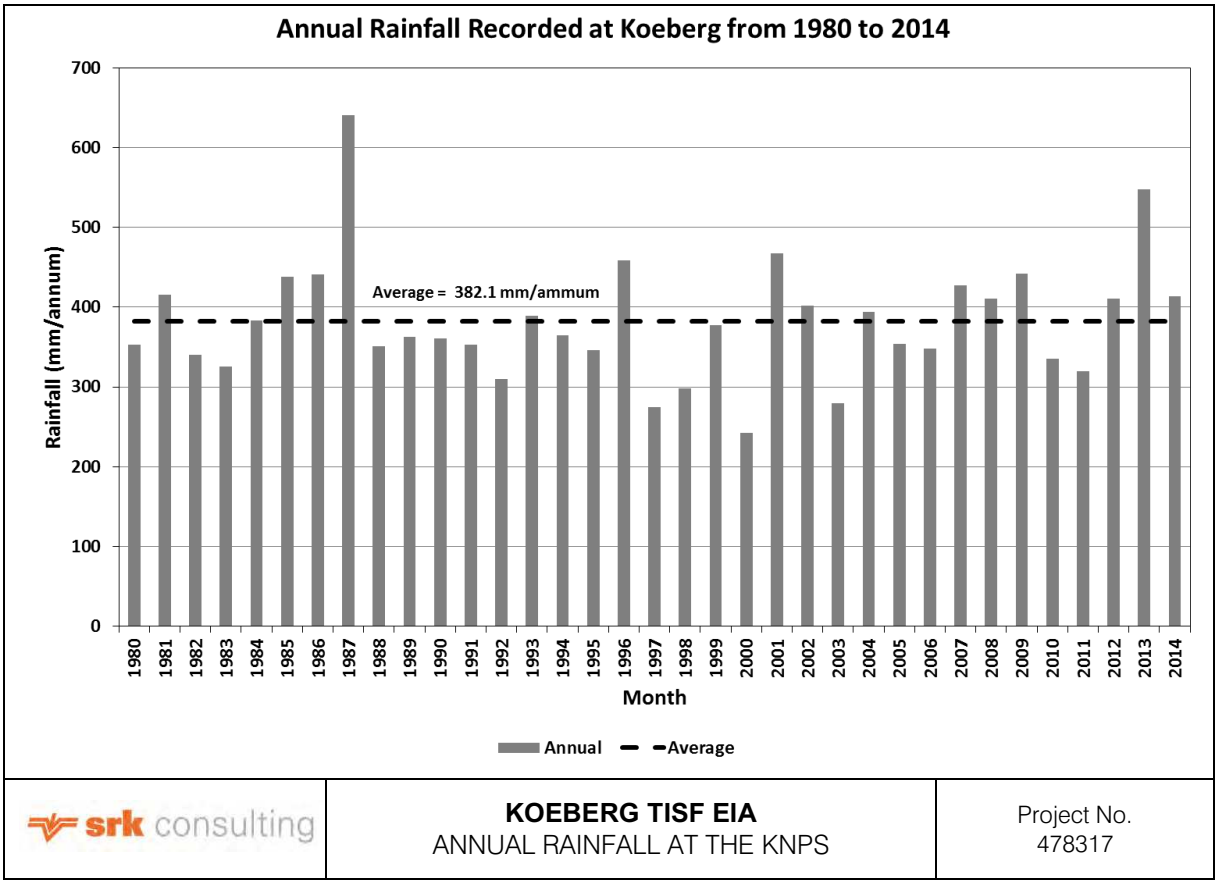


Figure 4-2: Variation in annual rainfall at the KNPS

Source: SRK, 2015

4.1.3.2 Ambient Temperature

Summers are hot and dry with an average daily maximum temperature of 28 ºC in summer. Winter months are cold and wet with an average daily maximum temperature of 17°C. July is typically the coldest month and February the hottest month of the year.

4.1.3.3 Wind

The predominant wind in the area is from the south-west in summer, followed by winds from the north-east in winter. Summer wind speeds are generally higher than those during winter.

4.1.4 Air Quality

There are no significant sources of air pollution in the area. Farming activities generate limited emissions, mainly airborne particulates. It is therefore expected that air quality in the project area is good.

4.1.5 Noise

There are no significant sources of noise in the area, aside from noise propagated by vehicles travelling along the R27. Along the coast, noise generated by wave action is likely to result in higher than normal ambient noise levels, especially during rough sea conditions.

The residents of Duynefontein are the closest sensitive noise receptors to the KNPS.

4.1.6 Hydrology and Surface Water

The KNPS falls within quaternary catchment G21B and in the Berg Water Management Area.

No watercourses flow through the KNPS or the surrounding Koeberg Nature Reserve. The Sout River (and its tributary, the Donkergat River) and Diep River drain the broader area. These rivers all flow in a south-westerly direction towards the coast, but are generally ephemeral in nature. The mouth of the Sout River is at Melkbosstrand, approximately 3.8 km south of the Koeberg Nature Reserve.

The only area in the vicinity of the KNPS where the terrain is sufficiently low-lying to support significant areas of wetland habitat occurs 1.5 km south of the site (SRK, 2014). The slack areas between a series of low lying east-west oriented dunes give rise to a mosaic system of alkaline dune-slack wetlands (Day, 2007a) (Figure 4-3). These dune wetlands are fed primarily by seasonal fluctuations in the water table, forming pools of shallow, brackish water during winter. These wetlands are dry in summer when the water table drops. The wetlands are considered of high local and regional importance, although their similarity to other wetlands north of the KNPS has not yet been established (Day, 2007a). A few other seasonal wetlands occur in isolated areas to the north and east of the KNPS (Figure 4-3).

In addition to the natural wetlands that occur within the nature reserve, the property also includes a number of artificial wetland areas, which are the product of activities associated with the construction of the KNPS e.g. borrow pits (Figure 4-3). A series of coastal infiltration basins, which have been excavated between the dunes 3 km north of the site for disposal of wastewater are highly artificial habitats, comprising deep, permanent, open water bodies, vegetated by species that thrive under conditions of nutrient enrichment (Day, 2007a and Day, 2007b). The coastal infiltration basins are unnatural water features of low quality, but locally rare, permanent freshwater habitat, artificially contributing to plant and animal diversity in the area. They play an important role in terms of providing a hydraulic barrier for the protection of the Atlantis Aquifer from seawater intrusion (Day, 2007a).

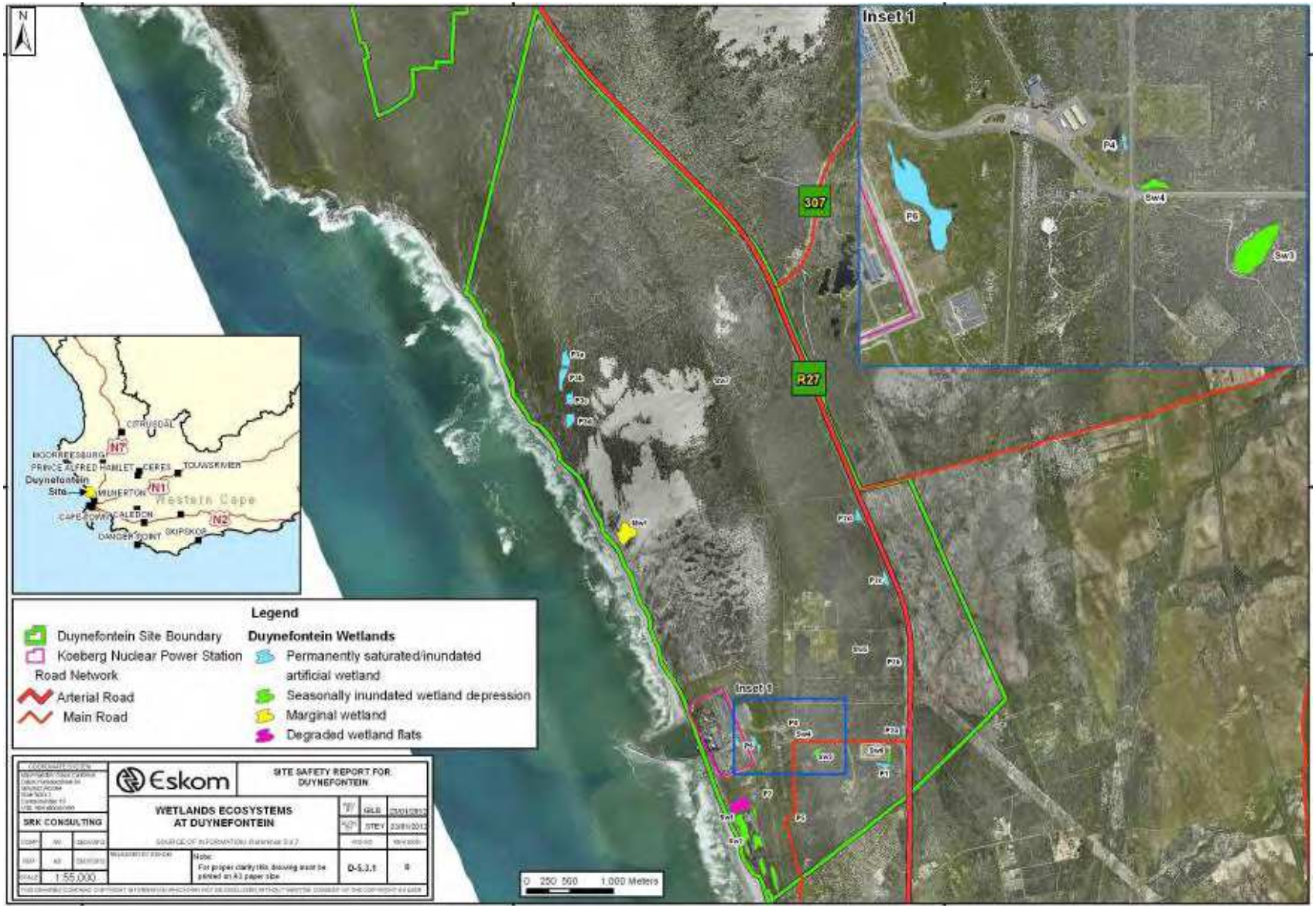


Figure 4-3: Wetlands occurring in the Koeberg Nature Reserve

Source: Koeberg Nature Reserve Management Authority, 2014

4.1.7 Hydrogeology

This section is based on the Geohydrology Baseline Assessment by SRK Consulting, 2015.

The KNPS falls within the Duynefontein Groundwater Resource Unit (GRU) which extends from the edge of the Atlantis industrial area southwards to the Sout River near Van Riebeeckstrand. The western and eastern boundaries of the GRU are formed by the coastline and outcrops of the Tygerberg Formation rocks, respectively. The GRU is predominantly covered by geologically younger sediments of the Witzand and Springfontyn formations.

4.1.7.1 Aquifer Types

Groundwater in and around the KNPS occurs in two aquifers (Figure 4-4), namely:

- An upper unconfined primary (intergranular) aquifer locally known as the Atlantis Aquifer; which forms part of the more extensive Sandveld Aquifer, and
- A deeper semi-confined secondary fractured bedrock aquifer known as the Malmesbury Group Aquifer.

The Atlantis Aquifer is an important and significant primary aquifer with two wellfields (Witzand and Silwerstroom) situated >5 km north of the KNPS supplying water to the surrounding towns (predominantly to Atlantis). Numerous boreholes exist around the KNPS (Figure 4-4).

Only the upper Sandveld Aquifer is discussed in the subsections below as the deeper Malmesbury Group Aquifer will not be impacted by the project for the following reasons:

- The Malmesbury Aquifer is separated from the Sandveld Aquifer by a c.5 m thick clay layer. This clay layer forms a low permeable confining barrier to downward migration of any potential contaminants.
- The Malmesbury Aquifer is a confined aquifer with an upward flow gradient which prevents downward movement of potential contaminants from the upper unconfined Sandveld Aquifer into the Malmesbury Aquifer.

4.1.7.2 Depth to Groundwater

Seasonal rainfall variation does not significantly affect groundwater flow direction or groundwater levels at the site. The influence of tides may impact on temporal variations in groundwater levels. Based on previous observations, groundwater levels west of the KNPS fluctuated by some 0.55 m during construction of the power units and by 0.70 m within the foundation area of the units (Dames and Moore, 1975a and Dames and Moore, 1975b).

Monitoring data for boreholes in close proximity to the KNPS since 1985 show no indication of significantly declining water levels. It is, therefore, apparent that groundwater levels have not been negatively impacted by abstraction from the Witzand or Aquarius wellfields (SRK, 2014). Seasonal trends are evident, as is the temporary influence of pumping.

The water table ranges between 2 and 5 mbgl. The depth to groundwater inversely mimics surface topography i.e. the higher the topography, the deeper the water table. Seasonal and tidal impacts are the dominant factors influencing local groundwater level fluctuations.

The depth to water table at Alternative 1, based on previous measurements in the area, is expected to be between 3 and 4 mbgl. Water depths measured at boreholes close to Alternative 2 indicate the water depth varied between 2.28 and 3.31 mbgl (SRK, 2010).

It is predicted that global warming will cause a future increase in sea levels worldwide (SRK, 2014). Modelling of potential sea level rise at the KNPS indicates a possible rise in sea level of about 1.2 m over the next 50 years (Bates *et al*, 2008). Groundwater levels at Alternative 1 could rise between 0.9 and 0.8 m and at Alternative 2 between 0.7 and 0.6 m, with effects (0.1 m) being propagated up to about 1 000 m inland (SRK, 2014).

4.1.7.3 Groundwater Flow

Using the available water level elevation data from the numerous boreholes around the KNPS, a detailed site groundwater level contour map was compiled (Figure 4-5). These contours indicate the direction of groundwater flow to be from the interior, across the KNPS in a south-westerly direction towards the coast, with discharge into the ocean. Groundwater flows under a relatively low gradient at a calculated flow rate of 2.6 m per day, which indicates a relatively quick migration across the KNPS, towards the coastline.

4.1.7.4 Aquifer Recharge

Estimates of recharge (as a percentage of rainfall) in the vicinity of the KNPS have previously been made by Bredenkamp and Vandoolaeghe (1982), Vandoolaeghe and Bertram (1982), Bertram et al., (1984), Fleisher (1990) and Fleisher and Eskes (1992). Average recharge was estimated to be between 10 and 30 % of mean annual precipitation (MAP). The recharge in the Duynefontein GRU was estimated to be 15 % of MAP (Woodford, 2007). Following a review of all available recharge estimates for this assessment, a site recharge figure of 15 % is considered to be representative.

Due to the unconfined nature of the upper sediments, recharge takes place over the entire area (Figure 4-6).

4.1.7.5 Borehole Yields and Groundwater Use

The Atlantis Aquifer is a highly productive aquifer with borehole yields of >10 L/s being obtained from production boreholes in the Witzand and Silwerstroom Wellfields, which are located >5 km north of the KNPS (Figure 4-7). Borehole yields in the range of 0.5 to 5 L/s are common in the sands underlying the KNPS (SRK, 2014).

The town of Atlantis has been largely dependent on groundwater for its water supply since 1976. Groundwater is abstracted from the aquifer at 40 boreholes in the Witzand and Silwerstroom Wellfields (Figure 4-7), softened at a water treatment plant and then distributed for domestic and industrial use (Flanagan and Parsons, 2005). Two basins situated in the dunes to the south-west of Atlantis, which serve as final retention ponds for intermediate quality stormwater and treated domestic wastewater, provide for the artificial recharge of the aquifer some 500 m up-gradient of the Witzand Wellfield (Wright and Parsons, 1994).

Based on data received from the CoCT, 2.6 Mm^3/a of groundwater was abstracted from the two wellfields in 2007, significantly less than what was estimated during previous years (SRK, 2014). The reduced yields and the reduced abstraction productivity of the two wellfields are a result of iron-related clogging. The CoCT is planning to rehabilitate and clean the boreholes to return borehole yields back to their initially determined sustainable yields (SRK, 2014). There are no visible signs of any negative impacts caused by groundwater abstraction from the Atlantis Aquifer, and the Silwerstroom spring is still flowing in spite of continued groundwater abstraction from the Silwerstroom Wellfield (Parsons, 1999). The discharge rate of the Silwerstroom spring was estimated to be 0.5 Mm^3/a during 1992 (Fleisher and Eskes, 1992). The Atlantis Aquifer is fully allocated and no further development or increased abstraction (other than rehabilitating the existing boreholes) will be allowed (Van der Berg et al., 2007).

Groundwater is used in the vicinity of the KNPS as a source of water for smallholdings, brickmaking and sand mining (SRK, 2014). Groundwater is predominantly used for small-scale vegetable farming, water for horses and irrigation of commercial lawn. There are approximately 1 000 erven in Duynefontein, of which about 75 % have wellpoints installed for garden irrigation (SRK, 2014). An average of some 230 m^3 per annum of groundwater per erf is abstracted via wellpoints from the primary aquifer, assuming gardens are irrigated each day. This equates to 173 000 m^3 per annum of groundwater being abstracted from the area south of the KNPS.

Some 30 000 m^3 per annum of groundwater is abstracted from four boreholes along the Aquarius Wellfield. The groundwater from these boreholes is currently used for stock watering and irrigation purposes, as well as to supply the dam at the conservation offices at the KNPS. These boreholes were initially drilled to supply water to the KNPS. However, as the groundwater is relatively saline, the use of these boreholes was temporarily abandoned as desalination by reverse osmosis was not cost-effective (Eskom, 2006a). It was previously estimated that 0.5 Mm^3/a of groundwater was abstracted from the Aquarius Wellfield (Parsons, 1999). The four boreholes were re-commissioned at the beginning of 2007.

Seventeen monitoring boreholes are situated around the reactors at the KNPS. These boreholes are solely used for groundwater monitoring purposes, as are three piezometers installed in some of the wetlands on site.

4.1.7.6 Aquifer Classification and Vulnerability

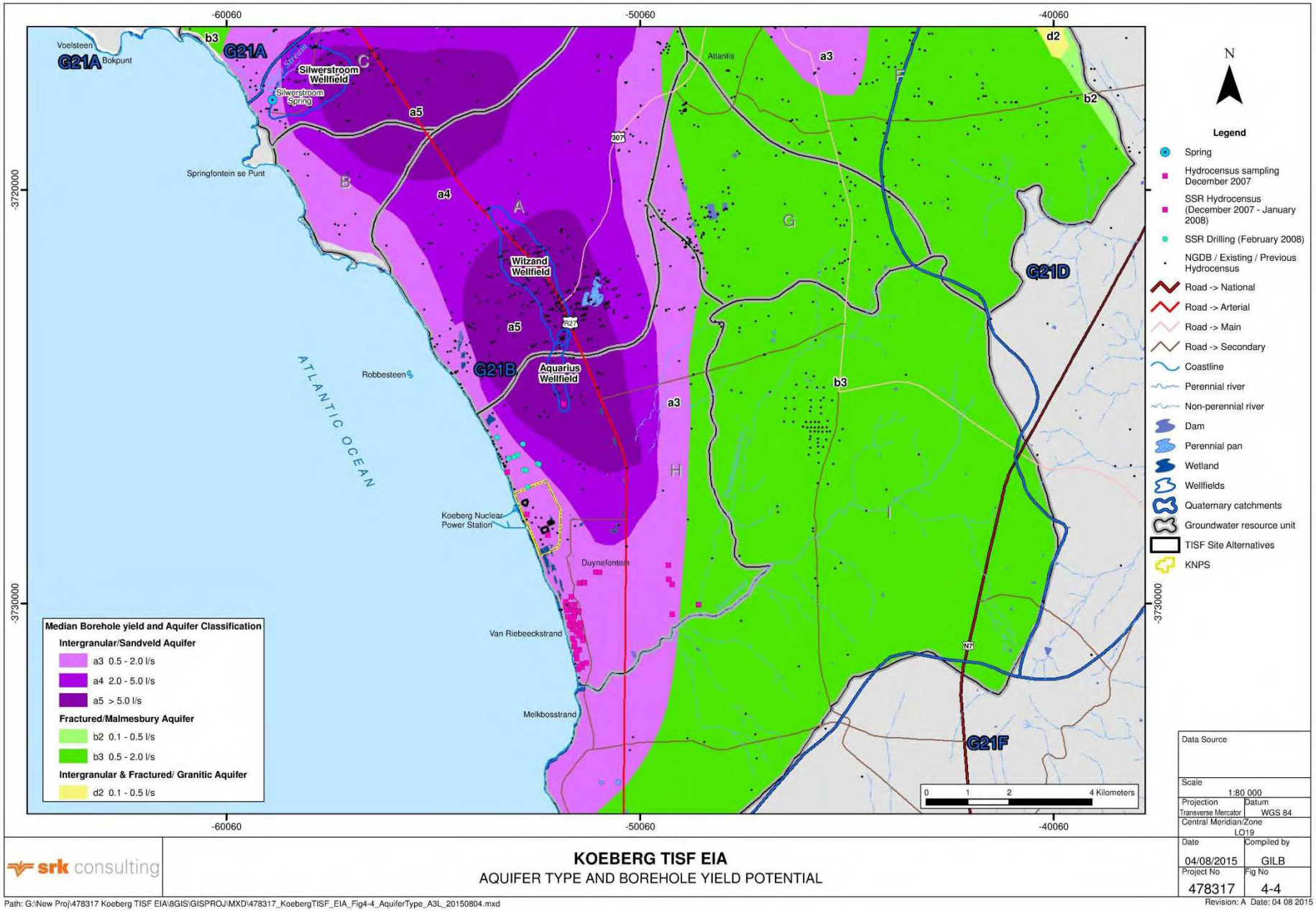
The Atlantis portion of the Sandveld Aquifer is classified as a Sole Source aquifer system (Parsons 1995 and Parsons and Conrad, 1998). Although smallholdings in the vicinity of the site are dependent on groundwater, a reticulated pipeline was installed in 2002. The primary aquifer system towards the east of the site is therefore classified as a Major Aquifer system with high vulnerability to anthropogenic impacts (Parsons and Flanagan, 2006). Its vulnerability is mainly due to its shallow unconfined water table and high permeability. The Sandveld Aquifer beneath the KNPS similarly has a high vulnerability due to its shallow water table and high permeability.

4.1.7.7 Groundwater Quality

The groundwater of the Sandveld Aquifer was classified as Class A type (Electrical Conductivity [EC] <70 mS/m) (Vandoolaeghe and Bertram, 1982). The groundwater is generally of a sodium (Na) - chloride (Cl) type, but younger groundwater in the vicinity of the site shows a calcium (Ca) - bicarbonate (HCO_3) character (Parsons, 1999). Interpretation of groundwater quality data collected in the area confirms that groundwater quality in the vicinity of the KNPS has a Na-Cl character, as is typical of groundwater in coastal environments. Based on monitoring data and previous investigations, groundwater in close proximity to the KNPS also shows a magnesium (Mg) - sulfate (SO_4) and Mg-Cl character.

Groundwater salinity (indicated as EC in mS/m) across the study area is indicated in Figure 4-8. Based on field measurements, EC at the KNPS ranges between 85 and 215 mS/m, while at the Aquarius Wellfield, it ranges from 135 to 200 mS/m (Jolly and Hartley, 1996). Groundwater quality monitoring data available for the Witzand Wellfield indicates that EC levels vary between 50 and 250 mS/m in the vicinity of the KNPS (Figure 4-8).

The quality of the groundwater is a direct result of the closeness of these aquifers to the ocean, i.e. at the end of the flow path and influence of frontal rainfall recharge and sea-spray / aerosols.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-3730000
Voelsteen
Bokpunt
G21A
b3
G21A
Silwerstroom Wellfield
Silwerstroom Spring
a5
Springfontein se Punt
B
a4
A
C
Witzand Wellfield
a5
R27
G21B
Aquarius Wellfield
Robbesteen
ATLANTIC OCEAN
a3
H
Koeberg Nuclear Power Station
Duynefontein
Van Riebeeckstrand
Melkbosstrand
Atlantis
a3
d2
b2
307
G
G21D
b3
N7
G21F
F
I
N
Legend
Spring
Hydrocensus sampling December 2007
SSR Hydrocensus (December 2007 - January 2008)
SSR Drilling (February 2008)
NGDB / Existing / Previous Hydrocensus
Road -> National
Road -> Arterial
Road -> Main
Road -> Secondary
Coastline
Perennial river
Non-perennial river
Dam
Perennial pan
Wetland
Wellfields
Quaternary catchments
Groundwater resource unit
TISF Site Alternatives
KNPS
Median Borehole yield and Aquifer Classification
Intergranular/Sandveld Aquifer
a3 0.5 - 2.0 l/s
a4 2.0 - 5.0 l/s
a5 > 5.0 l/s
Fractured/Malmesbury Aquifer
b2 0.1 - 0.5 l/s
b3 0.5 - 2.0 l/s
Intergranular & Fractured/ Granitic Aquifer
d2 0.1 - 0.5 l/s
0 1 2 4 Kilometers
Data Source
Scale
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Projection
Transverse Mercator
Datum
WGS 84
Central Meridian/Zone
LO19
Date
04/08/2015
Compiled by
GILB
Project No
478317
Fig No
4-4
srk consulting
KOEBERG TISF EIA
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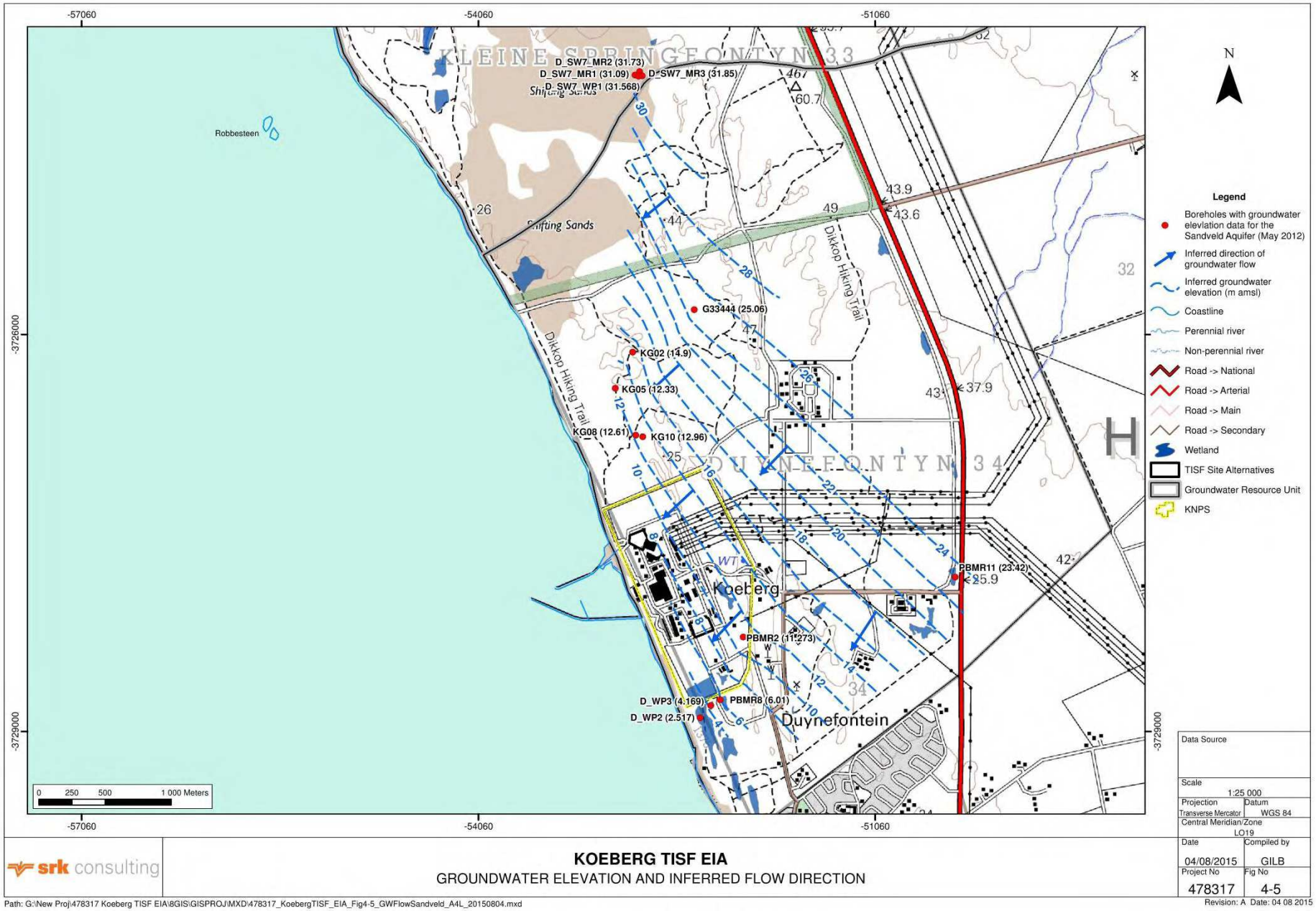
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-54060
-51060
-3726000
-3729000
KLEINE SPRINGFONTYN 33
DUYNEFONTYN 34
D_SW7_MR2 (31.73)
D_SW7_MR1 (31.09)
D_SW7_MR3 (31.85)
D_SW7_WP1 (31.568)
Robbesteen
Shifting Sands
Dikkop Hiking Trail
G33444 (25.06)
KG02 (14.9)
KG05 (12.33)
KG08 (12.61)
KG10 (12.96)
PBMR11 (23.42)
PBMR2 (11.273)
PBMR8 (6.01)
D_WP3 (4.169)
D_WP2 (2.517)
Koeberg
Duynefontein
WTP
H
N
Legend
Boreholes with groundwater elevlation data for the Sandveld Aquifer (May 2012)
Inferred direction of groundwater flow
Inferred groundwater elevation (m amsl)
Coastline
Perennial river
Non-perennial river
Road -> National
Road -> Arterial
Road -> Main
Road -> Secondary
Wetland
TISF Site Alternatives
Groundwater Resource Unit
KNPS
0 250 500 1 000 Meters
Data Source
Scale 1:25 000
Projection Transverse Mercator
Datum WGS 84
Central Meridian/Zone LO19
Date 04/08/2015
Compiled by GILB
Project No 478317
Fig No 4-5
srk consulting
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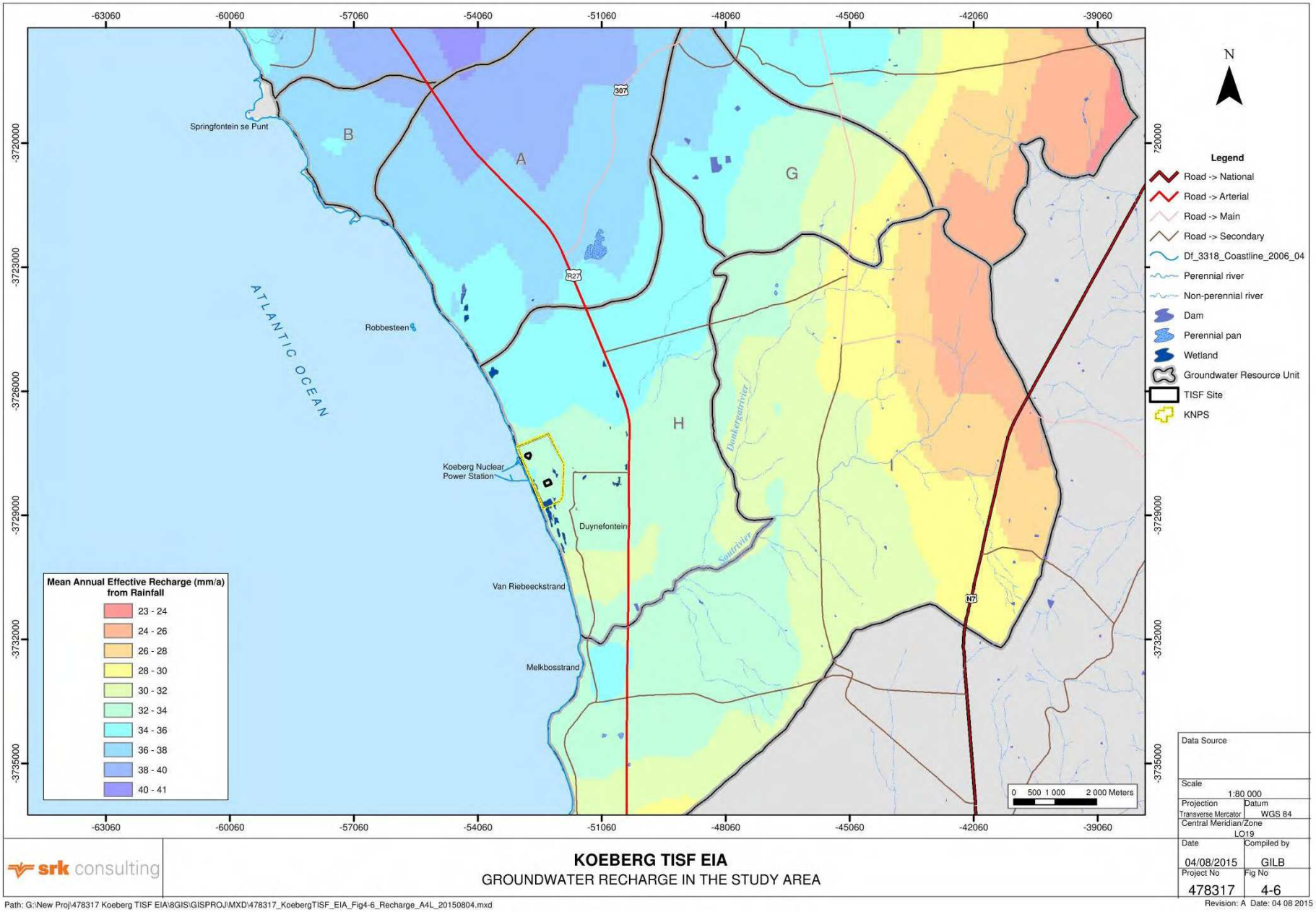
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-42060
-39060
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-3729000
-3732000
-3735000
N
Springfontein se Punt
B
A
G
H
I
307
R27
N7
ATLANTIC OCEAN
Robbesteen
Koeberg Nuclear Power Station
Duynefontein
Van Riebeeckstrand
Melkbosstrand
Dunkerpatrivier
Southrivier
Legend
Road -> National
Road -> Arterial
Road -> Main
Road -> Secondary
Df_3318_Coastline_2006_04
Perennial river
Non-perennial river
Dam
Perennial pan
Wetland
Groundwater Resource Unit
TISF Site
KNPS
Mean Annual Effective Recharge (mm/a) from Rainfall
23 - 24
24 - 26
26 - 28
28 - 30
30 - 32
32 - 34
34 - 36
36 - 38
38 - 40
40 - 41
0 500 1 000 2 000 Meters
Data Source
Scale
1:80 000
Projection
Transverse Mercator
Datum
WGS 84
Central Meridian/Zone
LO19
Date
04/08/2015
Compiled by
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Project No
478317
Fig No
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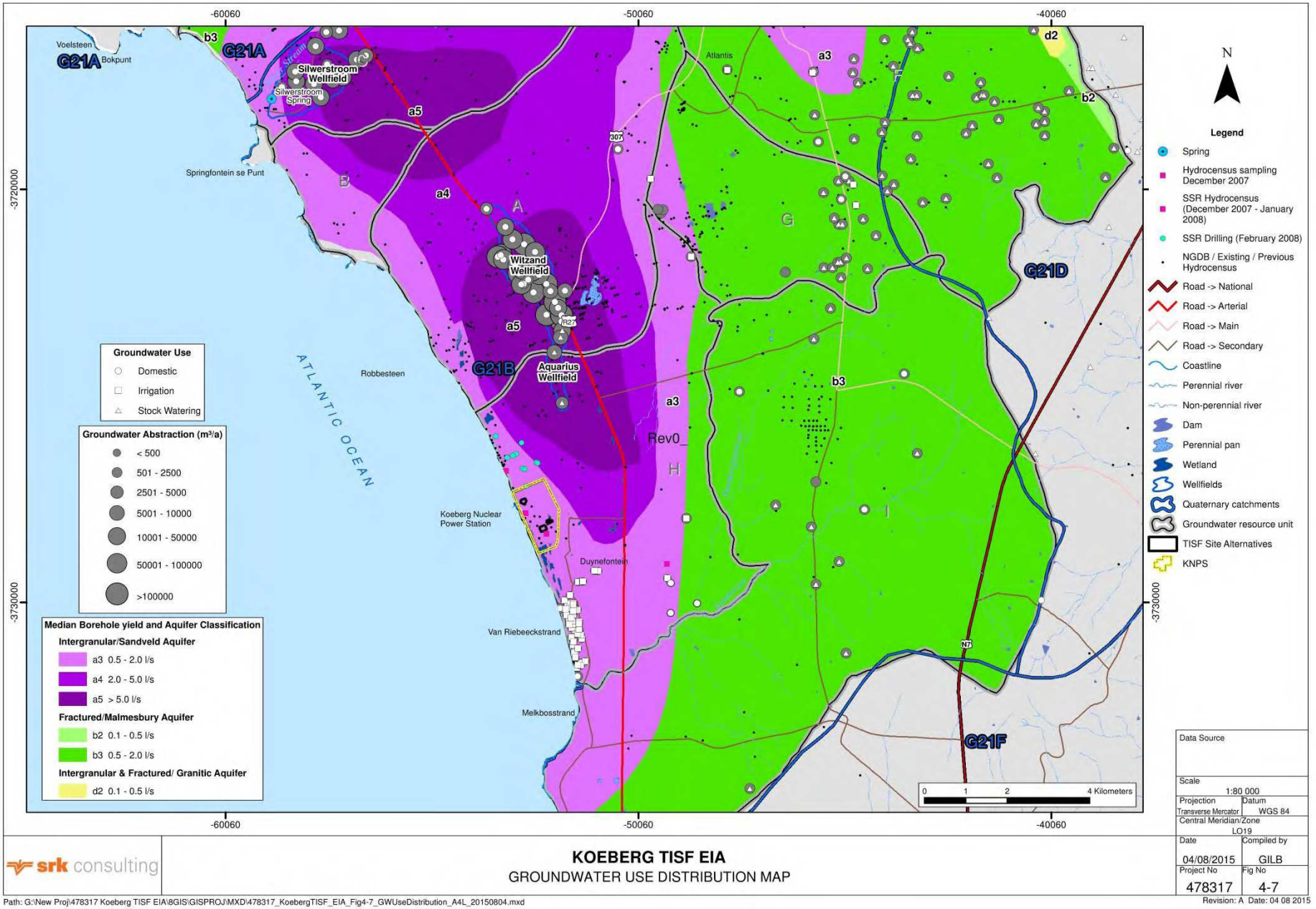
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Voelsteen
Bokpunt
G21A
b3
Silwerstroom Wellfield
Silwerstroom Spring
Springfontein se Punt
a5
a4
B
A
Witzand Wellfield
R27
Aquarius Wellfield
G21B
Robbesteen
ATLANTIC OCEAN
Koeberg Nuclear Power Station
Duynefontein
Van Riebeeckstrand
Melkbosstrand
Atlantis
a3
d2
b2
307
G
G21D
b3
Rev0_
H
I
N7
G21F
Groundwater Use
Domestic
Irrigation
Stock Watering
Groundwater Abstraction (m³/a)
< 500
501 - 2500
2501 - 5000
5001 - 10000
10001 - 50000
50001 - 100000
>100000
Median Borehole yield and Aquifer Classification
Intergranular/Sandveld Aquifer
a3 0.5 - 2.0 l/s
a4 2.0 - 5.0 l/s
a5 > 5.0 l/s
Fractured/Malmesbury Aquifer
b2 0.1 - 0.5 l/s
b3 0.5 - 2.0 l/s
Intergranular & Fractured/ Granitic Aquifer
d2 0.1 - 0.5 l/s
N
Legend
Spring
Hydrocensus sampling December 2007
SSR Hydrocensus (December 2007 - January 2008)
SSR Drilling (February 2008)
NGDB / Existing / Previous Hydrocensus
Road -> National
Road -> Arterial
Road -> Main
Road -> Secondary
Coastline
Perennial river
Non-perennial river
Dam
Perennial pan
Wetland
Wellfields
Quaternary catchments
Groundwater resource unit
TISF Site Alternatives
KNPS
0 1 2 4 Kilometers
srk consulting
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GROUNDWATER USE DISTRIBUTION MAP
Data Source
Scale 1:80 000
Projection Transverse Mercator
Datum WGS 84
Central Meridian/Zone LO19
Date 04/08/2015
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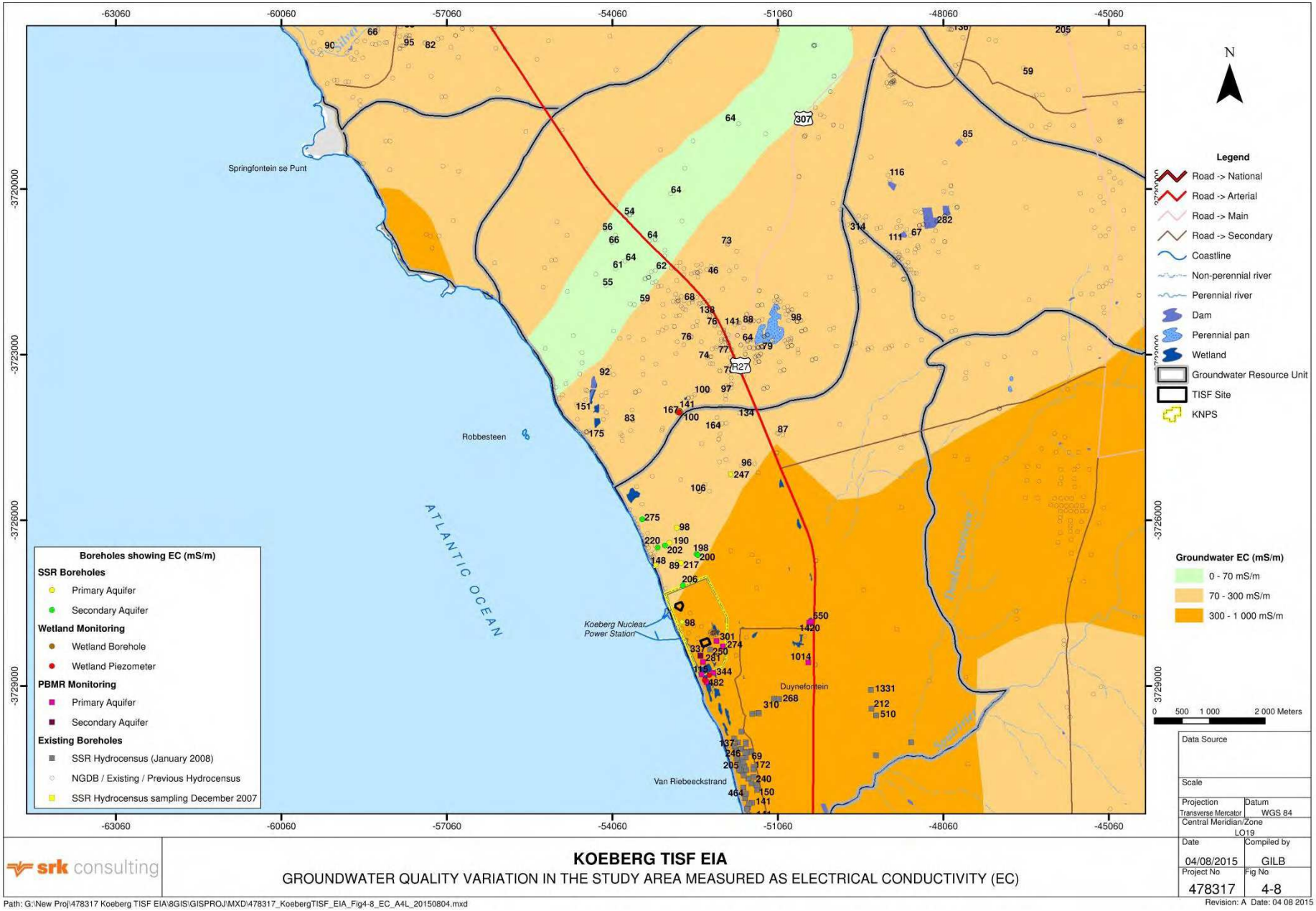
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Springfontein se Punt
Robbesteen
ATLANTIC OCEAN
Koeberg Nuclear Power Station
Duynefontein
Van Riebeeckstrand
Silver
307
R27
N
Legend
Road -> National
Road -> Arterial
Road -> Main
Road -> Secondary
Coastline
Non-perennial river
Perennial river
Dam
Perennial pan
Wetland
Groundwater Resource Unit
TISF Site
KNPS
Groundwater EC (mS/m)
0 - 70 mS/m
70 - 300 mS/m
300 - 1 000 mS/m
0 500 1 000 2 000 Meters
Boreholes showing EC (mS/m)
SSR Boreholes
Primary Aquifer
Secondary Aquifer
Wetland Monitoring
Wetland Borehole
Wetland Piezometer
PBMR Monitoring
Primary Aquifer
Secondary Aquifer
Existing Boreholes
SSR Hydrocensus (January 2008)
NGDB / Existing / Previous Hydrocensus
SSR Hydrocensus sampling December 2007
Data Source
Scale
Projection
Transverse Mercator
Datum
WGS 84
Central Meridian/Zone
LO19
Date
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Project No
478317
Fig No
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KOEBERG TISF EIA
GROUNDWATER QUALITY VARIATION IN THE STUDY AREA MEASURED AS ELECTRICAL CONDUCTIVITY (EC)
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Revision: A Date: 04 08 2015

4.1.7.8 Conceptual Geohydrological Model

A conceptual geohydrological model is a descriptive representation of a groundwater system that incorporates an interpretation of the geological and hydrological conditions. It consolidates the current understanding of the key processes of the groundwater system, including the influence of stresses, and assists in the understanding of possible future changes. Figure 4-9 presents a schematic representation of the geohydrological profile at the KNPS. The main concepts of the model, as discussed above, are summarised below:

- There is no downstream use of groundwater;
- Groundwater at the KNPS is near/at the end of its flow path;
- Depth to the groundwater table at the KNPS ranges between 3 and 4 mbgl;
- The receiving environment/downstream receptor of any contamination will be the shore zone/sea;
- There is a two aquifer system present, with an upper intergranular aquifer (Sandveld Aquifer) and a lower fractured rock aquifer (Malmesbury Aquifer). For this assessment, only the upper Sandveld Aquifer may potentially be impacted by the project;
- Local direct recharge only affects the Sandveld Aquifer - the Malmesbury Aquifer is recharged inland, far from the KNPS. There may be upward leakage of groundwater from the Malmesbury Aquifer into the Sandveld Aquifer (and vice versa) depending on relative groundwater heads in each aquifer;
- Groundwater flow is from the interior, across the KNPS, in a south-westerly direction towards the coast, with discharge into the ocean;
- Hydraulic conductivity values of the Sandveld Aquifer at and around the KNPS range from 0.9 to 5.6 m/d.
- Groundwater flows under a relatively low gradient at a calculated flow rate of c.2.6 m/d, which indicates a relatively quick migration across the KNPS, towards the coastline;
- There is an inferred interface between ‘fresh’ groundwater from inland and saline groundwater in the shore-zone. This interface may be shifted by groundwater control measures and sea level rise. However, down-hole salinity probing did not detect this zone and so it is unlikely to be a significant boundary at the KNPS; and
- Natural groundwater quality is marginally saline and of a mixed NaCl and $CaHCO_3$ character.

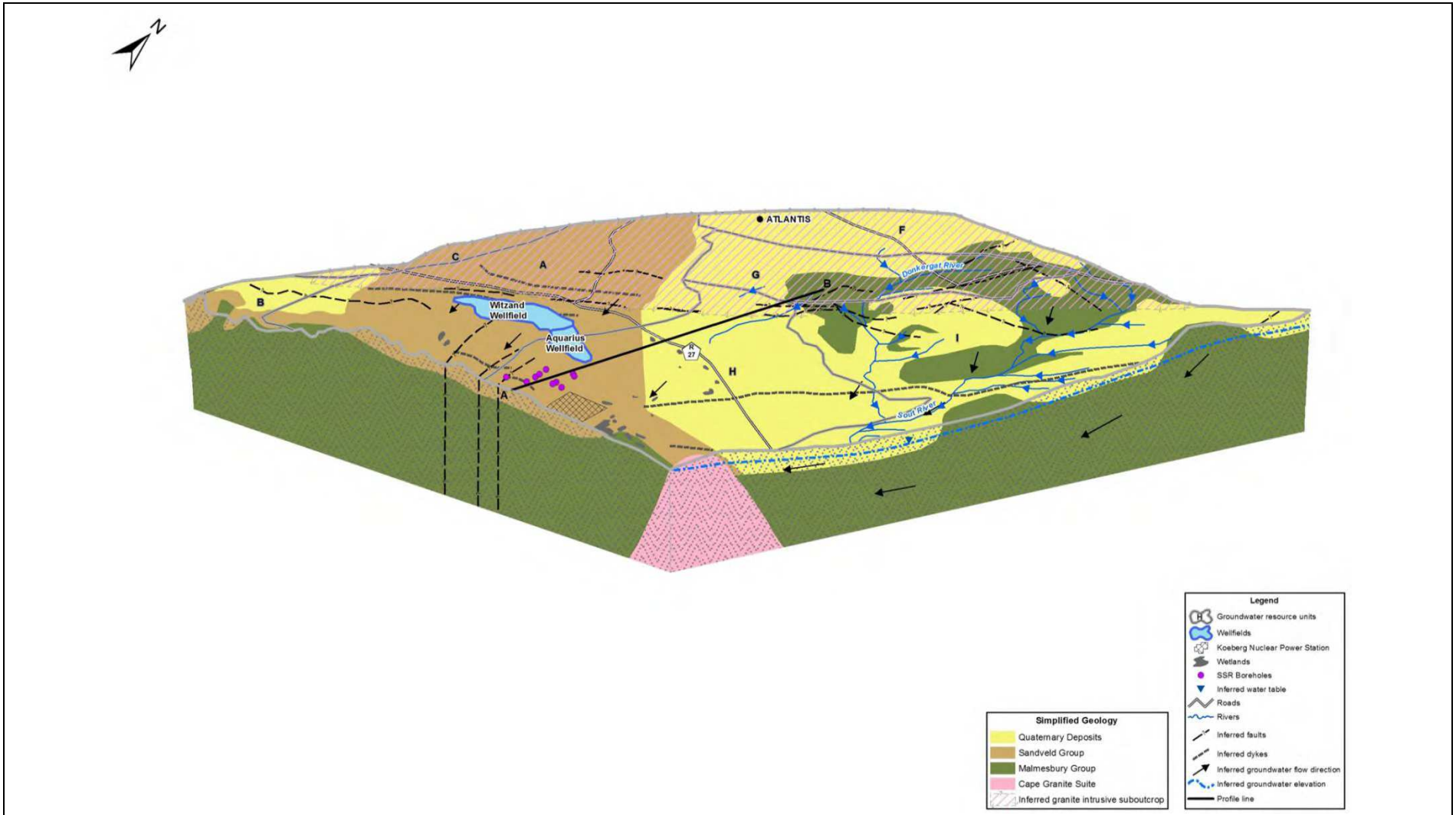

Figure 4-9: Conceptual 3D geohydrological model

Source: SRK, 2015a

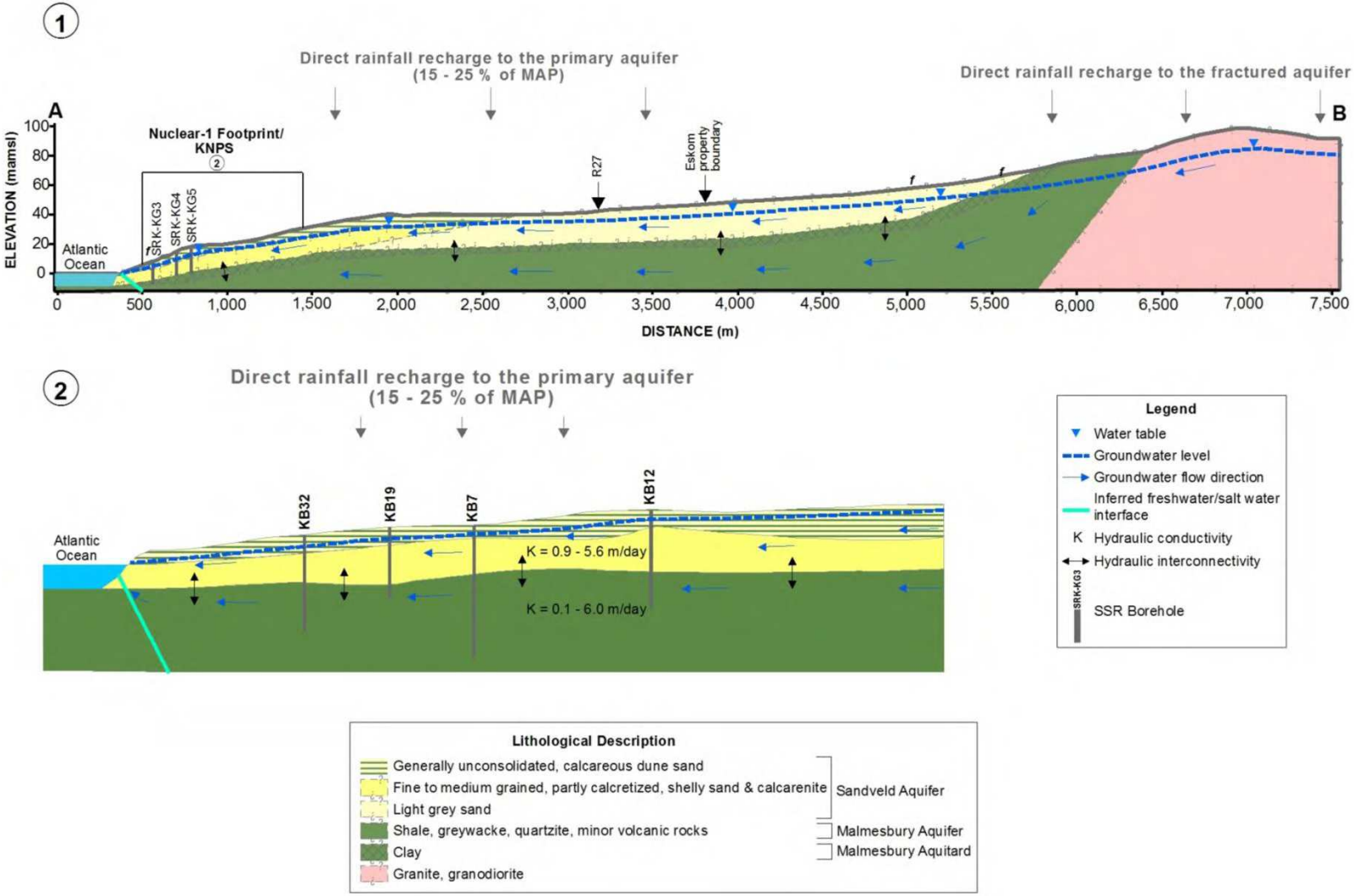

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Figure 4-10: Conceptual 2D geohydrological model

Source: SRK, 2015a

4.1.8 Terrestrial Vegetation and Habitats

This section is based on the Terrestrial Ecology Baseline Assessment by Scientific Aquatic Services, 2015.

The KNPS is located within the Fynbos biome and the Western Strandveld bioregion. The vegetation type indicated by Mucina and Rutherford (2009) is Cape Flats Dune Strandveld (Figure 4-11) which is considered to be *Endangered* within the region (National list of threatened ecosystems for South Africa, 2011). The Cape Flats Dune Strandveld vegetation type can be subdivided into two forms, the False Bay form and the West Coast form. The False Bay form occurs on the False Bay shoreline from Muizenberg to Gordons Bay (south and east of the city bowl), and the West Coast form occurs on the western shoreline from Cape Town to Bokbaai (north of the City bowl) (City of Cape Town Biodiversity Fact Sheet 5: Cape Flats Dune Strandveld, 2011). Cape Flats Dune Strandveld occurs as four discontinuous regions. The largest patch spans the south coast of False Bay and penetrates deep into the Cape Flats as a broad wedge as far north as Bellville (False Bay form). The other patch spans Silverstroomstrand and Table Bay and includes the Atlantis dune plume. The third region is a series of small patches covering coastal dune pockets on the Cape Peninsula, while the last patch is situated on Robben Island (Mucina and Rutherford, 2006).

Cape Flats Dune Strandveld is characterised by high levels of transformation as a result of urban sprawl, road building, sand mining and cultivation. Approximately 56% of the vegetation type as a whole has been transformed and only 7% is statutorily conserved. Approximately 7% of the False Bay and 7% of the West Coast forms are in proclaimed reserves, with the West Coast form also having 16% in the private Koeberg Nature Reserve (City of Cape Town Biodiversity Fact Sheet 5: Cape Flats Dune Strandveld, 2011). The conservation target for the Cape Flats Dune Strandveld (24%) has not yet been reached and any unnecessary loss of this vegetation type should be avoided, where possible.

Alternative 1 is located within the Cape Flats Dune Strandveld vegetation type. This vegetation type is characterised by a flat to slightly undulating (dunefields) landscape, covered by tall, evergreen, hard leaved shrubland with abundant grasses and annual herbs in gaps (Mucina and Rutherford, 2006). The vegetation associated with Alternative 1 (Figure 4-12) has been disturbed by historical construction related activities associated with the development of the KNPS and by gravel road development through the area, which has resulted in the loss of naturally occurring Cape Flats Dune Strandveld vegetation from the site. However, vegetation has subsequently begun to re-establish within the area. The vegetation currently present on site is characterised by the presence of clumps of shrubby vegetation with an open, shorter shrub and grassy layer. Annuals and bulbous species are also likely to appear in these gaps during spring after sufficient rainfall. The vegetation is dominated by the pioneer shrub *Chrysanthemoides incana* which is indicative of past disturbance on the site. However, additional indigenous floral species including *Otholobium bracteolatum, Helichrysum niveum, Searsia glauca, Morella cordifolia, Thesium* cf *spicatum*, *Trachyandra divaricata*, *Solanum africanum, Thesidium fragile, Cladoraphis cyperoides, Metalasia muricata, Cynodon dactylon, Ficinia lateralis, Atriplex nummularia, Limonium peregrinum, Searsia laevigata, Carpobrotus acinaciformis, Chironia baccifera, Pelargonium capitatum* and *Lessertia* sp. were also encountered scattered within the area.


18°24'40"E
18°25'8"E
18°25'36"E
18°26'4"E
18°26'32"E
18°27'0"E
33°39'56"S
33°40'24"S
33°40'52"S
33°41'20"S
N
Legend
Road -> Other
TISF Selected Location Alternatives
Security Protected Area
VEGETATION SENSITIVITY
Atlantis Sand Fynbos (Critically Endangered)
Cape Flats Dune Strandveld (Endangered)
Cape Seashore Vegetation (Least Concern)
Alternative 1 (CSB)
Alternative 2 (Ekhaya)
0 100 200 400 m
Data Source:
1/50,000 Topographic Map Sheet 3318
ESRI Bing Maps
Scale:
1:18 000 @ A4
Projection:
TM
Datum:
HH94
Central Meridian/Zone:
Lo19
Date:
06/11/2015
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GILB/FUBM
Project No:
478317
Fig No:
4-11
srk consulting
KOEBERG TISF EIA
VEGETATION TYPES
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Revision: A Date: 16 02 2016

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Figure 4-12: Vegetation associated with Alternative 1

Alternative 2 is also located within the Cape Flats Dune Strandveld vegetation type. Vegetation associated with Alternative 2 was historically disturbed by activities associated with construction of the KNPS and by the development of a laydown area. However, over the years, dune movement has resulted in the movement of sand over the disturbed area and Cape Flats Dune Strandveld vegetation has re-established in the area. Vegetation associated with Alternative 2 (Figure 4-13) is characterised by the presence of dense stands of shrubby, hard leaved vegetation up to approximately 1.5 m tall. Species diversity within the area proposed for Alternative 2 is considered to be higher than that associated with Alternative 1 with a higher floral species richness and evenness encountered. However, species diversity is not likely to be as high as in surrounding, undisturbed Cape Flats Dune Strandveld. Indigenous floral species encountered which are considered to be representative of the natural vegetation type included *Otholobium bracteolatum, Helichrysum niveum, Asparagus asparagoides, Seriphium plumosum, Searsia glauca, Searsia lucida, Thesidium fragile, Solanum africanum, Galium tomentosum, Helichrysum crispum, Morella cordifolia, Thesium* cf *spicatum, Helichrysum* sp.*, Trachyandra divaricata, Cladoraphis cyperoides, Metalasia muricata, Cynodon dactylon, Ficinia lateralis, Phylica ericoides, Searsia laevigata, Carpobrotus acinaciformis, Chironia baccifera, Pelargonium capitatum, Lessertia* sp*, Psoralea sp. Senecio* sp. and *Drosanthemum sp.*

srk consulting	**KOEBERG TISF EIA** VEGETATION ASSOCIATED WITH ALTERNATIVE 2	Project No. 478317

Figure 4-13: Vegetation associated with Alternative 2

During the field assessment, special emphasis was placed on the identification of floral Species of Conservation Concern (SCC) as listed by previous ecological assessments undertaken within and in the vicinity of the KNPS (Low, 2008, Todd, 2013 and Koeberg Nature Reserve Management Plan, 2015). A single possible SCC[7], *Lampranthus* cf *explanatus* (*Near Threatened*) was encountered within the construction footprint of Alternative 1. Individuals of this species were mostly encountered within the western portion of the site, to the west of the existing gravel road. Individuals of this species have also been recorded as occurring within the Koeberg Nature Reserve (Low, 2008) and are not restricted to the construction footprint of Alternative 1.

No SCC were encountered within Alternative 2 at the time of the assessment; however, the presence of individuals of the SCC *Lessertia canescens* was confirmed during a previous assessment of the site in 2013 (Pers. comm. – Nick Helme). *Lessertia canescens* has yet to be formally Red Listed as *Threatened*, due to recent taxonomic changes, but is likely to be listed as *Vulnerable*, and is restricted to coastal areas from Cape Town to Mossel Bay (Pers. comm. Nick Helme). *Lessertia canescence* is also likely to occur in other areas within the Koeberg Nature Reserve.

In a previous study, Low (2008) listed 22 SCC for Koeberg (based on a composite species list generated in SaSFlora 1998-2007). Additional floral SCC, as listed by Low (2008), which have a possibility of occurring within the site alternatives include annuals and bulbs such as *Cotula duckittiae* (*Vulnerable*), *Capnophyllum africanum* (*Near Threatened*), *Steirodiscus* cf *tagetes* (*Vulnerable*) and *Satyrium* cf *carneum* (*Near Threatened*). Although the site alternatives have been historically disturbed, there is still a small possibility that these species may occur.

Three floral species which are protected under the Western Cape Nature Conservation Laws Amendment Act 3 of 2000 (WCNCLAA) were also noted within the site alternatives at the time of the assessment. These include *Carpobrotus acinaciformis* (occurring on both sites),

[7] Was not in flower at the time of the assessment which created a limitation to the identification of the species.

Drosanthemum sp. (encountered within Alternative 2) and *Lampranthus* cf *explanatus* (occurring at Alternative 1) (all members of the Mesembryanthemaceae family).

Alien vegetation was very limited within both site alternatives. A few *Acacia longifolia* saplings were encountered interspersed with the vegetation of both sites. Additional alien and invasive species were largely limited to the outer boundary of the areas where disturbance has occurred as a result of previous road development.

4.1.9 Fauna

This section is based on the Terrestrial Ecology Baseline Assessment by Scientific Aquatic Services, 2015.

4.1.9.1 Mammals

The location of the site alternatives within the KNPS largely precludes the existence of medium to large mammal species because of the proximity of the sites to existing infrastructure and human activity. Also, both the site alternatives are located within the high security area, and as such are surrounded by a high security fence, which inhibits the movement of mammal species between the site alternatives and the surrounding natural habitat. However, smaller mammal species will be able to move through the fence structure and may inhabit the site alternatives either temporarily or permanently. Such mammals will likely comprise of the smaller Rodentia species, as noted through the observation of *Rhabdomys pumilio* (Four striped grass mouse) on site.

It is highly unlikely that the site alternatives will provide usable and viable habitat to medium and large mammal species. It is likely that a significantly higher number of mammal species will be located outside of the KNPS, within the Koeberg Nature Reserve. Koeberg Nature Reserve has significantly lower levels of transformation in comparison to the site alternatives and is home to a number of introduced antelope species and indigenous small mammal species.

4.1.9.2 Avifauna

Data obtained from the South African Bird Atlas Project (SABAP2), habitat observations on site and previous studies of the area surrounding both the site alternatives, indicates that the sites are likely to be inhabited and utilised by a number of common bird species of the region. Close proximity to human and noise disturbances within the complex combined with a lower habitat suitability of the site alternatives will most likely preclude avifaunal SCC from occurring on site. Any avifaunal species that may currently occuron either Alternative 1 or 2, are likely to utilise the surrounding area, and will not be solely restricted to either of the site alternatives. Furthermore, the absence of any wetlands or permanent water sources within both site alternatives will further result in decreased overall bird diversity. No priority avifaunal species as per the Western Cape State of Biodiversity Report (2012) are expected to occur within either of the site alternatives.

4.1.9.3 Invertebrates

Habitat observations on site and data obtained from previous studies along with invertebrate distribution data was assessed to determine the probability of invertebrate species occurrence within the site alternatives. Historically the surrounding habitat of both Alternative 1 and Alternative 2 hosted the butterfly SCC *Chrysoritis dicksoni* (Dickson's Strandveld Copper), which is listed as *Critically Endangered*. However, all known populations from the area are now considered to be "extinct", with the remaining populations only known to occur near Witsand (East of De Hoop Nature Reserve) (Henning et al, 2009).

4.1.9.4 Amphibians

No wetlands or preferred amphibian habitat units occur within either of the site alternatives. The surrounding areas contain seasonal wetland habitats, and as such it is likely that amphibians within

the area will congregate within these areas and largely avoid the site alternatives. The only amphibian SCC listed for the area is *Cacosternum capense* (Cape Caco), however the specific habitat requirements for this species are likely to exclude it from either Alternative 1 or 2. It is possible that this species will occur within the surrounding areas.

4.1.9.5 Reptiles

The location of both Alternative 1 and 2 within the high security fence line, as well as associated anthropogenic activities and disturbances, will likely preclude any reptile SCC from inhabiting the sites on a permanent basis. Although no reptile SCC are expected within the site alternatives, it is likely that other common reptile species will occur within both Alternative 1 and 2. It is unlikely that these reptiles rely solely on the sites for survival and will relocate to surrounding natural habitat should construction commence. *Scelotes montispectus* (Bloubergstrand Dwarf Burrowing Skink) has been confirmed to occur within the area surrounding the sites. As yet this species has not been identified as a SCC; however, due to its perceived limited distribution range and the lack of data for this species, the precautionary principle may well be applicable here. As such consideration needs to be given to the possibility that *S. montispectus* may occasionally traverse through either of the site alternatives.

4.1.9.6 Arachnids

Spider and scorpion species distribution has not been well documented and verified historically in the Western Cape. However the data available from previous studies in the area indicates that no arachnid SCC are known to occur within either Alternative 1 or 2. No arachnid species are listed as protected according to the Western Cape Province State of Biodiversity Report 2012 or in the WCNCLAA. *Harpactira atra* (Common Baboon Spider) has been observed within the Koeberg Nature Reserve. As such it is possible that there may be *H. atra* individuals occurring within both Alternative 1 and 2, although this species is not protected and is common throughout the Western Cape.

4.1.10 Conservation Areas

The Koeberg Nature Reserve was proclaimed as a private nature reserve in 1991 and was established by Eskom to conserve the natural habitat as far as possible whilst providing a buffer area surrounding the KNPS and maintaining land for future development (Eskom, 2014).

The Koeberg Nature Reserve covers an area of approximately 3 000 ha of Eskom property around the KNPS (Figure 3-1) and incorporates a number of environments - small wetlands, coastal dunefields, strandveld dune vegetation and sand plain fynbos. The reserve is home to a number of animal species. Grysbok, Steenbok and Duiker occur naturally in the area and Bontebok and Springbok have been introduced to the Reserve. The reserve's largest predator is the Caracal (Rooikat) and the African wild cat, Grey mongoose and Genet can also be seen. The most common reptiles are the Cape cobra, Mole snake, Boomslang, Skaapsteker and the Angulated tortoise. The reserve has an abundant birdlife with 153 species recorded to date - including the Ostrich, African fish eagle and Cape penduline tit.

Koeberg Nature Reserve is a private reserve but access is provided to the public with a number of hiking and mountain bike trail options.

4.2 Socio-economic Environment

4.2.1 National Socio-economic Environment

South Africa is a middle-income developing country with an abundance of natural resources. It is the most industrialised country in Africa, leading the continent in industrial output and mineral

production, with well-developed financial, legal, communication, energy and transport sectors. South Africa also has a smaller, but well developed, informal economy which interacts with the formal economy.

Not only is South Africa itself an important emerging economy, it also provides trade linkages to other African markets. The country plays a significant role in supplying relief aid, transport, communications and investment on the continent (SAinfo, 2009). South Africa's well-developed road and rail links provide the platform and infrastructure for land-based trade throughout Southern Africa.

Two of the biggest challenges facing the South African economy are poverty and unemployment. Current estimates place unemployment figures in South Africa at ~25%.

4.2.1.1 Performance and Structure of the Economy

Between 1999 and 2008 South Africa experienced sustained economic growth with Gross Domestic Product (GDP) growing at an average of 5.4%. The global financial crisis reduced local and international demand for domestic goods and services. South African GDP growth slowed to 3.2% in 2008 and contracted by 1.5% in 2009 (SARB, 2014), broadly mirroring developments in global economic activity.

During the recession and subsequent recovery, economic activity in developing markets was more robust than developed markets, with China and India specifically maintaining strong economic momentum (SARB, 2010). This provided strong support for commodity and resource exporting nations such as South Africa; and consequently GDP growth recovered in the third quarter of 2009. Growth was then strong in the first quarter of 2010 before cooling off to a certain degree thereafter (SARB, 2010).

In 2012 and 2013 global economic growth remained sluggish on the back of low economic output, and downward pressure on developing countries has intensified (PERO, 2014). In South Africa economic growth contracted during this period from both supply-side and demand side constraints, such as labour unrest (particularly in the mining and manufacturing sectors), a persistent current account deficit, interruptions in electricity supply, reduction in domestic demand, decrease in global commodity prices and reduced investor confidence (SARB, 2014 and PERO, 2015).

The tertiary sector in South Africa contributes the largest portion to GDP (62% in 2013); while the primary and secondary sectors contribute approximately 10% and 18% to GDP respectively. The relative decline in the contribution of the primary and secondary sectors to South Africa's economy since 2009 is evidence of the impact of labour disputes, constrained electricity supply and a reduction in both domestic and international demand. Constrained growth is expected to continue in the short term as a result of the persistence of these factors.

4.2.1.2 Employment

After rising to above 25% following the 2009 recession (Trading Economics, 2015), the South African unemployment rate[8] remained relatively stable until the first quarter of 2015, when it jumped to 26.4%, the highest unemployment rate in South Africa for 12 years (Fin24, 2015).

The failure of the South African labour market to stimulate employment growth post-2009 can be attributed to a number of factors, including a decline in labour relations, fall in commodity prices post-2012, slowdown in South African output growth, decline in investor confidence, electricity supply constraints and a renewed sluggishness in the global economic recovery, particularly in Europe, which is one of South Africa's major trading partners (SARB, 2014 and UNDP, 2015). The most

[8] The number of people actively looking for a job as a percentage of the labour force.

recent spike in the unemployment rate is likely to be partially a consequence of electricity rationing, as energy supply is increasingly constrained in the face of rising energy demand (SARB, 2015). Electricity rationing is set to continue in South Africa until at least 2017 (BusinessDay, 2015).

The percentage of total jobs in each sector broadly mirrors the sectors' percentage contribution to GDP (StatsSA, 2015 and StatsSA, 2014). The majority of employment in South Africa is in the social services and commercial industries, followed by manufacturing and finance. While the utilities sector (including electricity) contributes ~3% to annual GDP it only employs ~1% of the employed workforce in South Africa. Employment levels in the electricity-generation sector contracted marginally in 2009 and 2010. However, the sector's workforce expanded by 4% and 3.7% in 2011 and 2012 respectively, when Eskom expanded with a view to increase capacity (SARB, 2014).

4.2.1.3 Electricity Demand and Supply

Almost 90% of South Africa's electricity is generated in coal-fired power stations. The KNPS provides about 5% of national electricity capacity. A further 5% is provided by hydroelectric and pumped storage schemes (DOE, No date).

Eskom, the national wholly state-owned utility that also owns and operates the national electricity grid, supplies about 95% of South Africa's electricity. While Eskom does not have exclusive generation rights, it has a practical monopoly on bulk electricity. It also operates the integrated national high-voltage transmission system and supplies electricity directly to large consumers such as mines, mineral beneficiators and other large industries, municipalities, commercial farmers and residential consumers (DOE, No date).

In January 2008, Eskom curtailed power exports and introduced load shedding in South Africa to ration electricity, as demand outstripped supply capacity (WNA, 2015). The demand: supply ratio improved by 2009, partly due to the economic slowdown and hence lower electricity demand (WNA, 2015).

National electricity production has been declining since peaking in 2011, when 262 538 GWh were generated. In 2014, less electricity was produced in South Africa than in 2013 (StatsSA, 2014a), intensifying the country's continued challenge with a decreasing supply margin. In the face of declining production, Eskom again introduced load shedding in late 2014. It has been estimated that load shedding will continue until 2017, when additional generating facilities are scheduled to come online. Load shedding will therefore place an ongoing strain on growth in South Africa for the short term.

4.2.2 Provincial and Metropolitan Socio-economic Environment

The physical characteristics of the Western Cape support a diverse provincial economy. The shoreline provides an important fishing industry. Varying geographic and climatic zones, ranging from winter rainfall areas suitable for intensive farming (such as for citrus and viticulture) to the arid condition of the Karoo and Namaqualand only suitable for extensive livestock farming (PERO, 2010), allow for agricultural diversity. These characteristics also contribute to a sizable and developed tourism sector that attracts national and international visitors.

Although the Western Cape is not recognised as an industrial hub, a number of industries make significant contributions to the economy. These include a developed processing industry which supports the agricultural sector, heavy industries such as metal and chemical and, to a lesser and declining extent, the clothing and textiles industries. The economy of the Western Cape has seen significant growth in the large service sector.

Cape Town is one of Africa's most dynamic and developed metropolitan areas. It benefits from its strategic and spectacular location on the tip of Africa and at the foot of Table Mountain, recently

voted as one of the world's new seven wonders of nature. One of the Province's two deep sea ports as well the international airport are located in the Cape Town, facilitating both domestic and international trade and travel to and through the City.

4.2.2.1 Performance and Structure of the Economy

The economy of the Western Cape has outperformed the national economy since 2010 (StatsSA, 2014) and contributed more than 13% to national GDP since 2004, exceeding its share of national population and land mass (both ~11%). The historically better performance by the Western Cape economy stems from both the structure and source of its economic activity (PERO, 2014): the tertiary sector makes up a greater proportion of the Western Cape economy and has outperformed primary and secondary sector industries.

Regional GDP (GDPR) for the Western Cape economy grew at an annual average of 5.3% over the period 2006 – 2008 (compared to a national average of 4.7%). The Western Cape GDPR contracted in 2009, mirroring a similar development in the national GDP (StatsSA, 2014). After accelerating to an annual rate of 3.9% in 2011, economic growth in the Western Cape slowed to 2.9% in 2012 and has largely mirrored national growth since then (PERO, 2014).

The performance of the CoCT metropolitan area largely mirrors that of the Province, as it generates more than 70% of the Western Cape's GDPR (CoCT, 2013) with 64% of the Province's population. It is the second-largest metropolitan economy in South Africa, after the City of Johannesburg. On average, in the last 15 years, the variation of the City's GDP growth rate from the provincial rate was ~ 0.5 percentage points (CoCT, 2013).

The Western Cape economy has developed from its agricultural beginnings and now has a strong complement of food and beverage producers, higher value-added manufacturing activity and a range of services activities (including tourism). The regional economy is, however, still characterised by a strong agro-processing sector. The tertiary sector (67% of GDPR in 2013) plays a slightly more dominant role in the Western Cape economy than in the national economy (StatsSA, 2014), while the relative contribution of the primary sector is less than half that of the contribution to the national economy (4% of GDPR in 2013). The secondary sector contributed 18% of GDPR in 2013.

The most important industries to the Western Cape Economy in terms of contribution to GDPR are finance, real estate and business services (~30% of total value added); wholesale, retail and trade, catering and accommodation (~16% of total value added); and manufacturing (~16% of total value added) (StatsSA, 2014). Although it contributes a relatively small portion of GDPR, a wide diversity of products makes the agriculture, forestry and fishing industries important to the Western Cape economy.

The CoCT contributes 80% of the Western Cape's finance and business services, more than 70% of wholesale and retail trade and about 70% of manufacturing (CoCT, 2013).

Income, household consumption and growth in real consumer spending is expected to remain under pressure nationally in the short to medium term as rising inflation, higher interest rates, subdued employment and credit growth weigh on household income (PERO, 2014). This poses a particular challenge to the tertiary sector dominating the Western Cape economy, as a slowdown in consumer spending will reduce demand for services (PERO, 2014). However, the Western Cape is less exposed to the mining sector than the national economy, and the challenges related to an anticipated prolonged drop in commodity prices.

4.2.2.2 Population

The Western Cape has a population of ~6.1 million people, which is ~11% of the national population (StatsSA, 2014c). Almost 3.9 million people live in the Cape Town Metropolitan area, i.e. 63% of the

provincial population (CoCT, 2014). The population structure of both the Western Cape and the CoCT broadly mirrors the national population structure: ~25% are younger than 15 years, ~70% of the population is of working age (15 – 64 years old) and ~6% are over the age of 64 years (StatsSA, 2014b and CoCT, 2014b). The CoCT and the Western Cape Province have a slightly higher proportion of working-age population than South Africa as a whole.

The provincial and metropolitan populations grew on average by 2.3% per annum between 2001 and 2014 (CoCT, 2014), compared to a 1.6% average annual growth rate in the national population (Census, 2001 and Census, 2011). The faster population growth in the Western Cape and the CoCT can (at least partly) be ascribed to inter-provincial migration, where people are drawn to the Western Cape with the hope of finding employment and better opportunities (CoCT, 2014 and PERO, 2014). The Western Cape had a net in-migration of just over 150 000 people between 2006 and 2011 (StatsSA, 2014c). This trend is projected to continue.

4.2.2.3 Employment

Of the ~6.1 million people in the Western Cape, ~4.2 million people are of working age (15 – 64 years) (PERO, 2014). Of these, 64% (or ~2.9 million people) are in the labour force (employed or actively seeking employment), while ~8% (340 000 people) are discouraged work seekers[9]. Approximately 23% (675 000 people) of the provincial labour force was unemployed in 2014 (PERO, 2014).

Of the ~3.7 million people living in the City in 2011, ~2.6 million people were of working age. Of these, 65% (or ~1.7 million people) were in the labour force, while 3% were discouraged work seekers. Approximately 24% of Cape Town's labour force was unemployed in 2011 (Census 2011), closely mirroring provincial labour statistics.

Following the recession and global financial crisis, the unemployment rate increased in South Africa. The provincial unemployment rate grew by an average of 5.6% annually between 2009 and 2014 (higher than the national average of 3.5% - partly as a result of in-migration of unemployed people seeking work in the Western Cape). However, in the Western Cape, the number of employed people has increased at a faster rate than the national average (PERO, 2015) indicating that although unemployment is rising, additional jobs are being created in the Province.

The sector with the highest share of employment in the Western Cape in 2014 was wholesale and retail trade (21.5%), followed by general government services (21.4%), finance, real estate and business services (16.7%) and manufacturing (13.2%) (StatsSA, 2014b and StatsSA, 2010).

Employment structure in the CoCT is expected to largely mirror provincial employment statistics, with slightly lower numbers of the metropolitan population employed in the primary sector than in rural areas.

4.2.2.4 Income

Table 4-3 shows the distribution of annual household income in South Africa, the Western Cape and the CoCT. Both the Western Cape and the City have a smaller proportion of households earning very low income and a larger proportion of households earning higher incomes than at national level. Nevertheless, more than half of the households the Western Cape (65%) and the City (61%) have a monthly income of less than ~R6 366 (or R76 400 per annum).

[9] The Western Cape differs substantially from most other provinces in that the non-searching unemployed (also referred to as discouraged work seekers) account for ~8% of the working-age population, compared to nearly 32% nationally (PERO, 2014). A number of factors explain this difference, including the Province's relatively high level of urbanisation, the City of Cape Town's dominance within the provincial labour market and different patterns of educational attainment (PERO, 2014).

Table 4-3: Annual household income in 2011

Annual income	% of the households in:		
	South Africa	Western Cape	CoCT
No income	15%	13%	14%
R1 – R38 200	48%	36%	33%
R38 201 – R76 400	13%	16%	14%
R76 401 – R307 600	16%	24%	25%
R307 601 – R614 400	5%	7%	9%
R614 401+	3%	4%	5%

Source: Census 2011

The GDPR per capita in the Western Cape was estimated at R43 557 in 2011 (2005 prices) compared to R49 647 for Cape Town (CoCT, 2014). This placed the CoCT in third place, after Tshwane and Johannesburg, in terms of per capita GDPR amongst the country's six metros. The poverty rate[10] has decreased in the Western Cape Province and the CoCT by 4.6% and 4.2% respectively between 2001 and 2010 (CoCT, 2014) to ~160 000 people.

4.2.3 Local Socio-Economic Environment

The CoCT is divided into eight planning districts and 24 subcouncils. Subcouncils are divided into a total of 111 smaller administrative wards, which may contain several suburbs.

The KNPS is situated in the Blaauwberg Planning District (Planning District B) and Subcouncil 1 of the CoCT. The geographical boundaries of Subcouncil 1 and the Blaauwberg Planning District are almost identical. Subcouncil 1 is divided into Wards 4, 23, 29, 32, 104 and 107[11] (see Figure 4-14). The KNPS is located in Ward 32.

Subcouncil 1 is located on the western coastline of the City and stretches 30 km from Milnerton in the south to Atlantis in the north. The subcouncil includes a great diversity of areas, ranging from some of the poorest and most underprivileged suburbs in Cape Town such as Atlantis, Dunoon, Joe Slovo Park and Doornbach, to some of the more affluent, including Table View, Flamingo Vlei, Sunningdale, Big Bay, Blouberg and Melkbos.

A 5 km Precautionary Action Planning Zone (PAZ) and 16 km Urgent Protective Action Planning Zone (UPZ) have been delineated around the KNPS, where development is restricted. The population density around the KNPS is thus low. The study area has thus been taken as those areas within a 20 km radius of the KNPS, where socio-economic impacts may occur (for example, from construction activities) (see Figure 4-15).

Key residential areas (suburbs) that fall within the study area include (see Figure 4-15)[12]:

- Within 5 km of the KNPS: Melkbosstrand, Kleine Zout River Small Holdings and portions of the Atlantis and Milnerton non-urban areas;
- Within 5 – 10 km of the KNPS: Portions of the Atlantis and Milnerton non-urban areas;

[10] The poverty income is defined as the minimum monthly income needed to sustain a household and varies according to household size; the larger the household the larger the income required to keep its members out of poverty. The monthly income needed to keep a one person household out of poverty was estimated in 2010 to be R1 315, while for a two person household it was R1 626; a four person household required an estimated income of R2 544 to stay out of poverty while a household with eight or more person required an estimated R4 729.

[11] Prior to the 2011 Census Subcouncil 1 was divided into Wards 4, 23, 55, 56 and 104.

[12] Note that the "suburb" of Killarney Gardens is a wholly industrial area with no residential population and therefore is not included in the analysis.

- Within 10 – 15 km of the KNPS: Morning Star Small Holdings, Sunningdale, Atlantis and Philadelphia; and
- Within 15 – 20 km of the KNPS: Parklands, Vissershok, Bloubergstrand, Table View, Doornbach, Du Noon, Mamre and Milnerton.

A number of socio-economic indicators are discussed below, mainly derived from Census 2011 data. Where Census 2011 data is not available, Census 2001 data is used.

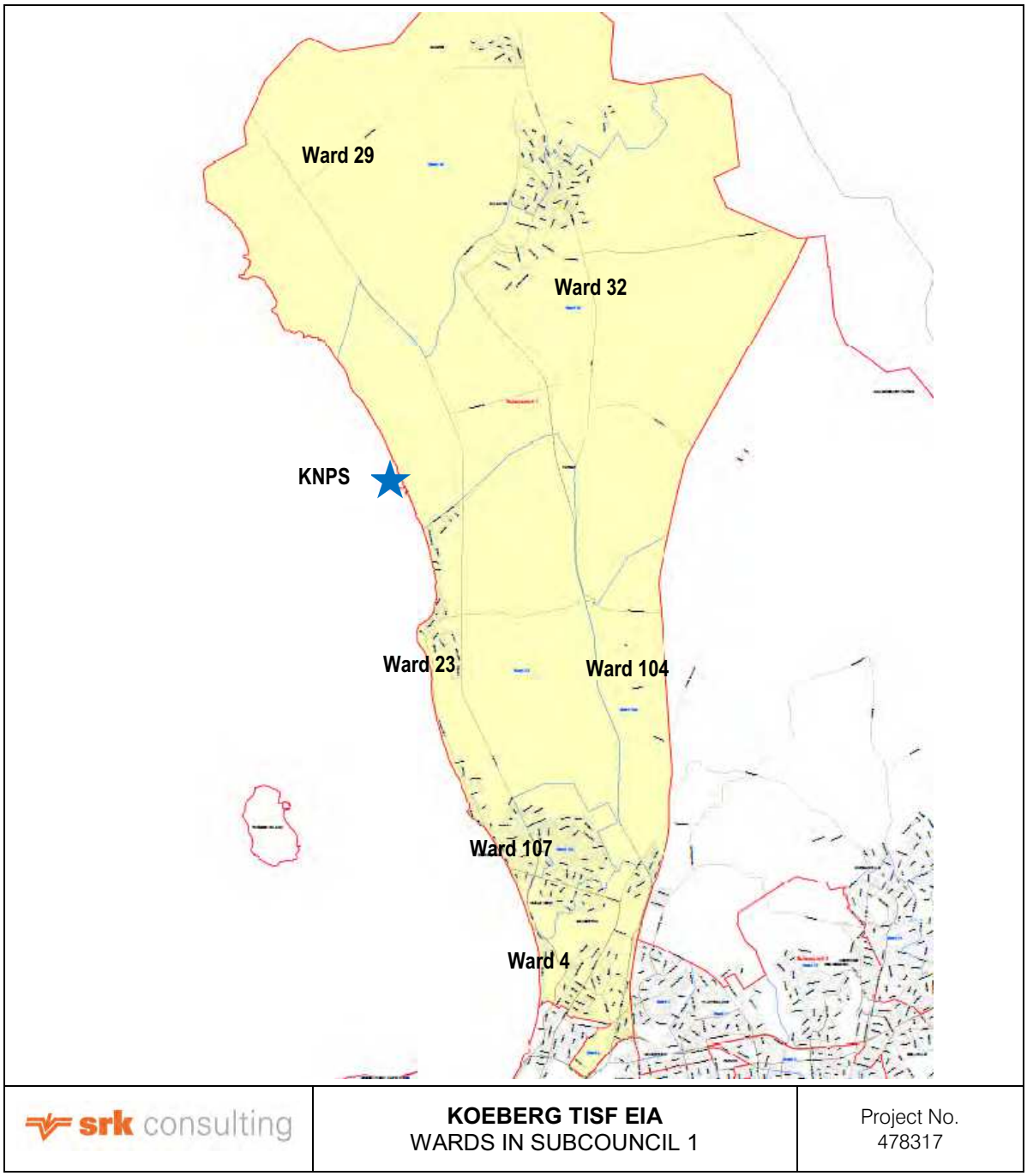


Figure 4-14: Wards in subcouncil 1

Source: CoCT, 2012

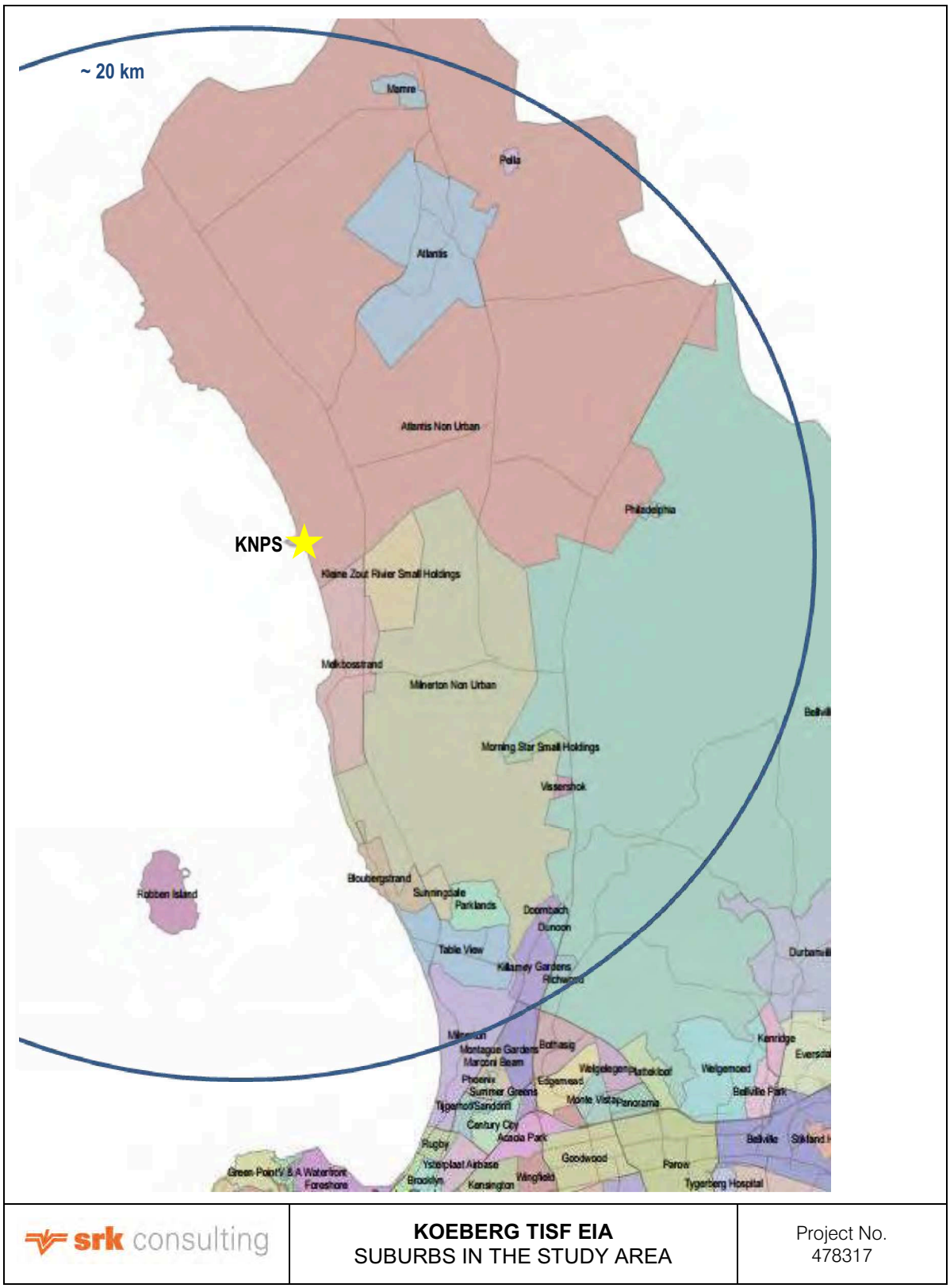


Figure 4-15: Suburbs in study area (within 20 km arc)

Source: CoCT, 2013a

4.2.3.1 Population

The geography of Cape Town makes the study area an attractive region for urban expansion. This is evidenced by the rapid residential expansion into new suburbs such as Sunningdale and Parklands. The population of the study area increased at an average of 7.3% per annum between 2001 and 2011 (see Table 4-4, Census 2011). This exceeds the average growth rate of the City (2.3%) by a considerable margin.

In 2001 the population of the study area was estimated to be 122 762. Census 2011 estimated the population of the study area to be 212 813, almost doubling in the 10 year period. Extrapolating the past population growth rate of the study area into the future, the population of this area could grow to more than 430 000 people by 2021. If the population of the study area grows at the current City-wide average growth rate, the population would be approximately 270 000 in 2021. In reality, population growth rates in the study area are likely to exceed the City average, but be below historic growth rates.

The most populous suburbs in the study area include Atlantis, Du Noon, Table View and Parklands: are all located more than 14 km from the KNPS. The largest suburb near the KNPS is Melkbosstrand with a population of more than 11 000 people, located > 2 km south of the KNPS.

The highest population growth in urban suburbs took place in areas furthest away from the KNPS, including Du Noon, Milnerton and Bloubergstrand. Apart from Du Noon, suburbs in the south west of the study area at or adjacent to more affluent communities have seen the most rapid urban growth between 2001 and 2011 (see Table 4-4). The population growth in the Milnerton non-urban area also indicates expansion of Sunningdale and Parklands beyond their registered suburban boundaries. The population of Du Noon had tripled between 2001 and 2011. Opportunities for employment at the industrial area of Killarney Gardens serve as a significant pull factor for people entering this area. Nevertheless, Melkbosstrand is also an attractive area and has shown considerable growth.

The gender profile of the study area is relatively evenly distributed with females having a slightly higher count (52%) against males (48%) (Eskom, 2015). This gender distribution is the same as the South African average.

Population density is highest in the urban areas to the south and north east of the KNPS (see Figure 4-16). Based on 2001 Census data, Eskom (Eskom, 2015) estimated that the average population density of the area within 16 km of the KNPS was 155 people per km^2. Based on the estimated population increase between 2001 and 2011, population density in the study area may have increased to at least 270 people per km^2 on average in 2011. However, population density is highly variable within the study area, with large areas nearly unpopulated.

Table 4-4: Population data for the study area

Suburb	2001 Population	2011 Population	Average Annual Population Growth Rate	Projected Population in 2021 at CoCT Growth Rate (2.3%)	Projected Population in 2021 at Study Area Historic Growth Rate
Melkbosstrand	6 462	11 302	7.5%	14 188	22 864
Kleine Zout River Small Holdings	No data	283	N/A	355	573
Atlantis non-urban	4032	2 479	-3.9%	3 112	5 015
Milnerton non-urban	205	3 293	150.6%	4 134	6 662
Morning Star Small Holdings	No data	485	N/A	609	981
Sunningdale	No data	5 299	N/A	6 652	10 720
Atlantis	54 904	67 490	2.3%	84 722	136 533
Philadelphia	No data	570	N/A	716	1 153
Parklands	No data	24 614	N/A	30 899	49 794
Vissershok	332	323	-0.3%	405	653
Bloubergstrand	5 844	11 179	9.1%	14 033	22 615
Table View	23 445	25 977	1.1%	32 610	52 552
Doornbach	4 082	5 033	2.3%	6 318	10 182
Du Noon	9 036	31 133	24.5%	39 082	62 982
Mamre	7 267	9 047	2.5%	11 357	18 302
Milnerton	7 153	14 306	10.0%	17 959	28 941
Total / Average	**122 762**	**212 813**	**7.3%**	**267 149**	**430 522**

Source: Census, 2011

Note:

- Dark grey shading indicates suburbs located within 5 km (PAZ) of the KNPS;
- Lighter shading indicates suburbs located within 10-15 km (UPZ) of the KNPS; and
- No shading indicates suburbs located within 15-20 km of the KNPS.

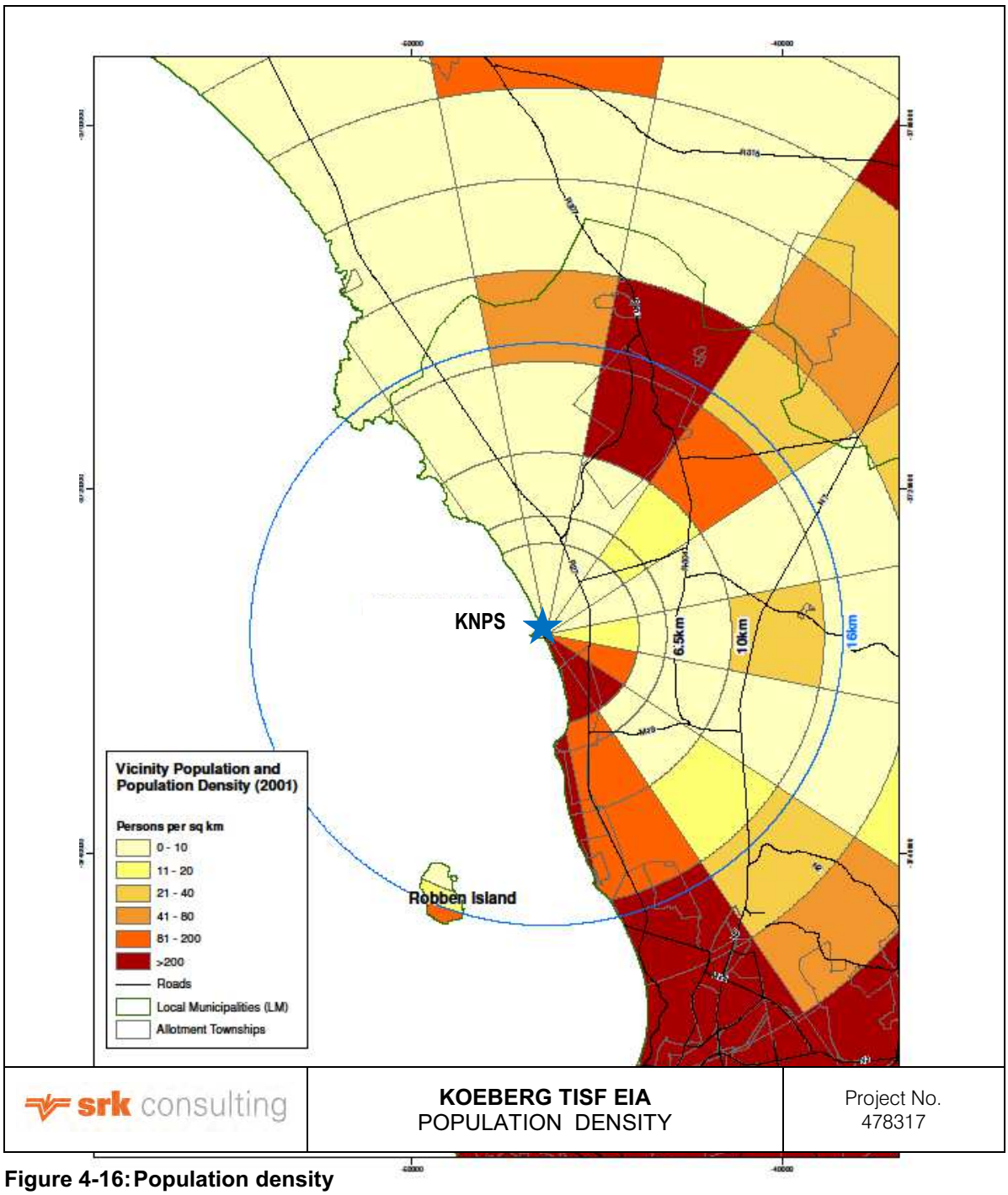


Figure 4-16: Population density

Source: Eskom, 2015

4.2.3.2 Socio-economic Status Index

The Socio-economic Status Index (SES) is an indicator of relative socio-economic status of communities, calculated by the CoCT based on Census 2001 data (CoCT, 2007). The SES considers four indicators:

- % of households earning less than R19 200 per annum;
- % of adults (20+) with highest educational level less than matric;
- % of the economically active population that was unemployed; and
- % of the labour force employed in elementary/unskilled occupations.

A higher SES score indicates relatively better socio-economic conditions. The SES of the Blaauwberg Planning District (Planning District B) is 30.22, below the City average of 37.97.

The socio-economic status of communities and wards within Planning District B varies significantly. Generally, areas north of the KNPS are more deprived than areas to the south (see Figure 4-17), although both include some communities that are considered "*worst off*"[13] by the CoCT, including Vissershok, Du Noon and areas of Atlantis.

Ward 104 was the worst off ward in the District in 2001 from a socio-economic perspective, indicating that people in this area are more likely to be unskilled and / or unemployed and have a lower income. This ward included the communities of Doornbach, Du Noon, Killarney, Killarney Gardens, Milnerton, Parklands, Sunridge, Table View and West Riding. Ward 23 was the best off ward in the district in 2011, indicating that people living in this ward are more likely to be skilled and / or employed and have a higher income. This ward included the communities of Atlantic Beach Estate, Blouberg, Bloubergrant, Bloubergstrand, Duynefontein, Melkbosstrand, Morningstar, Philadelphia, Sunningdale, Table View, Van Riebeeckstrand, Vissershok and West Beach.

The socio-economic status of communities in these wards also varies significantly. For example West Beach and Vissershok are classified as "best off" and "worst off" respectively in terms of their socio-economic status, and are both located within the same ward (see Figure 4-17).

Using Census 2011 data and, like the CoCT, considering income, education and employment, and including the status of dwellings in these suburbs (i.e. % of households that are informal) (see Table 4-6); SES Indices were calculated by SRK for this assessment to compare the current socio-economic status of suburbs in study area (see Table 4-5). Suburbs with a less favourable socio-economic status are located inland to the north, east and south east of the KNPS, while more affluent suburbs are located on the coastline to the south and south west. A brief description of the socio-economic characteristics of each of these suburbs is presented in Section 4.2.3.3.

[13] The City of Cape Town classifies suburbs with a SES score of 54.92 – 79.07 as being in the bottom 20th percentile of all suburbs in the City, while those suburbs with a SES score of less than 13.06 are classified as being in the top 20th percentile of all suburbs in the City.

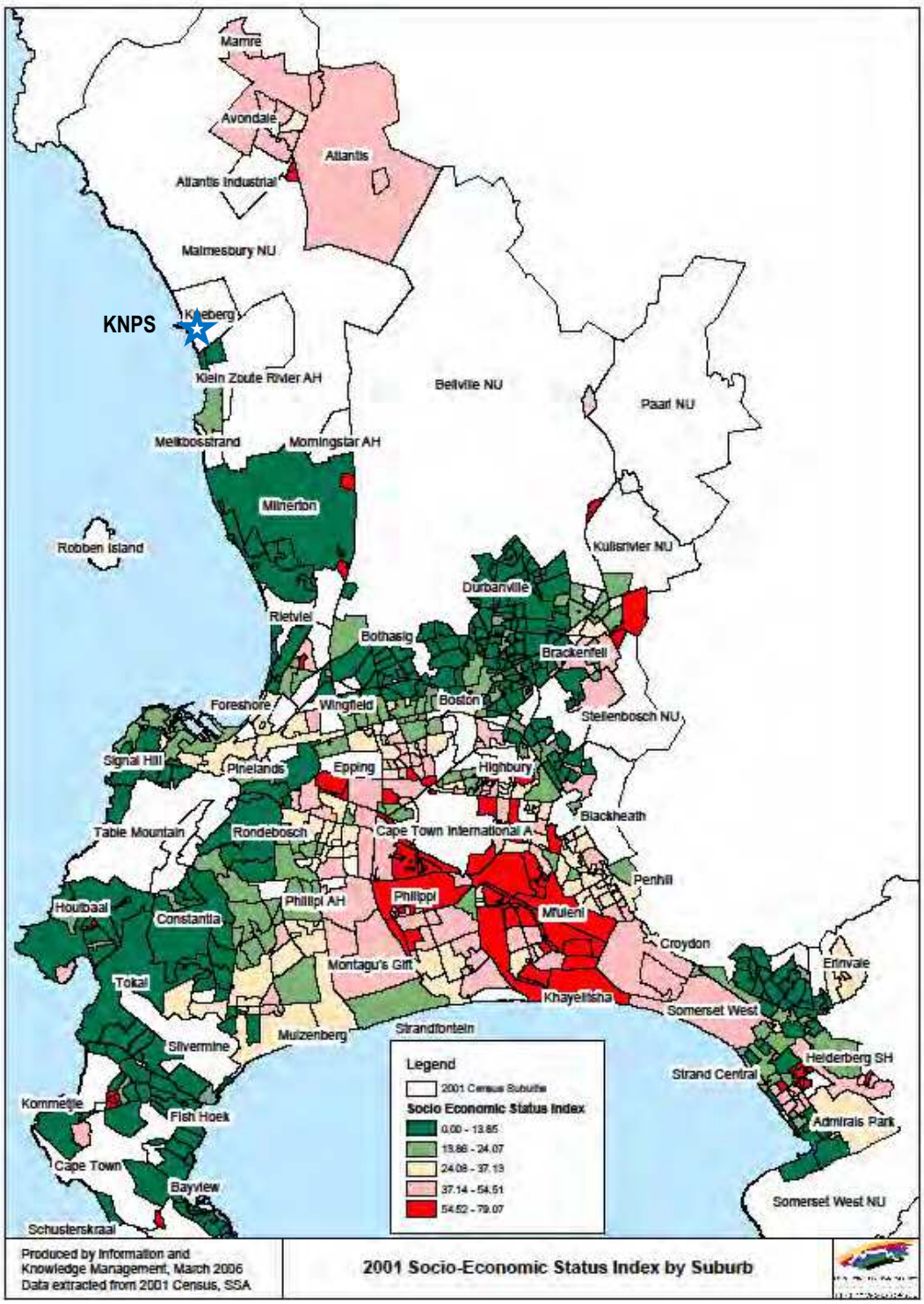


Figure 4-17: Socio-economic status index

Source: CoCT, 2007b

Table 4-5: SES indices for suburbs in study area (Census 2011)

Suburbs	Distance to the KNPS	SES Score
Melkbosstrand	up to 5 km	34,71
Kleine Zout River Small Holdings		52,13
Atlantis non-urban		54,35
Milnerton non-urban		36,77
Morning Star Small Holdings	10 – 15 km	36,37
Sunningdale		33,35
Atlantis		57,27
Philadelphia		50,14
Parklands	15 – 20 km	33,61
Vissershok		64,17
Bloubergstrand		33,53
Table View		34,31
Doornbach		59,43
Du Noon		56,21
Mamre		60,13
Milnerton		32,61
Average		**45,57**

Source: Census, 2011

Note: Grey shaded communities indicate above study area average SES Index scores

4.2.3.3 Socio-economic Analysis

The following section briefly describes the socio-economic status of the study area and of the suburbs in the study area. Table 4-6 presents selected socio-economic indicators for the suburbs in the study area.

Based on the SES indices derived for this assessment, the socio-economic status of the population of the study area is marginally better than the City average (see Table 4-6). On average, the population of the study area is slightly more educated and more likely to be employed than other people living in Cape Town. Households in the study area are less likely to have a very low monthly income (i.e. less than R3 200 / month). It is noteworthy that, on average, nearly one in four dwellings in each suburb is informal, about 2% higher than the City wide average.

The socio-economic status of people living in each of the suburbs in the study area varies significantly (see Table 4-6). A brief description of the socio-economic status of each suburb, or where appropriate, cluster of suburbs, follows.

Table 4-6: Socio-economic indicators for the study area

Suburb	% Working Age	% Adults with Grade 12 or Higher	Unemployment Rate	% hh Monthly Income < R3200	% Informal Dwelling	SES*
Melkbosstrand	68.6	82.0	5.7	17.1	2.0	34.71
Kleine Zout River Small Holdings	71.3	34.4	20.0	76.9	54.0	52.13
Atlantis non-urban	73.0	38.7	18.3	49.8	12.0	54.35
Milnerton non-urban	69.9	73.3	5.6	21.9	7.1	36.77
Morning Star Small Holdings	75.4	66.1	9.4	12.7	10.5	36.37
Sunningdale	65.1	83.2	3.1	14.5	1.0	33.35
Atlantis	68.4	32.4	26.6	50.4	15.5	57.27
Philadelphia	65.6	35.6	12.5	32.7	9.0	50.14
Parklands	72.6	84.7	6.6	13.2	0.6	33.61
Vissershok	70.5	2.8	63.2	93.2	96.9	64.17
Bloubergstrand	75.2	87.3	5.5	16.4	0.5	33.53
Table View	73.8	83.1	6.0	14.8	0.5	34.31
Doornbach	73.7	13.1	56.3	93.6	99.1	59.43
Du Noon	71.9	29.6	36.7	76.8	59.1	56.21
Mamre	67.9	32.0	27.2	48.7	3.4	60.13
Milnerton	72.9	85.7	4.6	12.4	0.9	32.61
City of Cape Town	*69.7*	*46.9*	*23.9*	*47.0*	*21.6*	*50.60*
Total / Average	**71.0**	**54.0**	**19.2**	**40.3**	**23.3**	**45.57**

Source: Census, 2011

Note: Grey shaded communities indicate above study area average SES Index scores

* - SES Indices have been derived by SRK for this study, considering income, education, employment status of dwellings in these suburbs (i.e. % of households that are informal) to compare the socioeconomic status of suburbs in study area.

Milnerton

The suburb of Milnerton is located in the south of the study area and includes the communities of Milnerton, Sunset Beach and Milnerton Ridge. The suburb is the best off suburb in the study area in terms of its socioeconomic status, with relatively low levels of unemployment and excellent service delivery. Dwellings are almost all formal (more than 99%), and residents of this suburb generally enjoy a more affluent lifestyle than the majority of the population of the study area.

The population of the suburb doubled between 2001 and 2011 to more than 14 000 people.

The suburb hosts a number of facilities such as the Milnerton Medi-Clinic, Paddocks Shopping Centre, Milnerton Golf Course, Killarney Race Track and Theo Marais Sports Park (Eskom, 2015). Sunset Beach and Woodbridge Island are both popular beaches located in the suburb. The Rietvlei Nature Area is also situated in this suburb.

The R27 and M5 roads provide access to the Cape Town Central Business District (CBD) to the south and to other areas in the City. These transportation routes are congested during high use periods (i.e. rush hour). The City railway network passes to the east of the suburb and also provides good access to the City. The recently (2013) launched MyCiti Bus Service also provides access to and from this area.

Sunningdale, Parklands, Bloubergstrand and Table View

These four contiguous suburbs are located to the north of Milnerton (Figure 4-15) and include the communities of Table View, Flamingo Vlei, Sunridge, Rosendal, West Riding, Bloubergrant, Blouberg Rise, Sunningdale, Parklands, Bloubergstrand, Blouberg Sands, West Beach and Big Bay. These suburbs also display a better than average socioeconomic status with relatively low levels of unemployment and better than average levels of service delivery. Dwellings are almost all formal (~ 99%), and residents of these suburbs generally enjoy a more affluent lifestyle relative to the population of the study area.

These four suburbs, particularly the communities of Big Bay, Sunningdale, Parklands and Blouberg Sands, have expanded significantly. A large amount of residential densification has also taken place, in particular along the coastal strip (Eskom, 2015). Sunningdale and Parklands are two of the fastest growing urban areas in Cape Town and further expansion is proposed (Eskom, 2015). The population of these four suburbs increased by nearly 130% to more than 67 000 people between 2001 and 2011 placing strain on services in the area (Eskom, 2015).

While this area is predominantly residential, the West Coast Village (Shopping Centre) and Big Bay are both important retail nodes, and the Blaauwberg Netcare (hospital) is located in Sunningdale. Many local residents and people from outside of the study area surf and kite surf at Bloubergstrand and Big Bay (Eskom, 2015).

The R27 and M5 roads provide access to the Cape Town CBD to the south and to other areas in the City. These transportation routes are congested during high use periods (i.e. rush hour). The MyCiti Bus Service also provides access to and from this area.

Parklands Main Road is proposed to develop as a mixed use activity street northward along the railway line.

Milnerton Non-urban

The Milnerton non-urban area is a largely unpopulated area located north of Sunningdale and Parklands stretching north towards the KNPS. The suburbs of Parklands and Sunningdale have expanded into this area and therefore the socioeconomic status largely reflects the socioeconomic status of these neighbouring suburbs (see Table 4-6). This also accounts for the rapid population expansion between 2001 and 2011 (see Table 4-4).

The Blaauwberg Conservation Area is located in this non-urban area, a unique nature area of approximately 2 000 ha comprising natural, cultural and historical elements which is regarded as a global biodiversity hotspot. The R304 and the M19 (Melkbosstrand Road) are important regional access routes and traverse the area.

Melkbosstrand

Melkbosstrand is the closest populated area to the KNPS and is located to the south of the facility on the coastline. The suburb includes the communities of Duynefontein, Van Riebeeckstad and Melkbosstrand. This suburb also displays a better than average socioeconomic status with relatively low levels of unemployment and better than average levels of service delivery. Dwellings are almost all formal (~ 99%), and residents of these suburbs generally enjoy a more affluent lifestyle relative to the population of the study area. Due to its location along the coastline and the adjacent Blaauwberg Conservation Area the suburb is a sought after residential area.

The most significant development in the suburb in the last 15 years is the Atlantic Beach golf estate to the south. The development of the Melkbosstrand CBD has also proceeded with the construction of a supermarket and residential component. The demarcation of the urban edge will limit the extent of outward expansion of the town over the development projection period. However, due to its proximity to the City and being a desirable residential area, a certain amount of infill and redevelopment may be expected (Eskom, 2015).

The beach is popular with surfers and is one of the landing points for the South Africa-Far East and South Atlantic/West Africa submarine cable systems.

The R27, which runs to the west of the suburb, provides access to and from other areas in Cape Town. The MyCiti Bus Service also provides access to and from this area.

Philadelphia

The rural village of Philadelphia is a small isolated community situated in the east of the study area with a population of only 570 people in 2011. The village has a slightly worse than average socioeconomic status, and the population has generally low levels of education (see Table 4-6). More than 90% of dwellings in the suburb are formal, and more than 65% of households earn more than R3200 / month.

The community was established as a religious community and is dominated by a large church. The historic town is a fairly popular destination for local tourists and hosts a primary school and a police station.

The R304, which runs through the suburb, provides access to and from other areas in Cape Town.

Morning Star Small Holdings

Morning Star Small Holdings is a small rural community of only about 500 people located about 12 km to the south east of the KNPS. This community is relatively affluent, with fairly low levels of unemployment. Dwellings are mostly formal (89.5%), and residents of this suburb generally enjoy a more affluent lifestyle than the majority of the population of the study area.

The N7, an important regional access route, passes to the east of Morning Star, and a railway line passes to the west providing access to and from Cape Town for this community.

Kleine Zout River Small Holdings

Kleine Zout River Small Holdings is a largely unpopulated rural area located to the west of Melkbosstrand (see Figure 4-15). More than half of the dwellings in the area are informal, and most of the population of 283 people have a low monthly income.

The area hosts an airstrip and an off-road vehicle track. The R27 forms the western boundary of the area.

Du Noon and Doornbach

The suburbs of Du Noon and Doornbach are two contiguous communities located to the west of Parklands (see Figure 4-15). Doornbach and large parts of Du Noon are informal settlements, and housing is typically of poor quality with little space, and residents are exposed to high levels of environmental risk. Correspondingly, service delivery is poor. These communities are characterised by low levels of education, high levels of unemployment and low income and are known for high levels of crime.

These suburbs reflect high levels of social and environmental vulnerability associated with living in low income settlements in urban areas in South Africa. The majority of people living in such areas can be considered socially, economically and environmentally vulnerable (Oelofse, 1999, in Lewis et al, 2007).

The population of Du Noon tripled between 2001 and 2011. Opportunities for employment at the adjacent industrial area of Killarney Gardens serve as a significant pull factor for people entering this area. A growth corridor is proposed between Big Bay and Doornbach (Eskom, 2015) which will further expand the population of this area.

The N7 runs to the west of this area, and the railway network provides access to the west. The MyCiti Bus Service also provides access to and from this area.

Atlantis and Mamre

Atlantis and Mamre are two large urban communities located in the north east of the study area. Atlantis was established in the 1970s by the apartheid era government as an industrial and residential community. The suburbs include the communities of Wesfleur, Saxonsea, Sherwood, Beaconhill, Robinvale, Avondale, Protea Park, Witsand and Mamre. While most households are formal, there are some informal settlements in Atlantis. The population has a below average level of education, and has a slightly higher unemployment rate than the City average. In addition to unemployment, crime is also a major challenge to these communities (IOL, 2013).

A large and important industrial sector is present in Atlantis. The establishment of a Hisense (electronics) factory in 2013 has created much needed employment opportunities and skills development in the area (BusinessDay, 2013).

While population growth rates have been low compared to the average rates in the study area and Atlantis has experienced a period of relative stagnation, further residential and industrial development is proposed in the Atlantis Growth Corridor. The town has also been identified at ministerial level for upgrading in order to facilitate the economic upliftment of the community (Eskom, 2015). Since heavy industrial uses are permitted in Atlantis, it could be expected that further heavy industrial uses may develop here (SSR, 2012).

The 41 bed Wesfleur Hospital is located in the suburb of Atlantis and is the closest hospital to the KNPS.

The railway network, the R27, the R304 and the MyCiti Bus service provide access to and from these suburbs.

Atlantis Non-Urban

The Atlantis non-urban area is a largely unpopulated rural area in the north of the district which surrounds Atlantis and Mamre. The population of this area experiences a similar socioeconomic status to Atlantis and Mamre.

This area includes the KNPS and surrounding nature reserve, the Atlantis dune field and aquifer and the Silwerstroomstrand recreational area on the coast. Silwerstroomstrand was expected to develop as a resort because of the beauty of the coastline, the growing popularity of the West Coast as a recreational area, and its proximity to the City. However, this has not yet materialised.

The R27 and the N7 are important regional access routes connecting Cape Town to areas to the north.

Vissershok

The community of Vissershok is a small informal community of about 300 people located near the Vissershok hazardous waste disposal site. This community is characterised by extremely low education and income levels. It is assumed that the majority of employed persons in this community work at the waste disposal site. The N7 runs to the west of Vissershok.

4.2.4 Cultural and Historical Environment

This section is based on the Heritage Baseline Assessment by ACO Associates cc, 2015.

The KNPS was built between 1976 and 1981 on what was at the time an undeveloped and alien infested farm. The site alternatives for the TISF were both extensively disturbed by extensive massive earthworks and lay down areas for the construction of the KNPS. While the broader site is rich, particularly in Pleistocene fossil deposits and possibly even earlier Miocene and Pliocene deposits at deeper depths, the site alternatives are sterile and significantly transformed by previous activities.

4.2.4.1 Palaeontological Context

In 1973, Richard Klein discovered the palaeontological site known as Duinefontein 2, which comprised of fragments of fossil animal bone that were un-earthed during trial excavations for the KNPS. The site was extensively excavated between 1998 and 2003. There are at least three buried horizons (ancient land surfaces) at Duinefontein 2 (Klein 1999), each of which represents different ages in the Pleistocene and Holocene history of the region. Klein and his team found the fossilized remains of ancient Pleistocene fauna (about 300 000 years old) along with traces of human activity. The animals included many species not seen in the Cape today, as well as several extinct species such as the giant buffalo, giant pigs, extinct species of elephant, hippopotamus and the cape horse. The main fossil horizon lay roughly 1 m below the surface of the present day windblown sands. Nodular calcretes had developed over the fossil horizon making excavation very difficult at times. Deep soundings by Klein and his team revealed the presence of an even older deeper horizon; however groundwater at a depth of 2 m prevented its detailed excavation. Klein (pers. comm.) is of the opinion that archaeological and palaeontological deposits such as those found at Duinefontein 2 have the potential to exist anywhere within the Eskom held property and beyond; however more detailed surveys conducted since, show that the main fossil beds lie in the portion of the nature reserve to the north of the KNPS.

When the excavation for the KNPS took place in the 1970's, a deep sequence of fossil bearing sediments was exposed. The most recent sands and calcretes contained Pleistocene mammalian fossils as well as evidence of Early Stone Age occupation in the form of stone artefacts (Klein pers. comm.). Deeper down in the sequence, the sediments contained marine fossils of the Miocene period deposited during periods of marine transgression. Palaeontologist John Pether (2007) has indicated that these early deposits are deeply buried at 10-14 m below surface level, underneath a vertical section of 24-28 m of sediment.

4.2.4.2 Archaeological Context

The coastal regions of the southwestern Cape were occupied in pre-colonial times by peoples who exploited marine resources for their livelihood. Human occupation of the coast is archaeologically reflected in the thousands of shell midden sites and rock shelter deposits. Herder sites, such as at Kasteelberg, show occupation between 1800 and 1600 years ago. European explorers had contact with many of the Khoekhoen groups along the coast. These peoples included the CochoqQua, whose territory stretched from Saldanha Bay to Vredenburg, and the ChariGuriQua or GuriQua who occupied the lower Berg River area, St Helena Bay and points around Piketberg. Shell middens have been observed locally at Blouberg Beach, Atlantic Beach but very few within the Koeberg Nature Reserve despite exhaustive surveys.

Archival documentation makes reference to Hermanus Dempers an 'inhabitant and owner of the 'Opstal' on the loan place named 'Duinefontein' (CA CO 3985 ref, 117, CO 3887 ref 79). When the property was surveyed in 1834, there was no indication of houses or any built structures. There is, however, a 'Kraal Ordannantie' which features on the diagram as well as the later 1890 SW Cape survey map. The kraal location appears to be outside of the KNPS boundary. The site of Demper's house is not known, but it is possible that ephemeral evidence of its presence may lie under the dune sands somewhere on the Eskom property.

The colonial period history of Duinefontein is interesting; however, it does not reveal any particular significance in terms of associations with events, or important historical personalities.

4.2.5 Visual and Aesthetic Environment

The inherent value of the visual landscape to viewers is informed by geology/topography, vegetation and land-use and is expressed as *Visual Character* (overall impression of the landscape), *Visual Quality* (how the landscape is experienced) and *Sense of Place* (uniqueness and identity).

4.2.5.1 Visual Character

Visual character is descriptive and non-evaluative, which implies that it is based on defined attributes that are neither positive nor negative. A change in visual character cannot be described as having positive or negative attributes until the viewer's response to that change has been taken into consideration. The probable change caused by the project is assessed against the existing degree of change caused by previous development.

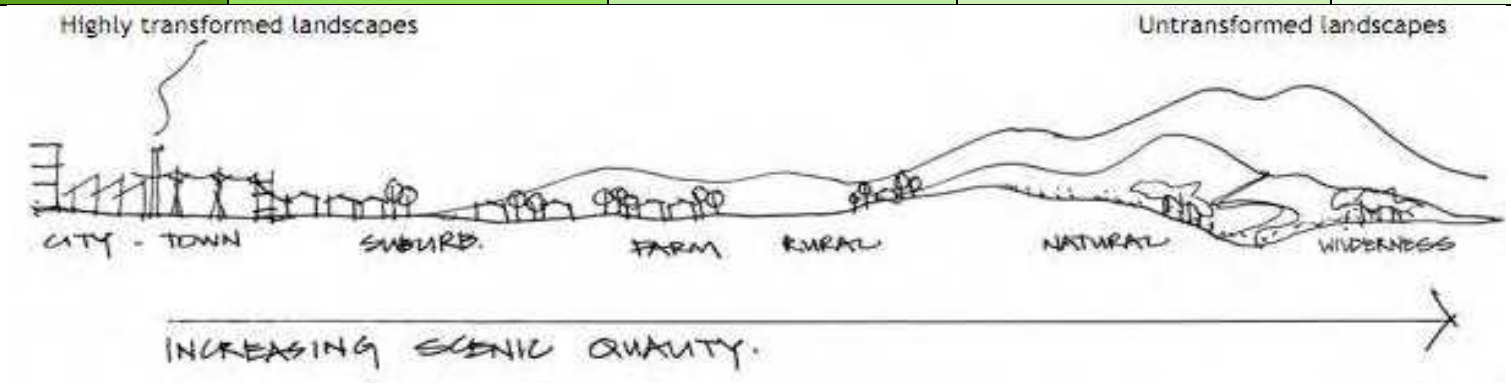
Typical character attributes, used to describe the visual character of the affected area and to give an indication of potential value to the viewer, are provided in Table 4-7.

The basis for the visual character of the study area is provided by the geology/topography, vegetation and land use of the area, giving rise to a confined industrial enclave in an open area of stable and active dunes under predominantly natural cover with influence from the ocean. The study area can be described as a *transition landscape* associated with the interface between urban development to the south and natural areas to the north.

The TISF will be located in the KNPS *SPA*, a substantially modified landscape (*highly transformed landscape*) with high levels of visual impact caused by the reactor units and associated infrastructure (buildings, roads, powerlines, etc.).

Table 4-7: Typical visual character attributes

Highly transformed landscape – urban/industrial	Transition landscape	Modified rural landscape	Natural transition landscape	Untransformed landscape – natural
Substantially developed landscape. High levels of visual impact associated with buildings, factories, roads and other related infrastructure (e.g. powerlines).	Transitional landscape associated with the interface between, rural, agricultural area and more developed suburban or urban zones.	Typical character is rural landscape, defined by field patterns, forestry plantations and agricultural areas and associated small-scale roads and buildings.	A changing landscape character associated with the interface between natural areas and modified rural / pastoral or agricultural zones.	No / minimal impact associated with the actions of man. National parks, coastlines, pristine forest areas.



Source: CNDV, 2006

http://www.shandinglu.org

http://www.nightjartravel.com

http://www.boschkloof.com

4.2.5.2 Visual Quality

Aesthetic value is an emotional response derived from our experience and perceptions. As such, it is subjective and difficult to quantify in absolute terms. Studies in perceptual psychology have shown that humans prefer landscapes with higher complexity (Crawford, 1994). Landscape quality can be said to increase when:

- Topographic ruggedness and relative relief increases;
- Water forms are present;
- Diverse patterns of grasslands, shrubs and trees occur;
- Natural landscape increases and man-made landscape decreases; and
- Where land-use compatibility increases.

The visual quality of the overall area can be ascribed to the open, modified natural character of the landscape with the KNPS as a prominent landmark on the coastline.

The visual quality is also enhanced by the view of Table Mountain in the background (looking south).

The low-growing vegetation does not add any visual interest although the predominantly natural state of the landscape inland of the KNPS (within the Koeberg Nature Reserve) and the vegetated primary dune and active dunefield to the north adds to the visual quality of the study area.

The visual quality of the area can be experienced through a number of views. These views include:

- Open views along the coast towards the KNPS (Figure 4-18);
- Rolling views across Koeberg Nature Reserve towards the KNPS (Figure 4-18 and Figure 4-19); and
- Extended, open views from the ridgeline across the coastal plain (Figure 4-19).

There are elements that detract from visual quality in the study area, notably the powerlines from the KNPS across the study area, and telecommunications masts. Nevertheless the visual quality of the study area is considered to be moderate.

4.2.5.3 Sense of Place

Our sense of a place depends not only on spatial form and quality but also on culture, temperament, status, experience and the current purpose of the observer (Lynch, 1992). Central to the idea of ‘sense of place’ or Genius Loci is identity. An area will have a stronger sense of place if it can easily be identified, that is to say if it is unique and distinct from other places. Lynch defines ‘sense of place’ as “the extent to which a person can recognise or recall a place as being distinct from other places – as having a vivid or unique, or at least a particular, character of its own” (Lynch, 1992:131).

It is often the case that sense of place is linked directly to visual quality and that areas/spaces with high visual quality have a strong sense of place. However, this is not an inviolate relationship and it is plausible that areas of low visual quality may have a strong sense of place or – more commonly – that areas of high visual quality have a weak sense of place. The defining feature of sense of place is uniqueness, generally real or biophysical (e.g. trees in an otherwise treeless expanse), but sometimes perceived (e.g. visible but unspectacular sacred sites and places which evoke defined responses in receptors). Tourism can sometimes serve as an indicator of sense of place insofar as it is often the uniqueness (and accessibility) of a space/place which attracts tourists.

The sense of place of the study area is determined by the KNPS facility and associated infrastructure located in a predominantly natural setting and influenced by the proximity to the coast and the Koeberg Nature Reserve. The study area has an immediately recognisable sense of place as the KNPS reactor units have been distinguishable, though not overly intrusive landmarks on the landscape for many years.

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Figure 4-18: View of the KNPS from Duynefontein beach (above) and view of the KNPS from Koeberg Nature Reserve with Table Mountain in the background (below)

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Figure 4-19: View across Koeberg Nature Reserve from the R27 (above) and view across the coastal plain towards the R27 from the primary dune (below)

4.2.5.4 Visual Receptors

Receptors are important insofar as they inform visual sensitivity. The sensitivity of viewers is determined by the number of viewers and by how likely they are to be impacted upon. Potential viewers include the following:

- **Motorists**: The KNPS is visible to users travelling on the R27 along the eastern boundary of the study area. Viewers along the R27 are transient (and moving at speed) and so are exposed to visual impacts for a relatively short period. The dunefield in the north of the study area provides partial screening, and although the KNPS is visible to motorists along the R27, the TISF will not be visible as the alternative sites are wholly screened by the primary dune.
- **Residents of Duynefontein**: Visibility from individual households is likely to be low, since the urban fabric obtrudes views of the site beyond the very immediate foreground. The primary dune provides visual screening to receptors in Duynefontein. The Alternative 2 site on the southern side of the KNPS may be partially visible from the beach, although this is unlikely as receptors can only approach to within approximately 1.6 km of the KNPS and the dunes provide partial screening. The Alternative 1 site will not be visible to residents of Duynefontein as this site is located on the northern side of the KNPS and will therefore be screened by existing infrastructure.
- **Visitors to the Koeberg Nature Reserve**: The primary dune provides visual screening to many of the trails and viewpoints within the nature reserve. Regular visitors to the area will have become accustomed to the KNPS infrastructure, while new visitors to the study area could be expected to notice industrial elements.

The ridgeline ensures that most of the KNPS *SPA*, and therefore the site alternatives, are screened from receptors. The TISF is unlikely to be easily distinguishable from the rest of the KNPS infrastructure. The sensitivity of viewers or visual receptors potentially affected by the visual impact of the Project is considered to be very low.

4.2.5.5 Viewing Distance and Visibility

The distance of a viewer from an object (in this case the TISF) is an important determinant of the magnitude of the visual impact. This is because the visual impact of an object diminishes/attenuates as the distance between the viewer and the object increases. Thus the visual impact at 1 000 m would, nominally, be 25% of the impact as viewed from 500 m. At 2 000 m it would be 10% of the impact at 500 m (Hull and Bishop, 1988 in Young, 2000).

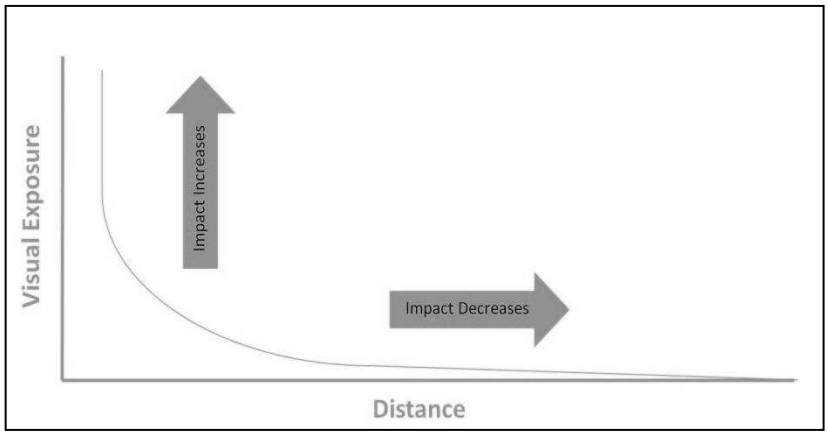


Figure 4-20: Visual exposure vs distance
Source: Adapted from Hull and Bishop (1998)

Three basic distance categories can be defined for a Project of this scale (as discussed and represented in Table 4-8):

- Foreground;
- Middleground; and
- Background.

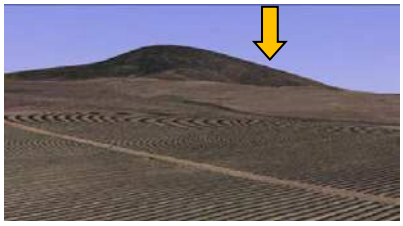
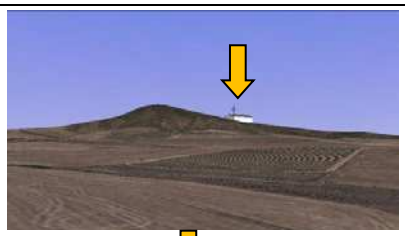
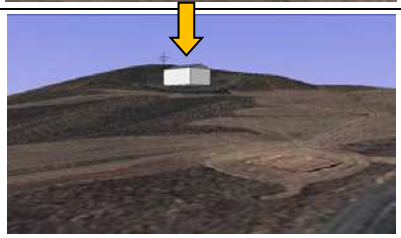
Table 4-8: Distance categories

FOREGROUND (0 – 1 km)	The zone where the proposed Project will dominate the frame of view. The TISF will be *highly visible* unless obscured.
MIDDLEGROUND (1 – 3 km)	The zone where colour and line are still readily discernible. The TISF will be *moderately visible* but will still be easily recognisable.
BACKGROUND (> 3 km)	This zone stretches from 3 km to the point from where the TISF can no longer be seen. Objects in this zone can be classified as *marginally visible* to *not visible*.

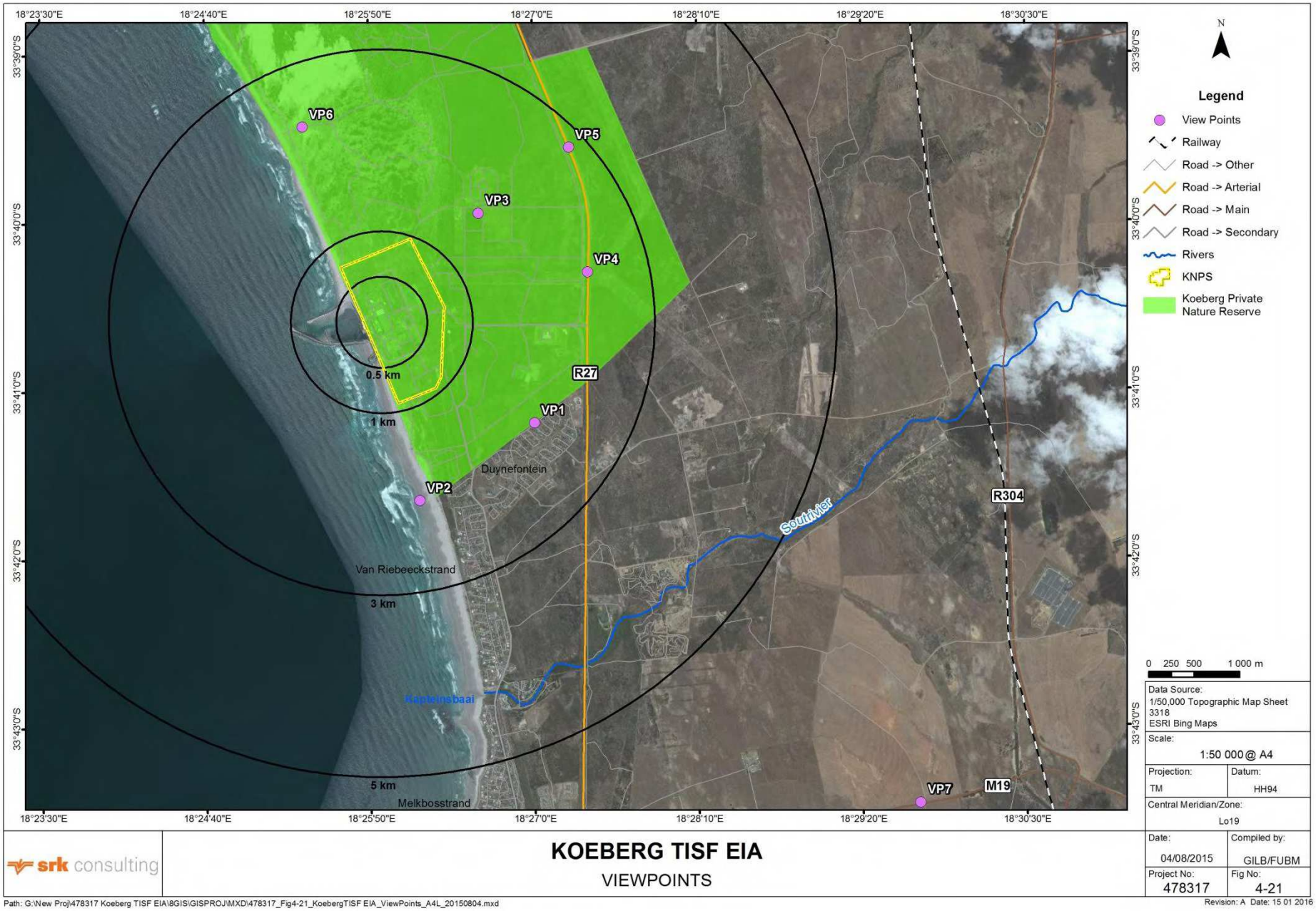
A range of (reasonably) accessible viewpoints were selected from the surrounding areas, in order to provide an indication of the likely visibility of the TISF. The viewpoints were not randomly selected but were chosen because they are likely to afford optimal views of the project, i.e. the TISF is likely to be less visible from other accessible viewpoints.

The selected viewpoints are shown in Figure 4-21, and views from these viewpoints are shown in the accompanying photographs (Figure 4-22 to Figure 4-25). The criteria used to determine the visibility of the TISF are set out in Table 4-9 and the visibility from each viewpoint is summarised in Table 4-10.

Table 4-9: Visibility criteria

NOT VISIBLE	Project cannot be seen	
MARGINALLY VISIBLE	Project is only just visible / partially visible (usually in background zone)	
VISIBLE	Project is visible although parts may be partially obscured (usually in middleground zone)	
HIGHLY VISIBLE	Project is clearly visible (usually in foreground or middleground zone)	

.


18°23'30"E
18°24'40"E
18°25'50"E
18°27'0"E
18°28'10"E
18°29'20"E
18°30'30"E
33°39'0"S
33°40'0"S
33°41'0"S
33°42'0"S
33°43'0"S
N
Legend
View Points
Railway
Road -> Other
Road -> Arterial
Road -> Main
Road -> Secondary
Rivers
KNPS
Koeberg Private Nature Reserve
VP1
VP2
VP3
VP4
VP5
VP6
VP7
0.5 km
1 km
3 km
5 km
R27
R304
M19
Duynefontein
Van Riebeeckstrand
Melkbosstrand
Kapteinsbaai
Soutriver
0 250 500 1 000 m
Data Source:
1/50,000 Topographic Map Sheet 3318
ESRI Bing Maps
Scale:
1:50 000 @ A4
Projection:
TM
Datum:
HH94
Central Meridian/Zone:
Lo19
Date:
04/08/2015
Compiled by:
GILB/FUBM
Project No:
478317
Fig No:
4-21
srk consulting
KOEBERG TISF EIA
VIEWPOINTS
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Revision: A Date: 15 01 2016

Table 4-10: Visibility from viewpoints

View Point #	Location	Co-ordinates	Direction of view towards/from the site	Time of Photograph	Potential Receptors	Visibility
VP1	Duynefontein (Napoleon Avenue)	33°41'11.63"S; 18°27'0.35"E	North-west	10:37am	Residents of Duynefontein	Alternative 1 Site - Not visible
						Alternative 2 Site – Not visible
VP2	Duynefontein beach	33°41'39.15"S; 18°26'11.29"E	North	10:53am	Visitors to Duynefontein beach	Alternative 1 Site – Not visible
						Alternative 2 Site – Marginally visible
VP3	Koeberg Nature Reserve administration buildings	33°39'56.73"S; 18°26'36.79"E	South-west	11:23am	Visitors to the Koeberg Nature Reserve	Alternative 1 Site - Not visible
						Alternative 2 Site – Not visible
VP4	R27	33°40'17.89"S; 18°27'23.29"E	West	11:30am	Users of the R27	Alternative 1 Site - Not visible
						Alternative 2 Site – Not visible
VP5	R27	33°39'33.36"S; 18°27'15.42"E	South-west	11:33am	Users of the R27	Alternative 1 Site - Not visible
						Alternative 2 Site – Not visible
VP6	Dune Road in Koeberg Nature Reserve north of site	33°39'24.25"S; 18°25'32.97"E	South	12:25pm	Visitors to Koeberg Nature Reserve	Alternative 1 Site – Marginally visible
						Alternative 2 Site – Not visible
VP7	Melkbosstrand Road	33°43'27.51"S; 18°29'44.40"E	North-west	10:25am	Users of Melkbosstrand Road	Alternative 1 Site – Not visible
						Alternative 2 Site – Marginally visible but 7.5km from site

Note: Shading indicates visibility according to Table 4-9.

srk consulting	**KOEBERG TISF VIA** VIEWS FROM VIEWPOINTS 1 & 2	Project No. 478317

Figure 4-22: Views from Viewpoint 1 (above) and Viewpoint 2 (below)

srk consulting	**KOEBERG TISF VIA** VIEWS FROM VIEWPOINTS 3 & 4	Project No. 478317

Figure 4-23: Views from Viewpoint 3 (above) and 4 Viewpoint (below)

srk consulting	**KOEBERG TISF VIA** VIEWS FROM VIEWPOINTS 5 & 6	Project No. 478317

Figure 4-24: Views from Viewpoint 5 (above) and Viewpoint 6 (below)

srk consulting	**KOEBERG TISF VIA** VIEWS FROM VIEWPOINT 7	Project No. 478317

Figure 4-25: Views from Viewpoint 7

5 Stakeholder Engagement

Stakeholder engagement forms a key component of the S&EIR process. The objectives of stakeholder engagement are outlined in this section, followed by a summary of the approach to be followed, in compliance with Chapter 6 of the EIA Regulations, 2014.

5.1 Objectives and Approach to Stakeholder Engagement

The overall aim of stakeholder engagement is to ensure that all IAPs have adequate opportunity to provide input into the process and raise their comments and concerns. More specifically, the objectives of stakeholder engagement are to:

- Identify IAPs and inform them about the proposed development and S&EIR process;
- Provide stakeholders with the opportunity to participate effectively in the process and identify relevant issues and concerns; and
- Provide stakeholders with the opportunity to review documentation and assist in identifying mitigation and management options to address potential environmental issues.

5.2 Stakeholder Engagement Activities

The activities undertaken and proposed during the Pre-Application and Scoping Phases of the assessment are outlined in Table 5-1 and Table 5-2 below.

Table 5-1: Stakeholder engagement activities planned during the Pre-Application Phase

Task	Objectives	Dates
Advertise release of Background Information Document (BID) for I&AP registration	To provide stakeholders with the opportunity to review the BID and register on the I&AP database.	08 October 2015
Initial public comment and registration period	To provide stakeholders with the opportunity to review the BID and provide initial comment and register as stakeholders for the EIA process.	09 October to 09 November 2015
Public Open Day	To present the proposed project to stakeholders and provide an opportunity for questions and discussion.	27 October 2015
Focus Group Meetings	To present the proposed project to relevant authorities and focus groups identified through stakeholder interest, and provide an opportunity for questions and discussion.	November 2015 to January 2016
Release Draft Scoping Report for public comment	To provide stakeholders with the opportunity to review the Scoping Report and provide initial comment.	March to April 2016
Compile Comments and Responses Summary	To record all issues and concerns raised and collate these comments in the Scoping Report.	May 2016

Table 5-2: Stakeholder engagement activities planned during the Scoping Phase

Task	Objectives	Dates
Advertise commencement of EIA process and release of Scoping Report for public comment period	To notify IAPs of the commencement of the EIA process and to provide a description of the proposed project and the affected environment, as well as a description of potential environmental issues, and the proposed approach to the Impact Assessment Phase.	July 2016
Public comment period	To provide stakeholders with the opportunity to review and comment on the results of the Scoping Phase.	July to August 2016

Task	Objectives	Dates
Public Open Day	To present the findings of the Scoping Report to stakeholders and provide an opportunity for questions and discussion.	July 2016
Focus Group Meetings	To present the findings of the Scoping Report to relevant authorities and focus groups identified through stakeholder interest, and provide an opportunity for questions and discussion.	July *to August* 2016
Compile Comments and Responses Summary and finalise Scoping Report	To record all issues and concerns raised and collate these comments in the final report which provides DEA with information to decide whether to accept the Scoping Report.	August 2016

The key activities (that will be) undertaken in the stakeholder engagement process during the Pre-Application and Scoping Phases are described further below.

5.2.1 Identification of Key Stakeholders

As required by the EIA Regulations, 2014, relevant local, provincial and national authorities, conservation bodies, local forums and representatives and surrounding land owners and occupants have been notified of the EIA and the release of the Scoping Report for comment.

Relevant authorities (Organs of State) have been automatically registered as IAPs. In accordance with the EIA Regulations, 2014, all other persons must request in writing to be placed on the register, submit written comments or attend meetings in order to be registered as stakeholders and included in future communication regarding the project. As specified in GN R 982, all persons who submit written comments, attend meetings or request in writing to be placed on the register will be registered as IAPs, and advertisements advise that IAPs register as such.

A list of stakeholders that were notified of the process is provided in ***Appendix E***[14]. The stakeholder database will be updated throughout the process.

5.2.2 Pre-Application Phase

5.2.2.1 Release of BID for Public Comment

Key stakeholders were identified and notified of the availability of the BID for public review. Newspaper advertisements (***Appendix F***) announcing the availability of the BID and inviting IAPs to register on the project database were placed in:

- One regional newspaper:
  - The Cape Times (in English).
- Five local newspapers:
  - WeskusNuus (in Afrikaans);
  - Table Talk (in English);
  - Tygerburger Table View (in English and Afrikaans);
  - Isolabantu (in isiXhosa); and
  - Impact 24/7 (in Afrikaans).

[14] Stakeholders who submitted written comments or attended the Public Open Day and/or Focus Group Meetings during the Pre-Application Phase, were registered on the stakeholder database.

A notice was also placed in the Shutdown Times (in English), an Eskom internal newsletter.

Copies of the BID and I&AP registration forms (included in ***Appendix G***) were made available for viewing at the following venues:

- Koeberg Public Library, Duynefontein;
- Wesfleur Public Library, Atlantis;
- Cape Town Public Library;
- The Koeberg Visitors' Centre; and
- SRK's office in Rondebosch.

A4 or A3 size notices, in English and/or Afrikaans, were placed on the noticeboards at each of the relevant locations. A2 site notices were placed at the entrances to the KNPS (see ***Appendix H***).

5.2.2.2 Public Open Day and Focus Group Meetings

A Public Open Day was held on Tuesday 27 October 2015 at the KNPS Visitors Centre from 15h00 to 18h30. The Public Open Day included a poster presentation (copies of posters and the attendance register are included as ***Appendix I***). The purpose of the Public Open Day was to provide stakeholders with information regarding the proposed project and allow for the identification of key issues and concerns to inform the Scoping process.

Focus Group Meetings were held with key stakeholders listed in Table 5-3 to facilitate focused discussion and the dissemination of information regarding the project. Notes from these meetings are included in ***Appendix J***.

Table 5-3: Focus Group Meetings during the Pre-Application Phase

Meeting 1: Pre-Application Meeting	**Date:** 20 November 2015	**Venue:** DEA Offices, Pretoria
Stakeholder	***Organisation***	
Henriette van Graan	NNR	
Peter Mkhabela	NNR	
Lerato Mokoena	DEA	
Wayne Hector	DEA	
Millicent Solomons	DEA	
Meeting 2: Authorities Meeting	**Date:** 26 January 2016	**Venue:** DEA&DP Offices, Cape Town
Stakeholder	***Organisation***	
Alvan Gabriel	DEA&DP: Development Management	
Adri la Meyer	DEA&DP: Development Management	
Lance McBain-Charles	DEA&DP: Waste Management Licencing	
Russell Mehl	DEA&DP: Pollution Management	
Melanese Schippers	DEA&DP: Development Management	
Anthony van Wyk	DEA&DP: Environmental Officer	
Zayed Brown	DEA&DP: Pollution and Chemicals Management	
Peter Harmse	DEA&DP: Air Quality Management	
Bhawoodien Parker	DEA&DP: Air Quality Management Monitoring	
Eugene Pienaar	DEA&DP: Waste Management	
Pat Titmuss	CoCT: Environmental Resources Management	
Morne Theron	CoCT: Environmental Resources Management	
Ian Gildenhuys	CoCT: City Health	

5.2.2.3 Release of Draft Scoping Report for Public Comment

The Draft Scoping Report *was* released for public and authorities comment from 18 March until 25 April 2016. Copies of the document *were* made available to all key commenting authorities, and all registered I&APs were notified in writing of the availability of the report for comment (***Appendix K***), and provided with an executive summary of the Draft Scoping Report.

Hard copies of the full report *were made* available for viewing at the following venues:

- Koeberg Public Library, Duynefontein;
- Wesfleur Public Library, Atlantis;
- Cape Town Public Library;
- The KNPS Visitors Centre; and
- SRK's office in Rondebosch.

An electronic version of the report *was also available* on SRK's website **www.srk.co.za** (via the 'Library' and 'Public Documents' links).

A notice was also placed in the internal Eskom KNPS communication newspaper, namely the "Shutdown Times" (in English). Eskom also communicated the proposed TISF project at the quarterly Public Safety Information Forum meetings on 30 September 2015 and 31 March 2016 respectively.

5.2.2.4 Initial Stakeholder Concerns

Key concerns raised by stakeholders during the *Pre-Application Phase* are as follows:

- Used nuclear fuel should not be stored at the KNPS;
- Used nuclear fuel should be stored at the CISF;
- Intended lifespan of the TISF;
- *Design details of the TISF*;
- Used nuclear fuel from other sources will be stored at the TISF;
- Transport of the dry storage casks to and from the TISF;
- *Access road design requirements;*
- Proximity of the increasing population to the TISF and the health and safety risks;
- Consideration of other alternatives;
- *Motivation for the preferred site alternative;*
- Impacts on coastal processes;
- *Delineation of the HWM;*
- *Impacts on terrestrial ecology;*
- Potential visual impacts of the TISF;
- Potential groundwater impacts;
- Potential impacts on the health and safety of employees;
- *Potential radiation impacts;*
- Lifespan and maintenance requirements of the casks;

- Security at the TISF and responses to emergencies;
- Cumulative impacts of other proposed projects;
- *Disposal of construction waste and general waste;*
- *Confusion between the KNPS SPA and NEM:PAA Protected Area;*

These issues have informed the Scoping Report *and particularly the Plan of Study for EIA*. All written comments received from stakeholders are included in ***Appendix L*** and a Comments and Responses Summary has been included in ***Appendix M***.

5.2.3 Scoping Phase

5.2.3.1 Notification of the EIA Process and Scoping Report for Public Comment

Newspaper advertisements announcing the commencement of the S&EIR process, the availability of the Scoping Report for stakeholder review and once again inviting additional I&APs to register on the project database *were* placed in:

- One regional newspaper:
  - The Cape Times (in English).
- Five local newspapers:
  - WeskusNuus (in Afrikaans);
  - Table Talk (in English);
  - Tygerburger Table View (in English and Afrikaans);
  - Isolabantu (in isiXhosa); and
  - Impact 24/7 (in Afrikaans).

Hard copies of the full report *were* made available at the venues listed in Section 5.2.2.4, and an electronic version of the report *can also be accessed* on SRK's website **www.srk.co.za** (via the 'Library' and 'Public Documents' links).

A4 or A3 size notices, in English and/or Afrikaans, were placed on the noticeboards at each of the relevant locations. A2 site notices were placed at the entrances to the KNPS.

Stakeholders will be provided with a 30 day comment period.

5.2.3.2 Public Open Day and Focus Group Meetings

A Public Open Day will be held *during the comment period*. At this Open Day, a series of posters will be presented and members of the EIA team and Eskom's technical team will be available to discuss any aspects of the proposed project with stakeholders.

The details of the Public Open Day are as follows:

- *Venue: Koeberg Visitors' Centre*
- *Date: 21 July 2016*
- *Time: 15h00 – 18h30*

Focus Group Meetings will be held with selected stakeholder groups during the week following the Public Open Day, to present the findings of the Scoping Report and to provide an additional opportunity for questions and discussion. The Public Open Day and Focus Group Meetings will help to guide the assessment of potential impacts during the Impact Assessment Phase.

5.2.3.3 Submission of Final Scoping Report / Next Steps

Following initial review of the Scoping Report, issues raised by authorities and the public will be summarised and responded to in a (revised) Comments and Responses Summary, which will be appended to the Scoping Report. The Scoping Report will be updated (if necessary) taking stakeholder input into account. The Final Scoping Report will then be submitted to DEA. The Impact Assessment Phase will commence on acceptance of the Final Scoping Report by DEA.

6 Potential Environmental and Social Impacts

6.1 Key Environmental Issues

The impacts of a project are mostly linked to the sensitivity of the receiving environment and proximity of receptors, the extent or footprint and nature of the development, potential risks in an emergency situation and stakeholders' perceptions.

Based on the above considerations as well as the professional experience of the EAP, the following *key* environmental issues – potential negative impacts and potential benefits of the project in its proposed setting – have been identified. Other less significant impacts are discussed in Section 7.7.9.

- **Geohydrology** – The construction of the TISF may potentially impact on groundwater levels and quality although this is unlikely as groundwater at the project site is deeper than the proposed TISF excavation depth. Dewatering of excavations will probably not be required during construction.
- **Terrestrial ecology** – Due to the ecological sensitivity of both TISF site alternatives and the presence of sensitive vegetation types, the project may negatively impact threatened and/or protected floral species. The project does not pose a threat to threatened or protected faunal species.
- **Socio-economic** – Potential negative impacts on the surrounding communities would be associated with an increase in nuisance factors (e.g. poor noise and air quality conditions during construction). Potential economic benefits are expected due to increased employment opportunities during the construction phase. The TISF will also ensure the continued operation of the KNPS, a significant electricity producer in the Western Cape.
- **Radiation and Human Health –** The potential exposure of Eskom employees as well as individuals in surrounding communities to radiation due to the handling and storage of used fuel at the TISF and the potential negative impacts on human health of is expected to be a key concern to stakeholders.
- **Heritage** – Although the West Coast is known for its wealth of fossil and shell middens, both TISF site alternatives are considered significantly disturbed by previous construction activities and in terms of the heritage landscape, the possibility of finding sites of archaeological or palaeontological importance is highly unlikely.
- **Visual –** The sense of place of the study area is determined by the KNPS infrastructure located in a predominantly natural setting and influenced by the proximity to the coast. The TISF will be located in the KNPS *SPA*, a substantially modified landscape and is therefore unlikely to have significant negative visual impacts for receptors.

The potential direct, indirect and cumulative impacts (negative and positive) of the project and the No Go option, based on the key issues listed above, will be addressed in the Impact Assessment Phase of the EIA. Specialist studies and inputs will be commissioned during the Impact Assessment Phase to address these issues (see Section 7.3).

Certain impacts, while important, are considered likely to be less significant than those discussed above, or unlikely to require specialist input given the information already available. It is proposed that these potential impacts be assessed by the EAP. These include **land use**, **air quality, noise, traffic, surface water and stormwater impacts** – see Section 7.7.9.

6.2 Radiation Risks

Eskom has a comprehensive ERP for the KNPS as discussed in Section 3.7.5. In the case of the TISF, there is very unlikely to be a scenario of severe damage to the KNPS and the used fuel casks that would generate a radiation plume exceeding the plume from the (simultaneously damaged) reactor units or from the SFP. A detailed analysis of possible scenarios that may lead to radiological releases will be assessed in the Probabilistic Safety Assessment (PSA) which has been commissioned by Eskom. The PSA will also inform the *update* of the KNPS ERP.

Risks associated with the TISF, and appropriate emergency response will be evaluated by the NNR, who will need to be assured that these matters are correctly addressed prior to authorising the TISF. As such, radiation risks will not be evaluated in detail in the Impact Assessment Phase, although impacts of any routine exposure to radiation to human health will be reported - see Sections 7.7.5 and 7.7.6.

7 Plan of Study for the EIA

The proposed Plan of Study for the Impact Assessment Phase of the EIA is presented below.

7.1 Description of the Proposed EIA Process

The Impact Assessment Phase can be divided into key steps, namely:

- Consultation with relevant authorities;
- Specialist studies;
- Compilation of an EIA Report and an Environmental Management Programme (EMPr);
- Stakeholder engagement; and
- Submission of the Final EIA Report and EMPr to the competent authority, in this case DEA.

These are outlined in more detail below.

7.2 Consultation with the Relevant Authorities

Consultation will be conducted with DEA and other relevant authorities to clarify their requirements for the Impact Assessment Phase of the proposed development, other permit and licence applications for the project and to ensure that comments from the key authorities can be received in time to allow for them to be addressed in the EIA. The authorities (and other organs of state) that will be consulted include:

- DEA;
- NNR;
- DEA&DP;
- HWC;
- DWS;
- DoE;
- CoCT;
- CapeNature; and
- DEA:O&C.

7.3 Specialist Studies

Specialist assessments will be undertaken as part of the Impact Assessment Phase to investigate the key potential environmental issues and impacts identified during Scoping. These key issues and impacts have been identified based on:

- The legal requirements (Chapter 2);
- The nature of the proposed activity (Chapter 3)
- The nature of the receiving environment (Chapter 4); and
- The professional experience of the EIA team.

*The following **specialist studies** are proposed for the Impact Assessment Phase:*

- *Geohydrology Specialist Study;*
- *Terrestrial Ecology (including terrestrial fauna) Specialist Study;*
- *Socio-economic Specialist Study;*
- *Review of Radiological Assessment;*
- *Human Health Specialist Study;*
- *Heritage Specialist Study; and*
- *Visual Specialist Study.*

Draft ToR for these studies are presented in Section 7.7 below.

7.4 Compilation of the Environmental Impact Assessment Report

The compilation of the EIA Report and EMPr will include the following tasks:

- Assimilation of the specialist studies / input into the EIA Report and EMPr;
- Identification and assessment of environmental impacts based on the results of the specialist studies / input and professional judgment of the EIA team. This will entail an assessment of the duration, extent, probability and intensity of the impacts to determine their significance (see Section 7.7.1 below);
- Identification of mitigation measures and recommendations for the management of the proposed project to avoid and minimise environmental impacts and maximise benefits; and
- Collation of the above information into an EIA Report and EMPr for the design, construction and operation phases of the project.

The update of the ERP falls outside the scope of the EIA and EMPr and will be undertaken/commissioned at a later stage.

7.5 Stakeholder Engagement

The stakeholder engagement process initiated during the Scoping Phase (see Section 5.2) will continue in the Impact Assessment Phase of the EIA. The key activities planned during the Impact Assessment Phase are outlined in Table 7-1.

Table 7-1: Stakeholder engagement activities planned during the Impact Assessment Phase

Task	Objectives	Dates
Update stakeholder database	To register additional stakeholders identified throughout the S&EIR process	Throughout S&EIR process
Compile and release EIA Report for public comment period	To assess the impacts of the project and formulate mitigation measures and management plans.	Impact Assessment Phase
Public comment period	To provide stakeholders with the opportunity to review and comment on the results of the Impact Assessment Phase.	Impact Assessment Phase
Public open day/focus group meetings with key stakeholder	To discuss potential impacts of the project and findings of the studies. Key stakeholder groups will be identified based on findings of specialist studies and interest from	Before and/or after the release of the EIA Report for public

Task	Objectives	Dates
groups	stakeholders and include groups that might be significantly affected by the project as well as local and regional authorities.	comment
Finalise EIA Report	To present the findings of the EIA process and incorporate stakeholder comment in the final report which provides DEA with information for decision-making.	Impact Assessment Phase

7.6 Submission of the Final EIA Report and EMPr to DEA

All comments received will be incorporated into a Comments and Responses Summary which will be appended to the Final EIA Report. The Final EIA Report (including the EMPr) will then be submitted to DEA to inform their decision regarding environmental authorisation of the proposed development.

7.7 Specialist Study Terms of Reference

The assessment of impacts will be based on the professional judgment of the specialists, fieldwork and desktop analysis, as required. General ToR applicable to all specialists, as well as specific ToR for each specialist study are set out below. The general ToR may not apply equally to all specialists but are included to provide a comprehensive guideline. Specialists will be instructed to disregard those elements of the general ToR that are not applicable to them.

7.7.1 General Terms of Reference

In June 2005 DEA&DP issued several guidelines for involving specialists in EIA processes. SRK expects that specialists will be aware of and utilise these guidelines to more precisely determine methods and approaches to specialist studies and will reference these guidelines accordingly. Specialist studies must also comply with Appendix 6 of the EIA Regulations, 2014.

The specialist studies shall be based on the procedure outlined below.

Approach to the Study

Provide an outline of the approach used in the study. Assumptions, limitations and sources of information must be clearly identified. The knowledge of local people should, where possible, be incorporated in the study. The description of the approach shall include a short discussion of the appropriateness of the methods used in the specialist study. The assessment of the data shall, where possible, be based on accepted scientific techniques, failing which the specialist is to make judgments based on professional expertise and experience.

Description of the Affected Environment or Baseline

A description of the affected environment must be provided, both at a site-specific level and for the wider region, the latter to provide an appropriate context and cumulative impact analysis. The focus of this description shall be relevant to the specialists' field of expertise.

It is essential that the relative uniqueness or irreplaceability of the area be understood in the context of the surrounding region at a local, regional (and, if necessary, national) scale. This will largely be based on a comparison to existing data sources, where available.

The baseline should provide an indication of the sensitivity of the affected environment. Sensitivity, in this instance, refers to the ‘ability’ of an affected environment to tolerate disturbance (given existing and expected cumulative impacts).

Lastly, the baseline should provide a sufficiently comprehensive description of the existing environment in the study area to ensure that a detailed assessment of the potential impacts of the

proposed development can be made. The baseline should include data collected through a thorough literature review as well as field surveys (where applicable).

Impact Identification and Assessment

Clear statements identifying the potential environmental impacts of the proposed project must be presented. This includes potential impacts of the construction and operation of the project. The specialist shall clearly identify the suite of potential **direct, indirect and cumulative environmental impacts**[15] in his/her study. The assessment of these impacts should take into account any other existing proposals in the surrounding area.

Direct impacts require a quantitative assessment which must follow the impact assessment methodology laid out in Section 7.7.2. The significance of impacts must be assessed both without and with assumed effective mitigation. Indirect and cumulative impacts should be described qualitatively.

The specialist shall comparatively assess environmental impacts of the development (and each alternative if applicable), and shall indicate any fatal flaws, i.e. very significant adverse environmental impacts which cannot be mitigated and which will jeopardise the project and/or activities in a particular area. All conclusions will need to be thoroughly backed up by scientific evidence.

Mitigation Measures

Specialists must recommend practicable **mitigation measures** or management actions that effectively minimise or eliminate negative impacts, enhance beneficial impacts, and assist project design. If appropriate, specialists must differentiate between essential mitigation and optimisation measures (i.e. implicit in the 'assuming mitigation' rating), and best practice measures (which reduce impacts, but do not affect the impact rating).

Specialists are also required to recommend appropriate monitoring and review programmes to track the efficacy of mitigation measures (if appropriate).

Specialists must indicate the environmental acceptability of the proposal (and alternatives if applicable), i.e. whether the impacts are acceptable or not. A comparison between the No Go alternative and the proposed development alternative(s) must also be included.

7.7.2 Geohydrology Specialist Study

The following ToR are proposed for the Geohydrology Specialist Study:

- Review previous geohydrology studies undertaken at the KNPS to determine baseline information available and to determine gaps in information;
- Describe and map the existing groundwater resources potentially affected by the project, including groundwater levels, groundwater quality, hydrological linkages with other surface and groundwater resources and existing users of groundwater resources in the area;
- Simulate a dewatering scenario for the construction phase and determine dewatering flow rates, volumes and impact on the aquifer by using existing numerical models for the KNPS;

[15] An **indirect** impact is an effect that is related to but removed from a proposed action by an intermediate step or process. **Cumulative** impacts occur when: Different impacts of one activity or impacts of different activities on the natural and social environment take place so frequently in time or so densely in space that they cannot be assimilated; or impacts of one activity combine with the impacts of the same or other activities in a synergistic manner.

- Identify potential impacts of the project on groundwater resources as well as potential impacts of groundwater on the proposed development;
- Assess the impacts of the project on groundwater resources using the prescribed impact assessment methodology;
- Identify and assess potential cumulative impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area;
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology; and
- Recommend and draft a monitoring campaign to ensure the correct implementation and adequacy of recommenced mitigation and management measures, if applicable.

7.7.3 Terrestrial Ecology Specialist Study

The following ToR are proposed for the Terrestrial Ecology Specialist Study:

- Review previous terrestrial ecology studies undertaken at the KNPS to determine baseline information available and to determine gaps in information;
- Undertake a field assessment of the entire area to be affected by construction activities as well as the surrounding zone of influence to identify habitat types, conservation importance and ecological state;
- List any potentially threatened, endangered and endemic flora and fauna species in the area and indicate the importance of the identified species in a local, regional and national context;
- Map areas of higher and lower sensitivity on the site;
- Define applicable legislative requirements regarding any permit applications required;
- Identify potential impacts of the project on terrestrial ecology;
- Assess the impacts of the project on terrestrial ecology in the area using the prescribed impact assessment methodology;
- Identify and assess potential cumulative ecological impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area;
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology; and
- Recommend and draft a monitoring campaign to ensure the correct implementation and adequacy of recommenced mitigation and management measures, if applicable.

The specialist should also refer to and, where appropriate, comply with, the DEA&DP Guidelines for Involving Biodiversity Specialists in EIA Processes (2006).

7.7.4 Socio-economic Specialist Study

The following ToR are proposed for the Socio-economic Specialist Study:

- Describe the socio-economic characteristics of the study area, based on:
  - Existing public data, including:
    - Statistical data from Census 2011 and 2001 and the 2007 community survey;
    - Relevant planning and policy frameworks for the area, such as the District Plans of the CoCT Spatial Development Framework and Environmental Management Framework;
    - Spatial data analysis produced by the City of Cape Town;
    - Maps and aerial photographs of the study area;
    - Previous studies undertaken for the KNPS site;
    - Economic publications, such as the Provincial Economic Review and Outlook for the Western Cape; and
    - Previous studies undertaken for similar projects.
  - Interviews with key stakeholders (e.g. local councillors or organisations).
- Describe current and historical social trends;
- Identify the potential social and economic impacts of the project;
- Assess the socio-economic impacts of the project area using the prescribed impact assessment methodology. Findings of other specialist studies, such as the visual, heritage and human health studies compiled for the project, must be considered where relevant;
- Identify and assess potential cumulative socio-economic impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area; and
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology.

The SRK Cape Town environmental team includes a socio-economic specialist who has the expertise and necessary tools to undertake the Socio-economic Specialist Study. This specialist input will be incorporated directly into the EIA Report and a separate specialist report will not be produced.

7.7.5 Review of Radiological Assessment

A Radiological Assessment was commissioned by Eskom prior to commencement of the EIA. In order to meet the independence requirements as stipulated in the EIA Regulations, 2014 an independent review of the Radiological Assessment will be undertaken to inform the EIA process.

The following ToR are proposed for the Independent Review of the Radiological Assessment:

- Review the ToR and the radiation specialist's proposal for the Radiological Assessment;
- Recommend any changes required to the Radiological Assessment ToR to comply with South African legislation, by-laws and international best practice;
- Review relevant aspects of the Radiological Assessment including, as a minimum, the methodology, input data, findings, conclusions and recommendations of the Assessment relating to Public Dose Assessment and Worker Dose Assessment; and

- Identify gaps in reporting and make recommendations to improve reports and processes so that they are aligned with international best practice and national legislation.

The (reviewed) Radiological Assessment will not be reported in detail in the Impact Assessment Phase, but will be a critical input into the Human Health Specialist, to better understand and report any potential impacts associated with exposure to radiation.

7.7.6 Human Health Specialist Study

The following ToR are proposed for the Human Health Specialist Study:

- Compile a baseline assessment based on exposure scenarios prior to development of the TISF;
- Contextualise radiation dose (using data from the Radiological Assessment) in terms of risk for morbidity and mortality using generic numerical factors to convert total radiation dose to cancer risk;
- Identify potential impacts of the project on human health of the communities surrounding the KNPS;
- Assess the impacts of the project on human health in the area using the prescribed impact assessment methodology;
- Identify and assess potential cumulative human health impacts resulting from the proposed development in relation to existing developments at the KNPS;
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology; and
- Recommend and draft a monitoring campaign to ensure the correct implementation and adequacy of recommenced mitigation and management measures, if applicable.

7.7.7 Heritage Specialist Study

The following ToR are proposed for the Heritage Specialist Study:

- Review previous heritage studies undertaken at Koeberg to determine baseline information available and to determine gaps in information;
- Compile the NID for submission to HWC;
- Identify and describe any heritage resources in the area and their importance in a local, regional and national context;
- Identify potential impacts of the project on heritage resources;
- Assess the impacts of the project on heritage resources in the area using the prescribed impact assessment methodology;
- Identify and assess potential cumulative impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area;
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology; and
- Recommend and draft a monitoring campaign to ensure the correct implementation and adequacy of recommenced mitigation and management measures, if applicable.

7.7.8 Visual Specialist Study

The following ToR are proposed for the Visual Specialist Study:

- Determine the character and sensitivity of the visual environment;
- Identify visual resources and key viewing corridors / viewpoints;
- Determine the existing visual character and quality in order to understand the sensitivity of the landscape;
- Identify and determine the magnitude of visual impacts through analysis and synthesis of the following factors:
  - Visual absorption capacity;
  - Visual exposure;
  - Viewing Distance and Visibility;
  - Landscape Integrity; and
  - Sensitivity of Viewers (visual receptors);
- Assess the impacts of the project on the visual environment and sense of place using the prescribed impact assessment methodology;
- Identify and assess potential cumulative visual impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area; and
- Recommend practicable mitigation measures to avoid and/or minimise/reduce impacts and enhance benefits. Assess the effectiveness of proposed mitigation measures using the prescribed impact assessment methodology.

The SRK Cape Town environmental team includes a professional landscape architect and visual specialist who has the expertise and necessary tools to undertake the Visual Specialist Study. This specialist input will be incorporated directly into the EIA Report and a separate specialist report will not be produced.

7.8 Less Significant Impacts

Certain impacts, while important, are considered likely to be less significant and will be assessed by the EAP, rather than a full specialist study, where required. These include:

- **Air Quality** – Limited emissions (dust) may be generated by construction vehicles and plant during the construction phase of the project. Emissions from the TISF during operation, as well as from vehicles transporting used fuel to the TISF are likely to be limited;
- **Noise** – The number of sensitive receptors in the area is limited; however, construction activities will raise noise levels in the area. It is unlikely that noise generated during the operational phase will exceed current ambient noise levels;
- **Traffic** – The number of vehicles on the roads around the KNPS will increase marginally during the construction phase. However, traffic in the area is modest and it is considered highly unlikely that increased traffic volumes will result in increased congestion on the roads; and
- **Surface water** – Although no surface water features occur on the TISF site alternatives, some wetlands occur in surrounding areas and may be impacted if run-off from the site is not adequately controlled.

7.9 Impact Rating Methodology

The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring and the **probability** that the impact will occur.

The criteria used to determine impact consequence are presented in Table 7-2 below.

Table 7-2: Criteria used to determine the consequence of the impact

Rating	Definition of Rating	Score
A. *Extent* *– the area over which the impact will be experienced*		
Local	Confined to project or adjacent areas	1
Regional	Affecting the region (e.g. District Municipality or Province)	2
(Inter) national	Affecting areas beyond the Province	3
B. ***Intensity*** *– the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. ***Duration*** *– the timeframe over which the impact will be experienced and its reversibility*		
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

Table 7-3: Method used to determine the consequence score

***Combined Score* (A+B+C)**	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Once the consequence is derived, the probability of the impact occurring is considered, using the probability classifications presented in Table 7-4 below.

Table 7-4: Probability classification

Probability*– the likelihood of the impact occurring*	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall **significance** of impacts is determined by considering consequence and probability using the rating system prescribed in Table 7-5 below.

Table 7-5: Impact significance ratings

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	Low	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	Medium	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	High	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	Very High	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

Finally the impacts are also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in Table 7-6 below.

Table 7-6: Impact status and confidence classification

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information, SRK's judgment and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by authorities in their decision-making process based on the implications of ratings ascribed below:

- **Insignificant:** the potential impact is negligible and will not have an influence on the decision regarding the proposed activity.
- **Very Low:** the potential impact is very small and should not have any meaningful influence on the decision regarding the proposed activity.
- **Low:** the potential impact may not have any meaningful influence on the decision regarding the proposed activity.
- **Medium:** the potential impact should influence the decision regarding the proposed activity.
- **High:** the potential impact will affect the decision regarding the proposed activity.
- **Very High:** The proposed activity should only be approved under special circumstances.

Practicable mitigation and optimisation measures are recommended and impacts are rated in the prescribed way both without and with the assumed effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are either:

- **Essential**: measures that must be implemented and are non-negotiable; and
- **Best Practice:** recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the proponent if not implemented.

7.10 Cumulative Impacts

Anthropogenic activities can result in numerous and complex effects on the natural and social environment. While many of these are direct and immediate, the environmental effects of individual activities (or projects) can combine and interact with other activities in time and space to cause incremental or aggregate effects. Effects from disparate activities may accumulate or interact to

cause **additional** effects that may not be apparent when assessing the individual activities one at a time (Canadian Environmental Protection Agency, no date). Cumulative effects can also be defined as the total impact that a series of developments, either present, past or future, will have on the environment within a specific region over a particular period of time (DEAT IEM Guideline 7, Cumulative effects assessment, 2004).

The International Finance Corporation (IFC) states that environmental assessment should include consideration of *"… cumulative impacts of existing projects, the proposed project and anticipated future projects."* For the purposes of this report, cumulative impacts are defined as 'direct and indirect impacts that act together with current or future potential impacts of other activities or proposed activities in the area/region that affect the same resources and/or receptors'.

To define the level of cumulative impact, it is critical to look beyond the geographical boundaries and environmental impacts of a single development on the environment and consider the area of influence of the specific project as well as other developments currently in or proposed in the area and their understood impacts and area of influence. It may be that impacts experienced as a result of a single development are not considered to be significant, but when considered as part of a cumulative impact assessment, these require mitigation.

Key considerations for the assessment of cumulative impacts as part of the environmental impact assessment are:

- The Cumulative Impact Assessment will need to give consideration to developments that may have contributed to cumulative effects in the past, may be contributing or are anticipated to contribute in the foreseeable future. This needs to be relevant to the timeframe within which impacts are to be experienced as a result of the project itself (i.e. all phases for which the project specific impact assessment is being undertaken). Given that the baseline environment will already be impacted on by the historical and current contributors to the cumulative impact, it is only necessary when undertaking the cumulative impact assessment to place an emphasis on an identified future cumulative baseline environment;
- Cumulative impacts may not be applicable to all aspects, as project related impacts may be confined to the project area and not subject to or contributing to impacts in the broader area of influence as a whole. For example, if the project area is confined to a water catchment which is not anticipated to be impacted on by other developments (past, present or foreseeable future) then a cumulative impact assessment need not be considered for this environmental aspect/component;
- A cumulative impact assessment will consider a specific area of influence which will be determined by the impact itself and the baseline environment in which it is proposed; e.g. where one or more projects affect the same ecosystem, the whole area in which the ecosystem is found may be considered the area of influence for the cumulative assessment. This will vary across project aspects and therefore a single area of influence for the cumulative impact assessment cannot be set; and
- The cumulative impact assessment can only be undertaken where information is readily available and as such will only be an initial assessment of the likely cumulative impact in terms of knowledge available at the time of the assessment. It is critical to understand the information sources and limitations that exist.

For the most part, cumulative effects or aspects thereof are too uncertain to be quantifiable, due mainly to a lack of data availability and accuracy. This is particularly true of cumulative effects arising from potential or future projects, the design or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed. Given the limited detail available regarding such future developments, the analysis will be of a more generic nature and

focus on key issues and sensitivities for the project and how these might be influenced by cumulative impacts with other activities.

For cumulative effects analysis to be a useful tool to decision makers and stakeholders, it must be limited to effects that can be meaningfully evaluated, rather than expanded to the point where the resource or receptors are no longer significantly affected or the effects are no longer of interest to stakeholders. To this end, four important aspects require consideration prior to the evaluation of cumulative effects:

1. The determination of an appropriate **area of influence**, i.e. spatial and, to a lesser extent, temporal boundaries for evaluation of cumulative effects of the project;

   The TISF site alternatives are both situated within the existing boundaries of the KNPS SPA, which is located within the Koeberg Nature Reserve and various development exclusion zones. Impacts are likely to be mostly of local extent. The spatial scope of this analysis is generally aligned with the zone of influence of the project and potential projects (if any) in the vicinity that may have impacts overlapping with the proposed project.

2. Identification of **Valued Environmental and Social Components** (VECs). VECs are environmental and social attributes that are considered to be important in assessing risks; they may be: physical features, habitats, wildlife populations (e.g. biodiversity), ecosystem services, natural processes (e.g. water and nutrient cycles, microclimate), social conditions (e.g. health, economics) or cultural aspects (e.g. traditional spiritual ceremonies);

   The project is located within the KNPS SPA, within portions of the site identified for development. Access to both site alternatives is limited due to strict security requirements. Although previously disturbed, natural vegetation has re-established on both site alternatives including some SCC. As such the VECs considered in the cumulative assessment are as follows:

   - *Koeberg Nature Reserve.*

3. **External natural and social stressors**, e.g. flooding, wildfires, etc.;

   Natural stressors are limited and may include fynbos fires. Development exclusions zones surrounding the KNPS limit social stressors and none have been identified for the TISF project.

4. The **evaluation of relevant projects** for consideration in the cumulative effects analysis:

   - Cumulative Impacts of Existing Activities: It is reasonably straightforward to identify significant past and present projects and activities that may interact with the project to produce cumulative impacts, and in many respects, these are taken into account in the descriptions of the biophysical and socio-economic baseline; and
   - Potential Cumulative Impacts of Future Activities: Relevant future projects that will be included in the assessment are defined as those that are ‘reasonably foreseeable’, i.e. those that have a high probability of implementation in the foreseeable future; speculation is not sufficient reason for inclusion. Such projects may include those for which EAs have already been granted, that are currently subject to EA applications or that have been identified in an IDP of the relevant local municipality.

Projects that fall in the above categories and that may result in cumulative impacts with the proposed development and therefore have been considered in the cumulative impact analysis are listed below:

- ***Past and existing projects / activities:***

  The development of the KNPS in the 1980s in what was at the time a relatively remote location, and the subsequent establishment of associated facilities and infrastructure, as well as declaration of the Koeberg Nature Reserve.

  The establishment of the Duynefontein residential area, south of the KNPS, largely inhabited by employees of the KNPS.

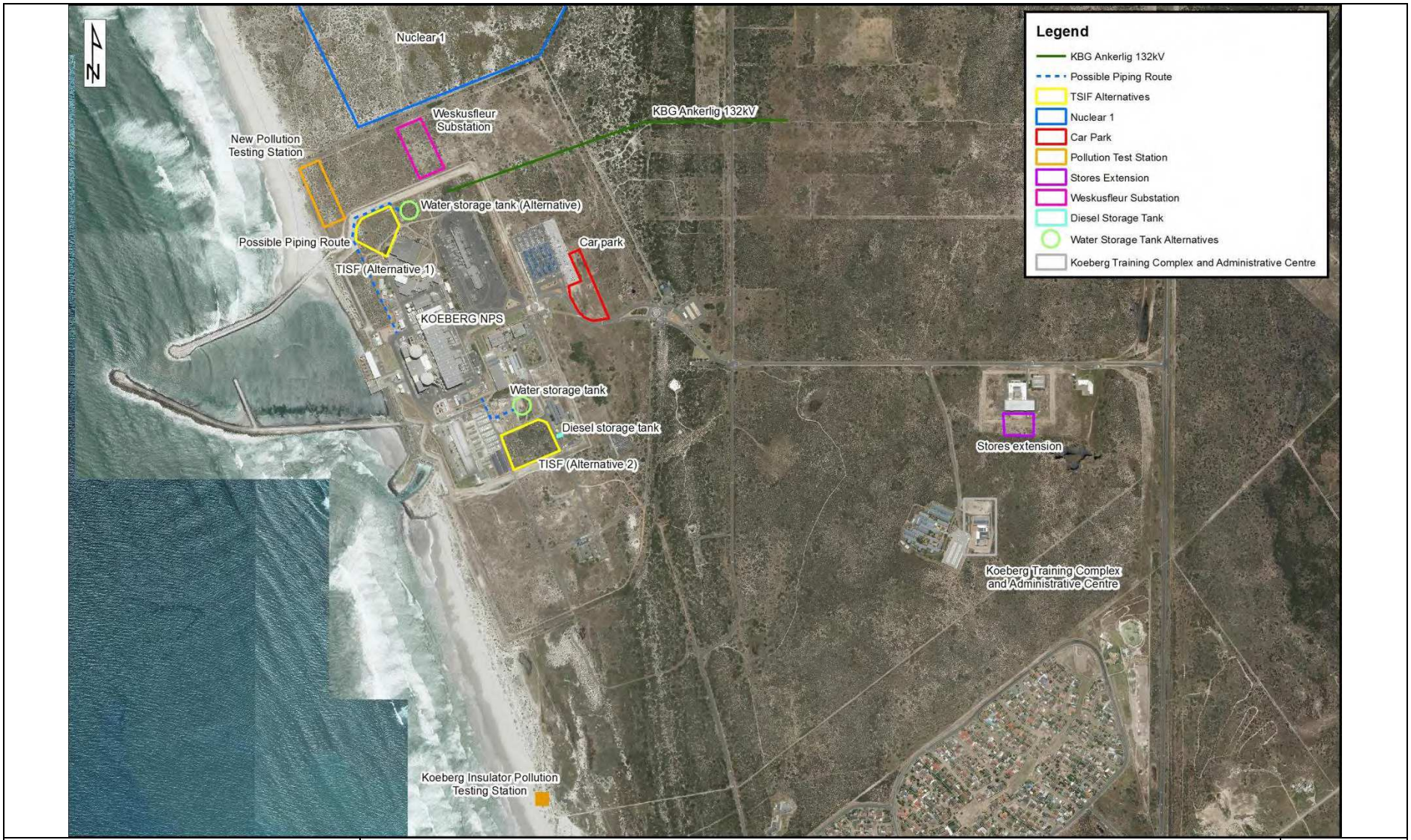
  The construction of the new Simulator Building adjacent to the Edusec Building as part of the environmental authorisation and rezoning for the Koeberg Training Centre Complex and Administrative Centre.

- ***Future projects / activities:***

  Numerous developments are proposed/anticipated within the Koeberg Nature Reserve and surrounds including those identified in Table 7-7 and Figure 7-1.

Table 7-7: Proposed developments within Koeberg Nature Reserve and their status

Project	Status	Reference Number
Koeberg Training Centre Complex and Administrative Centre	EA obtained	*DEA Ref no: 12/12/20/997*
KBG Ankerlig 132 kV powerline	EA obtained	*NEAS Ref no: DEA/EIA.0000723/2011* *DEA Ref no: 14/12/16/3/3/1/329*
(Ankerlig 400kV powerline)	(EA obtained)	(DEA Ref no: 14/12/16/3/3/1/1182)
Weskusfleur substation	EIA in progress	DEA Ref no: 14/12/16/3/3/2/508
New nuclear facility (Nuclear 1)	EIA in progress	DEA Ref no: 12/12/20/944
Koeberg Diesel Storage project (on-site Koeberg and Bulk Stores Extension)	BA process in 2016	*Reference number still to be issued*
Potable water storage tanks (on-site Koeberg)	BA process in 2016	*Reference number still to be issued*
New Koeberg Insulator Pollution Testing Station (KIPTS) and decommissioning of the existing KIPTS	BA process in 2016	*Reference number still to be issued*
Car park area extension project	BA process in 2016	*Reference number still to be issued*



srk consulting	**KOEBERG TISF EIA** PROPOSED DEVELOPMENTS	Project No. 478317

Figure 7-1: Approved and proposed developments within the Koeberg Nature Reserve
Source: Eskom, 2016

8 Conclusions and Recommendations

8.1 Conclusions

In order to apply for EA for the TISF, a Scoping Study is being undertaken in terms of the EIA Regulations, 2014, promulgated in terms of NEMA. The objectives of the study are to:

- Identify stakeholders and inform them of the proposed activity and the S&EIR process;
- Provide stakeholders with the opportunity to participate effectively in the process and identify any issues and concerns associated with the proposed activity;
- Identify areas of likely impact and environmental issues that will require further investigation during the Impact Assessment Phase; and
- Develop ToR for specialist studies to be undertaken.

The conclusions of the Scoping Study are as follows:

Eskom proposes to construct a TISF for the storage of dry casks at the KNPS to accommodate used nuclear fuel from the reactors for the operational life of the power station, thereby ensuring the continued operation of the KNPS.

Used fuel assemblies from the nuclear reactors are stored in SFPs within the KNPS. The SFPs serving Reactor Unit 1 and Reactor Unit 2 will reach capacity by March 2018 and September 2018, respectively. As the current SFPs are reaching their storage capacity, additional space will be created by transferring used fuel from the SFPs into dry storage casks as part of Eskom's Koeberg Spent Fuel Storage Project to cater for the KNPS' needs until 2025.

The TISF will be constructed on a section of vacant land within the KNPS *SPA*. The TISF will comprise of concrete pad(s) within a site footprint of approximately 12 800 m^2. The TISF will be constructed to accommodate 160 dry storage casks, though the dry storage casks will be placed on the pad in a modular manner. This strategy assumes that the CISF will not be commissioned earlier than 2025. The dry storage casks will be either metal or concrete casks or concrete assemblies, and will be approximately 6 m in height. A secure perimeter fence of approximately 2.3 m in height will be erected around the TISF site with controlled pedestrian and service gates. The TISF will meet the requirements of the NNR and will be built and managed according to the IAEA safety standards.

The dry storage casks will accommodate used fuel assemblies removed from the reactor units and cooled in the SFPs. The dry storage system is a passive system which is not reliant on human action or active components to maintain a suitable safety level. Heat generated from used fuel radioactive decay will dissipate through the external surface of the dry casks.

Various site alternatives were considered during the early planning stages of the project and two feasible and reasonable alternatives were identified for assessment in the EIA:

- Alternative 1 (the preferred alternative): located adjacent to the CBS on the northern boundary of the KNPS; and
- Alternative 2: located along the southern boundary of the KNPS next to the Ekhaya Building.

The following key environmental issues associated with the TISF and storage of used fuel have been identified through the Scoping process:

- **Geohydrology** – potential impact on groundwater and possible need, although unlikely, for dewatering during construction;

- **Terrestrial ecology** – potential loss of indigenous vegetation and sensitive or protected species and habitats;
- **Socio-economic** – potential benefit of limited investment and temporary employment during the construction phase of the project, and improved trade balance and stability of energy supply during operations;
- **Radiation Human health** – potential impact of radiation from the dry storage casks on the health of Eskom employees and surrounding residents;
- **Heritage** – potential impacts on archaeological and paleontological resources during the construction phase; and
- **Visual aspects** – potential deterioration of sense of place and aesthetic value.

Potential risks associated with emergency situations during the operation of the TISF will be evaluated through a PSA commissioned by Eskom, to inform their application to the NNR.

8.2 Recommendations

Based on the findings of the Scoping Study, the following specialist studies are proposed for the Impact Assessment Phase:

- Geohydrology Specialist Study;
- Terrestrial Ecology Specialist Study;
- Socio-Economic Specialist Study;
- Review of Radiation Assessment;
- Human Health Specialist Study;
- Heritage Specialist Study; and
- Visual Specialist Study.

8.3 Way Forward

This Scoping Report is not a final report and may be amended based on comments received from stakeholders. The Executive Summary of this Scoping Report will be sent to all registered stakeholders. Copies of the complete Scoping Report are available for viewing at the following venues:

- Koeberg Public Library, Duynefontein;
- Wesfleur Public Library, Atlantis;
- Cape Town Public Library;
- The Koeberg Visitors' Centre; and
- SRK's office in Rondebosch.

An electronic version of the report can also be accessed on SRK's website www.srk.co.za (via the 'Library' and 'Public Documents' links). Upon request, hard copies of the Scoping Report and digital copies on CD can be posted to stakeholders at a cost.

*Stakeholders are invited to attend a **Public Open Day** where the information presented in the Scoping Report will be discussed and additional concerns and issues can be raised with the environmental consultants and the project team. The details of the Public Open Day are as follows:*

- *Venue: Koeberg Visitors' Centre*
- *Date: 21 July 2016*
- *Time: 15h00 – 18h30*

The public is invited to review this Scoping Report and send written comment to:

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Email: jedutoit@srk.co.za

Stakeholders will be provided with a 30 day comment period. For comments to be included in the Final Scoping Report, they must reach the above contact person **no later than *8 August 2016*.**

Issues and concerns identified in the Scoping Phase will assist in focussing the EIA and will be used to refine the ToR for specialist investigations during the Impact Assessment Phase of the EIA process. Stakeholders are therefore urged to submit written comment, as comments may affect the Scoping Report and the ToR for specialist assessment. Once stakeholders have commented on the information presented in the Scoping Report, it will be finalised and submitted to DEA.

Prepared by

Sharon Jones

Principal Environmental Consultant

Reviewed by

Chris Dalgliesh

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 environmental practices.

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Appendices