Proposed Development of the Kokerboom 1, 2 and 3 Transmission Lines and switching stations near Loeriesfontein, in the Northern Cape Province

Draft Basic Assessment Report
Reference: -30.471212/ 19.499372
Revision:1

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Document control record

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NEMA requirements for Basic Assessment Reports		ZUTARI
Appendix 1	**Content as required by NEMA**	**Section/Chapter**
3(a)	(i) details of the EAP who prepared the report; and	Control sheet, Section 1.4, Annexure A
	(ii) details of the expertise of the EAP, including a curriculum vitae.	
(b)	the location of the activity, including-	Section 1.2 and 4.2, Chapter 4.
	(i) the 21-digit Surveyor General code of each cadastral land parcel;	
	(ii) where available, the physical address and farm name;	
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	N/A
(c)	a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is-	Section,1.3 and Chapter 4
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	Chapter 4 and Annexure F
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	NA
(d)	a description of the scope of the proposed activity, including-	Chapter 4
	(i) all listed and specified activities triggered;	Section 2.2
	(ii) a description of the activities to be undertaken, including associated structures and infrastructure;	Chapter 4.
(e)	a description of the policy and legislative context within which the development is proposed including i. an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process; ii. how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	Chapter 2
(f)	a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 4.4
(g)	a motivation for the preferred site, activity and technology alternative;	Chapter 5
(h)	a full description of the process followed to reach the proposed preferred alternative within the site, including -	Chapter 5
	(i) details of all the alternatives considered;	
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Section 3.3, Section 3.4, Annexure C
	(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;	Section 3.5, Annexure C
	(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 6
	(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts - (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	Chapter 6.
	(vi) the methodology used in identifying and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Chapter 3 Section 3.2.2

	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Chapter 6
	(viii) the possible mitigation measures that could be applied and level of residual risk;	Chapter 6
	(ix) the outcome of the site selection matrix;	Chapter 5
	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and	Chapter 5
	(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	Chapter 8,
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including— (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Chapter 6
(j)	an assessment of each identified potentially significant impact and risk, including— (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;	Chapter 6
(k)	where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	Chapter 6 Annexure G
(l)	an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment;	Chapter 7
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and	
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	
(m)	based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	Chapter 6 Annexure G
(n)	any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Chapter 6
(o)	a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 1.5
(p)	a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	Chapter 7

(q)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	NA.
(r)	an undertaking under oath or affirmation by the EAP in relation to- (i) the correctness of the information provided in the report; (ii) the inclusion of comments and inputs from stakeholders and interested and affected parties; and (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;	Annexure A
(s)	where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	NA
(t)	any specific information required by the competent authority; and	Email correspondence from the DFFE form part of Annexure B.
(2)	any other matter required in terms of section 24(4)(a) and (b) of the Act.	N/A

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GLOSSARY OF TERMS

Basic Assessment Report	A basic report assessing the potential significant impacts of issues identified during scoping.
Environment	The surroundings (biophysical, social and economic) within which humans exist and that are made up of i. the land, water and atmosphere of the earth; ii. micro-organisms, plant and animal life; iii. any part or combination of (i) and (ii) and the interrelationships among and between them; and iv. the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.
Environmental Impact Assessment (EIA)	A study of the environmental consequences of a proposed course of action. A systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and S&EIR
Environmental impact	An environmental change caused by some human act.
Environmental Management Programme (EMPr)	A document that provides procedures for mitigating and monitoring environmental impacts, during the pre-construction, construction, operation and decommissioning phases.
Public Participation Process	A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development.
Wind Turbine	A wind turbine is a rotary device that extracts energy from the wind.

UNITS OF MEASUREMENT

≈	Approximately
c/kWh	Cent per kilowatt hour
GW	Gigawatt
GWh	Gigawatt hours
ha	Hectares
kL	Kilolitre
km	kilometres
Km/h	Kilometre per hour
kV	Kilovolt
Mm	millimetre
m/s	Metres per second
MW	Megawatts
Rpm	Revolutions per minute

ABBREVIATIONS

BA	Basic Assessment
BAR	Basic Assessment Report
BVI	Business Venture Investments No.1788 (Pty) Ltd
BW	Bidding Window
CAA	Civil Aviation Authority
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
COP	Convention of the Parties
CRR	Comments and Response Report
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning (Western Cape)
DFFE	Department of Forestry, Fisheries and the Environment
DM	District Municipality
DoE	Department of Energy
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act (Act 73 of 1989)
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EMF	Environmental Management Framework
GN	Government Notice
I&APs	Interested and Affected Parties
IDZ	Industrial Development Zone
IEIM	Integrated Environmental Information Management
IPP	Independent Power Producer
IRP	Integrated Resource Plan
LM	Local Municipality
MTS	Main Transmission Substation
NBKB	Ngwao Boswa Kapa Bokone Northern Cape Provincial Heritage Resources Authority
NCDAERL	Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform
NCNCA	Northern Cape Nature Conservation Act (Act 9 of 2009)
NEMA	National Environmental Management Act (No. 107 of 1998) (as amended)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (No. 25 of 1999)
NRTA	National Road Traffic Act (Act 93 of 1996)
NWA	National Water Act (Act 36 of 1998)
OHL	Overhead Powerline (Transmission Line)
PPP	Public Participation Process
REFIT	Renewable Energy Feed-In Tariffs
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SAHRA	South African Heritage Resources Agency
SACNSP	South African Council for Natural Scientific Professions
SDF	Spatial Development Framework
SKA	Square Kilometre Array
ToR	Terms of Reference
UNEP	United Nations Environmental Programme
UNFCCC	United Nations Framework Convention on Climate Change
WEF	Wind Energy Facility
WESSA	Wildlife and Environment Society of South Africa

1 INTRODUCTION AND BACKGROUND

1.1 Introducing the proposed grid connection infrastructure

The Proponent, *Business Venture Investments No. 1788 (Pty) Ltd (BVI)*, proposes to construct grid connection infrastructure to connect to the authorised Kokerboom 1, 2 and 3 Wind Energy Facilities (WEF), on farms near Loeriesfontein in the Northern Cape. The proposed grid connection infrastructure would consist of three 132kV overhead transmission lines (OHL)(single or double circuit), and three switching stations and associated infrastructure, which would connect the three authorised Kokerboom WEFs to the existing Eskom Helios Main Transmission Substation (MTS), near Loeriesfontein in the Northern Cape. Associated infrastructure will include permanent access/service tracks (where no existing roads exist) as well as temporary laydown areas and site camps that will be rehabilitated after construction.

The Proponent (or its successor in title) will be responsible for the construction phase of the development. After construction is complete, ownership of the grid connection infrastructure will be transferred to Eskom (as per Eskom's requirements), and Eskom will then be responsible for the operation and maintenance of the infrastructure, as well as decommissioning should the need to decommission the infrastructure arise. The purpose of this BAR is to apply for environmental authorisation in terms of the Environmental Impact Assessment (EIA) regulations (GN R982 of 2014, as amended) pursuant to the National Environmental Management Act (Act 107 of 1998) (NEMA) for the proposed grid connection infrastructure. Since the project is associated with energy generation, and energy projects are dealt with by the national authority, the competent authority is the National Department of Forestry, Fisheries and the Environment (DFFE).

1.2 Background

The proponent obtained environmental authorisation for the construction of the three proposed WEFs, i.e. Kokerboom 1, 2 and 3[1]. The proponent is currently applying through a new Scoping & EIR process to revise the Kokerboom 3 WEF layout to relocate turbines further northwards away from the operational WEFs, and at the same time split the WEF project into two separate WEFs, namely the Kokerboom 3 and Kokerboom 4. Due to the proposed change in WEF layouts the transmission line requirements have also changed. Transmission lines for Kokerboom 1, 2 and 3 have were authorised in 2018 (DEA Ref. No.: 14/12/16/3/3/1/1818, 2018/02/01). However, as with the WEF process, a new application for environmental authorisation for three new transmission lines and their associated infrastructure is being applied for through this Basic Assessment (BA) process, given that a portion of the now proposed grid connection infrastructure is located outside of the corridor authorised in the original BA.

This draft BAR pertains to the applications for three transmission lines, as they relate to the Kokerboom 1, 2 and 3 WEFs respectively (the grid connection for Kokerboom 4 WEF will be applied for in a separate application).

[1] Kokerboom 1 DEA Ref. No.: 14/12/16/3/3/2/985, Kokerboom 2 DEA Ref. No.: 14/12/16/3/3/2/986 and Kokerboom 3 DEA Ref. No: 14/12/16/3/3/2/1009

1.3 Project description

Zutari (Pty) Ltd (formerly Aurecon South Africa (Pty) Ltd)) has been appointed to undertake the requisite Basic Assessment (BA) process for three new transmission lines and switching stations (Figure 1-1 and Figure 1-2) connecting the Kokerboom 1, 2 and 3 WEFs to the Eskom Helios MTS, as required in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as amended, on behalf of the Proponent.

The sites of the Kokerboom 1, 2 and 3 WEFs which the proposed transmission line will connect to will be located approximately 53 kilometres (km) north of Loeriesfontein, 85 km west of Brandvlei and 160 km southeast of Springbok in the Northern Cape. The three transmission lines will be connecting to the Helios MTS which will feed into the existing national Eskom electricity grid.

Figure 1-1: Reginal locality of Kokerboom 1, 2 and 3 Transmission lines and switching stations, near Loeriesfontein in the Hantam Local Municipality (blue outline), Northern Cape

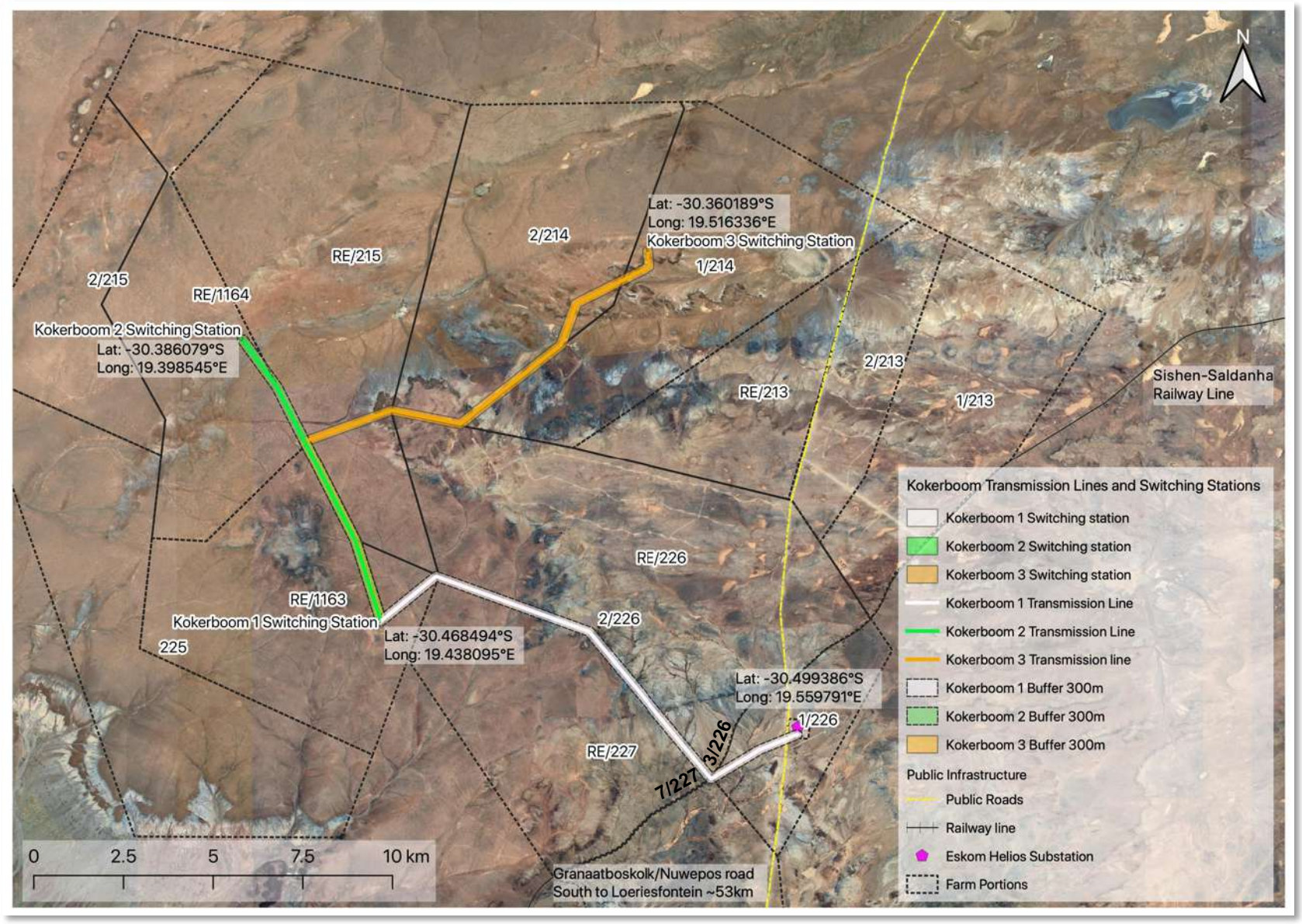


Figure 1-2: Location of Kokerboom 1, 2 and 3 Transmission lines and switching stations, near Loeriesfontein in the Northern Cape

In terms of the NEMA, the proposed project triggers a suite of listed activities which require authorisation from the competent environmental authority via an BA process before they can be undertaken. Since the project is for the evacuation of energy, and energy projects are dealt with by the national authority, the competent authority is thus the national DFFE. DFFE's decision will be based on the outcome of this BA process. The BA process entails a number of phases which are further detailed in Section 3.1.2.

The purpose of this BAR[2] is to set out and assess the environmental outcomes, impacts and residual risks of the proposed activity. Accordingly, the BAR includes the following chapters:

- Chapter 1 introduces the Kokerboom 1, 2 and 3 Transmission lines and Switching Stations project in the context of the Kokerboom WEFs and renewable energy industry in South Africa. It also introduces the EIA project team and provides a summary of the main assumptions and limitations.
- Chapter 2 outlines an analysis of the legal framework relevant to the project.
- Chapter 3 focuses on the EIA methodology, detailing the phases of the BA process as well as the public participation process.
- Chapter 4 provides a project description specific to the Kokerboom 1, 2 and 3 Transmission lines and Switching Stations.
- Chapter 5 provides the alternatives that have been considered.
- Chapter 6 describes the baseline environment i.e., current state of the environment, on site and surrounds, and assesses the potential impacts on the environment that may be caused by the project.
- Chapter 7 provides an Environmental Impacts Statement summarising the outcomes of the impact assessment and key issues and a
- Chapter 8 Provides a conclusion and way forward in terms of the application for Environmental Authorisation.

A number of annexures accompany this report and include the following:

- Annexure A provides details on the Environmental Assessment Practitioners (EAP) who compiled this report.
- Annexure B provides correspondence with DFFE to date.
- Annexure C contains a Public Participation Plan which entails a comprehensive description of the public participation process and was approved by DFFE on 23 June 2021.
- Annexure D includes specialist input, where this was submitted in a report format.
- Annexure E, DFFE Screening Tool Report
- Annexure F, Transmission line route coordinates at 150m intervals (WGS84)
- Annexure G, Generic EMPr
- Annexure H, Site photographs, General photos taken on 19 June 2021.

1.4 EIA Project Team

Zutari has selected a team of highly experienced specialists and multi-disciplinary practitioners to execute this project in a professional and unbiased manner. Please refer to Table 1-1 BA Project Team or a list of the team. Full CVs of the EIA and Project Management team are available in Annexure A. Should a CV of a Specialist be required that is not included in the relevant specialist report in Annexure D, this will be provided upon request from the Zutari Project Leader.

Table 1-1: BA Project Team

Role	Consultant	Company
EIA and Project Management		

[2] Appendix 1 of amended EIA Regulations (GN R982) of NEMA lists the content required in a Basic Assessment Report. This has been listed for cross checking purposes on the page preceding the table of contents.

Role	Consultant	Company
Project Director	Stephan van den Berg	Zutari
Project Leader / Manager	Charles Norman	Zutari
Project Staff & Senior EAP	Charles Norman	Zutari
Sub-consulting Specialists		
Avifauna (birds)	Chris van Rooyen	Chris van Rooyen consulting CC
Terrestrial and Aquatic Ecology	Brian Colloty	Scherman Colloty & Associates
Butterfly specialist	David Alan Edge	Private consultant
Socio-economic[3]	Tony Barbour	Private Consultant
Visual	Stephen Stead	Visual Resources Management (VRM) Africa
EMI/RFI Assessment	Callie Fouche	ITC Services
Agricultural potential	Johann Lanz	Private Consultant
Heritage (incl. archaeology)	Jayson Orton	ASHA Consulting (Pty) Ltd
Palaeontology	John Almond	Natura Viva

1.4.1 Independence

The amended 2014 EIA Regulations pursuant to NEMA, provide general requirements for EAPs and specialists with the intention of reducing the potential for bias in the environmental process. The first requirement is that the EAP should be independent (Regulation 13(1)(a) of GN R982, as amended).

Neither Zutari nor any of its sub-consultants are subsidiaries of *BVI*, nor is *BVI* a subsidiary to Zutari.

Zutari and its sub-consultants do not have any interests in secondary or downstream developments that may arise out of the authorisation of the proposed project.

1.5 Assumptions, Limitations and Gaps in Knowledge

In undertaking the investigation and compiling the BAR, the following has been assumed:

- The information provided by the client is accurate and unbiased, and no information that could change the outcome of the BA process has been withheld.
- The scope of this investigation is limited to assessing the environmental impacts associated with the proposed grid connection infrastructure. The environmental impacts of the three proposed WEFs has been investigated in three separate EIA processes.
- The BA process is based on Best Practice Guidelines which were available at the time of writing this report.
- The final transmission line layout will occur within the footprint of the transmission line corridor that was assessed by the EAP and specialists. This refers to the transmission lines that are illustrated in Figure 1-2, with a buffer of 150m on either side (i.e. a 300m width).
- For the purpose of this assessment, it is assumed that one or all three Kokerboom WEFs will be constructed. If none of the WEFs reach construction, the associated infrastructure in this application will most likely not be constructed.
- The associated linear infrastructure, such as roads, will be required to move with any changes to the layout, but will remain within the assessed 300m corridor.
- The requisite water use authorisations and other necessary permits required for construction will be applied for, upon a successful REIPPPP bid for the associated WEF.
- Other renewable energy projects in the area propose their own grid connection infrastructure, also connecting into the Helios MTS. It is assumed that the cumulative impact assessment for this BAR

[3] The Socio-economic reports undertaken by Tony Barbour for the Kokerboom Grid (authorised in 2018), and Kokerboom 3 and 4 WEFs (EIA currently in progress) was used as baseline document for socio economic input into this report.

speaks to both the impacts caused by the grid connection infrastructure, as well as the technology (wind or solar) for the projects listed in Table 3-5.

In undertaking this BAR process, a few gaps in knowledge were evident. These are as follows:

- Specific source of water for the development has not yet been identified
- No indication of commencement date of construction phase, since the proposed development is dependent on the construction timelines of the Kokerboom WEFs, which are not yet known.
- Lack of precise plan for decommissioning the grid connection infrastructure.
- Eskom preference regarding connection to the grid through transmission lines from the proposed Kokerboom WEFs.

Any gaps that have been encountered by the specialists are identified in their respective assessments (Annexure D).

The planning for the proposed project is at a feasibility level and its design is conceptual – but near final, subject to feedback received during the PPP. Importantly, the assessment of the transmission lines in this report have focused on a 300m (150m each side of the centre line) buffer to allow for micro-sitting of pylons during construction and to enable on site mitigation measures to be undertaken based on alignment of project components within this buffer area. This BA process forms a part of a suite of feasibility studies, and as these studies progress, more information will become available to inform the process. The DFFE, and other authorities, will be requested to issue their comments to allow for the type of refinements that typically occur during project design. Undertaking the EIA (BA) process in parallel with the feasibility studies does have a number of benefits, which include integrating environmental aspects into the layout and design and therefore ultimately encouraging a more environmentally responsive and sustainable project.

The assumptions, limitations and gaps in knowledge will not affect the EAPs assessment or findings of the proposed grid connection infrastructure.

1.6 Renewable Energy in South Africa

The proposed transmission line infrastructure will service the authorised Kokerboom 1, 2 and 3 WEFs, if selected as a preferred bidder, it would form part of the REIPPPP and contribute to the IRP 2019 targets for wind energy and much needed low carbon energy to the national grid to assist South Africa with its development objectives, a transition to a low carbon economy and its commitments to combat climate change. Consequently, contextualising the proposed transmission line infrastructure in terms of South Africa's renewable energy targets are important.

South Africa's electricity sector is based largely on old and "dirty"[4], emission-intensive coal-fired power, which makes South Africa the world's 14th largest emitter of greenhouse gases (GHGs) (Timperley & McSweeney, 2018) and the second highest CO_2 emitter per capita, behind Russia (which is a cold climate country), when compared with the BRICS countries (Our World in Data, 2017). Eskom currently relies on fossil-fuels to produce approximately 86.97% (World Atlas, 2016) of the country's electricity, using over 90 million tonnes of coal per annum (Eskom, Understanding Electricity, 2019). Many of South Africa's coal fired power stations are approaching end-of-life and will soon need be decommissioned and the capacity replaced. Despite South Africa's high per capita CO_2 levels, the country also suffers with a high level of extreme poverty, inequality and underdevelopment and is in desperate need for further economic development and upliftment.

South Africa therefore experiences major challenges. It has a clear need to continue to develop the country on socio-economic grounds and lift people out of poverty, which requires more energy, but absolute imperative to curb its high CO_2 per capita emissions rates. Add to this that South Africa's energy supply is currently highly constrained, it has a growing population that is increasing demand through ongoing electrification programmes leading to an oversubscribed power supply and the sporadic need for load shedding. This harms the country's economy, discourages investment and furthers the country's coal burning addiction. New generation capacity is urgently needed to bridge the current shortfall in the short term, as well as to supply long-term energy security to support a growing economy. It is hard to motivate for any other form of generation other than renewables that can quickly, and cost effectively fill this gap while meeting our CO_2 emission reduction commitments and creating a diversified energy supply. This is because it only takes on average two years or less from construction to operation for winds farms and the lowest cost of energy for a WEF in the last REIPPPP round (round 4) in South Africa came in at under 60c/ kWh. Nuclear is another low carbon option of producing electricity but it has very long lead times, and at present would take the form of a large-scale project which have significant lead times, upfront costs and related debt burden for the government (a plethora of economic considerations) and is thus not a quick or short to medium term solution. This is recognised in the government's latest 2019 Integrated Resource Plan (IRP2019), as detailed below, which has more wind energy planned between now and 2030 than any other energy source and no nuclear (except extension of the design life of Koeberg) up to the 2030 horizon. In the longer term (beyond 2030), the coal power stations will need to be replaced with low carbon options, which will likely continue to include renewables, but also nuclear (as baseload), gas and diesel. Eskom recognises that "it is crucial that the private sector plays a role in addressing the future electricity needs of the country. This will reduce the funding burden on Government, relieve the borrowing requirements of Eskom and introduce generation technologies that Eskom may not consider part of its core function" (Eskom, Guide to Independent Power Producer (IPP) processes, 2019).

For these reasons South Africa has turned to renewable energy over conventional fossil fuel-based energy generation. Nuclear and renewable energy, including wind, solar, hydro and biogas, provide a lower impact

[4] Associated with the burning of lower grade coals and outmoded technologies.

alternative to the conventional coal-based electricity generation methods, as far as the global warming crisis is concerned, and can also contribute to a range of socio-economic benefits which contribute to the country's economic development imperatives.

The government began exploring feed-in tariffs (FITs) for renewable energy in 2009 but according to the PPIAF and World Bank Group Report on 'South Africa's Renewable Energy IPP Procurement Program' (PPIAF, 2014), these were later rejected in favour of competitive tenders for commercial scale projects. The resulting program, now known as the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), has successfully channelled substantial private sector expertise and investment into grid-connected renewable energy in South Africa at competitive prices. Thus far the REIPPPP, in line with the Integrated Resource Plan (IRP2010) have procured 6,422MW of new renewable power from 112 Independent Power Producers (IPPs) and installed just over 3,776 MW of it (SAWEA, 2019). The REIPPPP's contribution to South Africa's climate change objectives so far is a reduction of 33.2 million tonnes or CO^2 (by 31 December 2018) (SAWEA, 2019) and these reductions will continue to grow as the programme rolls out. The renewable energy sector is estimated to be more employment-intensive than traditional thermal powerplants and has attracted R 209.4 billion in private sector investment (SAWEA, 2019). Additionally, renewable energy facilities (wind and solar) have been getting cheaper as the global market develops and is now cheaper in R/kWh than conventional power supplies (Coal and nuclear), as shown in research undertaken by the CSIR back in 2016 (wind and solar has become even cheaper since then) and presented in the following graph (Refer Figure 1-3).

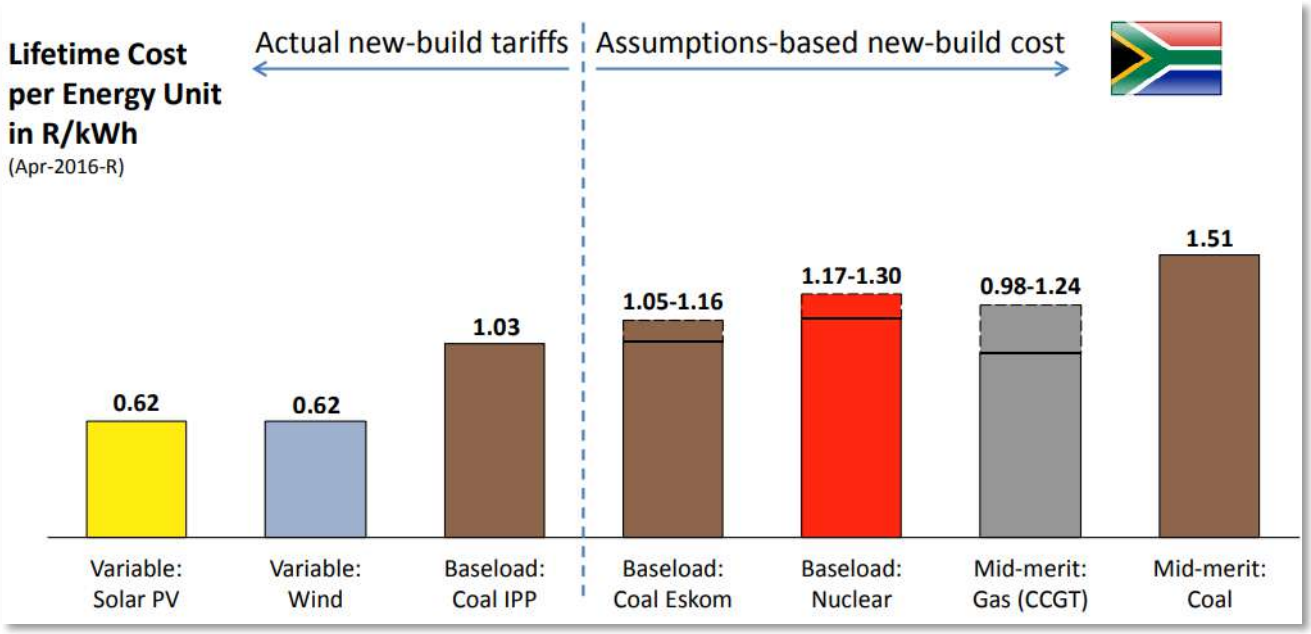


Figure 1-3: Power cost per kWh for the main generation types under consideration by South Africa (CSIR, 2016)

The drawback is that solar and wind energy are not consistent baseload power producers because the sun does not always shine (night times, cloud cover or even seasonal change) and the wind does not always blow consistently or predictably. These facilities therefore produce intermittent and variable power and often not at the times when its most needed, i.e. the daily electrical demand peaks around sun-up and sundown. These problems can be somewhat mitigated, firstly through storage (either in chemical batteries, thermal reservoirs, pump storage schemes, or other mechanisms) to level variations or bridge short periods and secondly by spreading out the renewable facilities across the country to ensure some facilities are always located somewhere where energy can be produced (i.e. the wind is blowing and/ or the sun is shining). Wind energy is better placed than solar to provide electricity during the daily 6-8a.m and 6-9p.m peaks in energy demand and this is the main reason that in the 2019 Integrated Resource place (2019)

(IRP2019) there is far more new wind energy planned till 2030 than solar. Lastly one must make up the difference with peaking facilities (i.e. quick response gas and diesel turbines that can fill the demand/supply gaps). Despite all this, the country may still need additional baseload capacity in the form of new coal or nuclear beyond 2030 and 2040.

The 2010 Intergraded Resource Plan (IRP2010) for electricity set a target to source 17.8 Gigawatts (GW) of the country's electricity supply from renewable energy sources, over a 20-year period from 2010 to 2030 (Independent Power Producers Office, n.d.). The 2019 Integrated Resource place (2019) (IRP2019) was released on 18 October 2019 and includes the following capacity allocation for new generation:

- 1 500MW of new coal power (noting that there will be decommissioning of coal capacity over the period)
- 2 500MW of hydro power
- 6 000MW solar
- 14 400MW wind
- 2 000MW of storage
- 3 000MW from gas

The following chart (Refer Figure 1-4) provides a view for South Africa's energy mix between now and 2030. The Department of Energy (DoE) indicated that new nuclear capacity may come online after 2030 to replace decommissioned coal baseload and shows the central role that wind energy will play in this transformation. Wind is by far the largest planned source of new energy capacity over the next 10 years which shows that there is a strategic imperative by government for wind power and need to develop WEFs at diverse locations across the country.

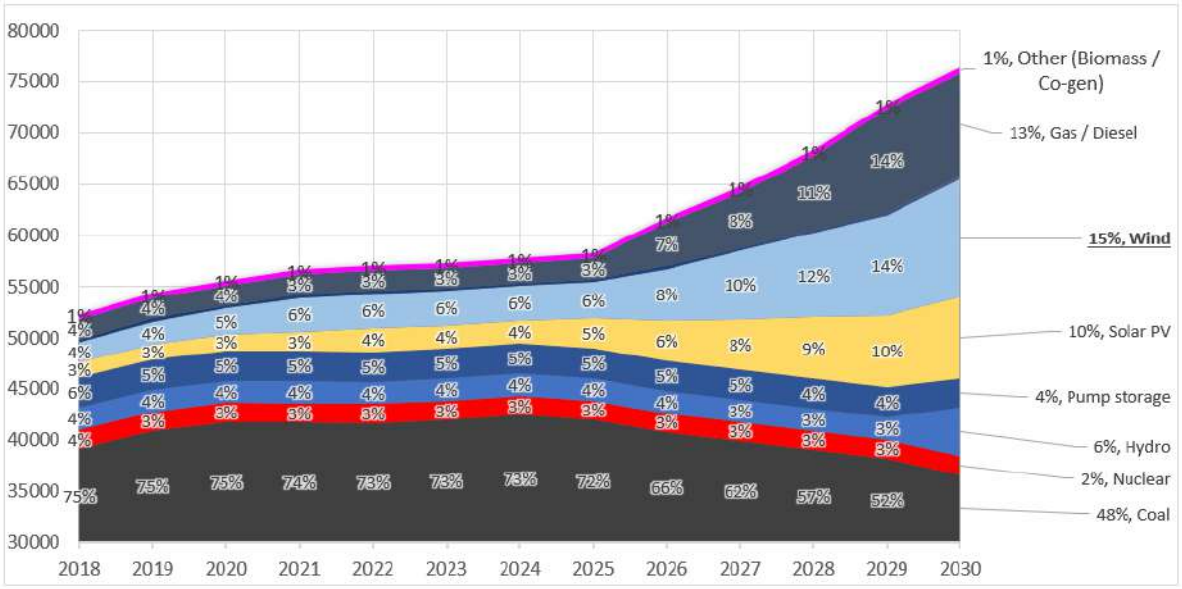


Figure 1-4: South Africa's energy mix from 2018 to 2030 based on IRP2019 figures (Integrated Resource Plan 2019, 2019)

2 LEGAL AND PLANNING CONTEXT

There are a host of legal and policy documents and guidelines to consider when undertaking such a project. These have been detailed in the sections that follow.

2.1 Relevant Legislation

An overview of the relevant legislation is provided in Table 2-1.

Table 2-1: Legislation considered in preparation of the BAR

Legal Requirements		
Legislation considered	**Relevant Organ of State / authority**	**Aspect of Project**
National Environmental Management Act, Act No. 107 of 1998 (NEMA), as amended	Department of Forestry, Fisheries, and the Environment (DFFE)	Several listed activities in terms of NEMA GN No R983 and R985 in the Government Gazette of 4 December 2014 (as amended on 7 April 2017), have been triggered and need to be authorised for the proposed Transmission lines and Switching Stations (also see Table 2-2). Based on the listed activities triggered, the application for environmental authorisation will follow the BA process as set out in Regulations 19-20 of GN R982.
National Environmental Management: Biodiversity Act, Act No. 10 of 2004 (NEMBA)	Department of Forestry, Fisheries, and the Environment (DFFE)	The act calls for the management of all biodiversity within South Africa. All indigenous fauna is protected under the NCNCA (refer further below in this table). Wetland conservation is driven by the South African National Biodiversity Institute (SANBI), a requirement under NEMBA and the study area has been mapped as Very High sensitivity related to presence of wetlands and Freshwater Ecosystem Priority Areas (NFEPA)
Environmental Conservation Act, Act No. 73 of 1989 (ECA)	Department of Forestry, Fisheries, and the Environment (DFFE)	Noise impacts associated with transmission lines and switching stations are generally confined to the construction phase and low level noise “humming” during operation. In terms of section 25 of the ECA, the national Noise Control Regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) (NCR) was promulgated. The NCRs were revised under Government Notice Number R55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. Currently, no provincial or local regulations exist in the Northern Cape and no approval is required. Mitigation measures, are included in the BAR and EMPr.
National Water Act, Act No. 36 of 1998 (NWA)	Department of Water Affairs and Sanitation (DWS)	Section 21 of the NWA recognises water uses that require authorisation by DWS before they commence. Construction of infrastructure within drainage lines could be required for the associated roads and authorisation is therefore required in terms of Section

		21 (c) and (i) in the form of either a General Authorisation or Water Use License Application (WULA). The information required by the DWS for this application has been included in the aquatic ecology assessment in Annexure D. However, this application will only be submitted if the associated WEF project is awarded preferred bidder status in terms of the REIPPPP. No water use may begin without the appropriate authorisation.
National Heritage Resources Act, Act No. 25 of 1999 (NHRA)	South African Heritage Resources Agency (SAHRA), and Northern Cape Provincial Heritage Resources Authority Ngwao Boswa Kapa Bokone (NBKB)	The proposed Kokerboom 1, 2 and 3 Transmission lines and associated roads will exceed 300 m in length. The Switching Stations will exceed 5,000 m^2 in extent. Therefore, Section 38 of the NHRA is applicable. As such, a Heritage Impact Assessment and Palaeontological Assessment has been undertaken as required by the NHRA. Comment on the project will be obtained from NBKB and SAHRA during the PPP and appropriate mitigation measures have been included in the BAR and EMPr.
Aviation Act, Act No 74 of 1962	Civil Aviation Authority (CAA)	Transmission lines and switching stations may potentially interfere with radio navigation equipment. Transmission lines and switching stations are also considered to be potential physical obstacles and may need to be fitted with aviation warning lights if required by the CAA. A landing strip adjacent the Helios MTS has been identified. Application for approval have been submitted to the CAA, who has in turn confirmed no objection to the Kokerboom 1, 2 and 3 WEFs and associated grid connections. A Civil Aviation Compliance Assessment Report is attached in Annexure D (includes a landowner letter stating that the landing strip adjacent Helios is not in use, CAA approval of the Kokerboom 3 WEF site).
Conservation of Agricultural Resources Act, Act No. 43 of 1983 (CARA)	Northern Cape Department of Agriculture and Rural Development	The purpose of this Act is to ensure that natural agricultural resources of South Africa are conserved through maintaining the production potential of land, combating and preventing erosion, preventing the weakening or destruction of water sources, protecting vegetation, and combating weeds and invader plants. As such, as part of the BA process, recommendations will be made to ensure that measures are implemented to maintain the agricultural production of land, prevent soil erosion, and protect any water bodies and natural vegetation on site. The Proponent together with the relevant farmers should also ensure the control of any undesired aliens, declared weeds, and plant invaders listed in the regulation that may pose a problem because of the proposed project.

National Road Traffic Act, Act No. 93 of 1996 (NRTA)	Department of Transport, Northern Cape	Certain vehicles and loads cannot be moved on public roads without exceeding the limitations in terms of the dimensions and/or mass as prescribed in the Regulations of the NRTA. Due to the large size of some of the transmission line and switching station components they will need to be transported via "abnormal loads". As such, the Northern Cape Department of Transport will be provided with an opportunity to review and comment on this BA process.
The National Energy Act, Act No. 34 of 2008	Department of Energy (DoE)	The REIPPPP is guided by the National Energy Act, one of the purposes of which is to promote sustainable development of renewable energy infrastructure for which the transmission lines and switching stations will form part of.
Northern Cape Nature Conservation Act Act No. 9 of 2009 (NCNCA)	Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform	Numerous sections (specifically sections 50-51) under NCNCA deal with indigenous and protected plants. The protected status of various species that may be located on the site requires a permit under NCNCA in order for the plants to be removed or destroyed i.e. a permit is required before development may commence.
Astronomy Geographic Advantage Act, Act No. 21 of 2007 (AGA), and associated Regulations	Department of Science and Innovation (DSI)	In terms of Schedule D of the Regulations on the Protection of the Karoo Central Astronomy Advantage Areas (KCAAA)(GN 1411 of 15 December 2017), transmission lines located more than 50km away from the SKA Infrastructure Territory are exempt from requiring a permit from the DSI unless the operation of such infrastructure are found to cause interference with the SKA. The proposed infrastructure is more than 50km away from the SKA Infrastructure Territory and is thus exempt from the AGA permitting requirements. Specific KCAAA requirements for transmission of power include: 5. Additional conditions for distribution or transmission power systems (1) In addition to the conditions in regulation 3 of these regulations, no person may construct or install any new overhead distribution or transmission power systems with a voltage rating – (2) (a) equal or greater to sixty-six thousand Volts (66 000 V) within sixteen km of SKA Infrastructure Territory; and (b) less than sixty-six thousand Volts (66 000 V) within six km of SKA Infrastructure Territories. Despite compliance with sub-regulation (1), the distribution or transmission power system may not cause electromagnetic interference to SKA Infrastructure Territories which exceeds the protection

		levels prescribed in the Radio Astronomy Protection Levels Regulations, 2012. An Electro-magnetic interference (EMI) assessment has been undertaken to determine the potential impact on the SKA radio telescope. A comment on the project will also be obtained from SKA, for its inclusion in the BA process.

2.2 Listed Activities in terms of NEMA

NEMA is the primary legislation tasked with the management of environmental resources and, accordingly, identifies activities that require authorisation prior to commencement. Such activities listed in the amended 2014 EIA Regulations (GN R982, as amended) are detailed in Table 2-2.

Table 2-2: Listed activities triggered by the proposed Kokerboom 1, 2 and 3 Transmission Lines and Switching Stations

Activity No(s):	**Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 of the EIA Regulations, 2014 as amended**	**Describe the portion of the proposed project to which the applicable listed activity relates.**
GN R983 Activity 11	"The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts".	The proposed 132 kV OHL transmission lines would connect the proposed Kokerboom WEFs to the Helios MTS. A switching station will be constructed at the start of each transmission line. All transmission lines are proposed within be within a rural area. Kokerboom 1 Transmission line ≈16km Kokerboom 2 Transmission line ≈10km Kokerboom 3 Transmission line ≈19km
GN R983 Activity 12	The development of – (ii) infrastructure or structures with a physical footprint of 100 m^2 or more; Where such development occurs – (a) within a watercourse; (c) if no development setback exists, within 32 m of a water course, measured from the edge of a watercourse;	Drainage lines are scattered across the proposed site. The proposed roads, transmission lines and/ or other infrastructure are likely to cross these drainage lines or be within 32 m thereof.
GN R983 Activity 19	The infilling or depositing of any material of more than 10 m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 m^3 from a watercourse;	Access roads (service tracks) and possibly one or more of the transmission line pylons will be located within a watercourse (drainage line) which would therefore trigger this activity.
GN R983 Activity 27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- (i) undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	Ground and vegetation clearance would be required for each of the two switching stations which would therefore trigger this activity. The transmission line is considered a linear activity and therefore would not be applicable. Kokerboom 1 Switching station 1,5ha Kokerboom 2 Switching station, 1ha Kokerboom 3 Switching station, 1ha
GN R983 Activity 28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 1 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 ha.	The proposed switching stations are considered to constitute "industrial development". The proposed farms on which the infrastructure is proposed are zoned as agricultural land. The proposed farm portions on which the project is proposed are being used for livestock grazing (mostly sheep).
Activity No(s):	**Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 3 of the EIA Regulations, 2014 as amended**	**Describe the portion of the proposed project to which the applicable listed activity relates.**

GN R985 Activity 4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. g. Northern Cape ii. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The transmission line roads will cross areas mapped as CBAs according to the latest (2016) CBA maps for the Northern Cape. It could not be confirmed if these CBA areas[5] have been adopted in systematic biodiversity plans by the competent authority or in bioregional plans.
GN R985 Activity 12	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. g. Northern Cape ii. Within critical biodiversity areas identified in bioregional plans;	Vegetation exceeding the threshold of 300m^2 will likely be cleared where transmission lines and associated roads cross areas identified as CBAs in the 2016 Northern Cape CBA maps. Note the listed activity only refers to "identified in bioregional plans" thus the need for it to be identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans is not specific.
GN R985 Activity 18	The widening of a road by more than 4 m, or the lengthening of a road by more than 1 km. (g) Northern Cape (ii) Outside urban areas: (ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.	Access tracks for the proposed development, which will include extensions of existing farm tracks may be lengthened by more than one kilometre within 100m from the edge of a watercourse. Existing roads would be used as far as practically possible and feasible, but would likely not require widening by more than 4 m. Some of these roads may traverse drainage lines or fall within 100 m from the edge of a watercourse or wetland.

2.2.1 DFFE Screening Tool

Government Notice 960, gazetted on 05 July 2019, in accordance with the NEMA EIA Regulations 2014 (as amended) requires that a National web based environmental screening tool is used to produce a report that should be submitted with an EA application to the DEA[6] from 05 October 2019 and onwards (i.e. 90 days following the date of publication of this notice). The downloaded report is appended in Annexure E. This report shows, on a high level, the site's sensitivity to transmission line development based on different environmental themes (including, inter alia, terrestrial ecology, avifauna, heritage) and identifies assessment protocols that must be undertaken depending on the environmental theme's sensitivity rating within the development site.

Assessment protocols that set out the "procedures to be followed for the assessment and minimum criteria for reporting of identified environmental themes in terms of section 24(5)(a) and (h) of the national environmental management act, 1998, when applying for environmental authorisation" were Gazetted on 20 March 2020. These protocols in terms of reporting of identified environmental themes where met in terms NEMA.

2.3 Relevant Policies

South Africa's Constitution (1997), together with the three policies indicated in Figure 2-1 below, have been key in developing South Africa's renewable energy industry.

[5] The ecologist identified that the CBA mapping was updated by Oosthuysen and Hollness in 2016, which includes CBAs and Ecosystem Support Areas (ESAs) located within the footprint of the greater Kokerboom study area. However, it's not clear if these mapped areas have been included in a Bioregional Plan, in a systematic biodiversity plan adopted by the Competent Authority to date.

[6] DEA is now referred to as DFFE effective 1 April 2021.

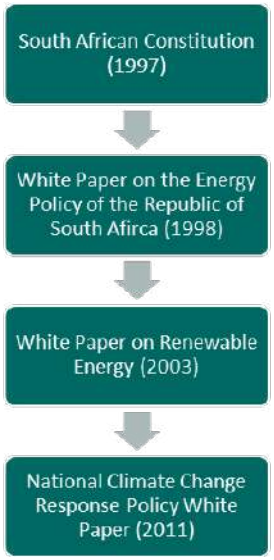


Figure 2-1: Key policies for initiating renewable energy in South Africa

2.4 Relevant Guidelines

This BA process is informed by the series of national Environmental Guidelines where applicable and relevant:

- EIA Guideline for Renewable Energy Projects (DEA, 2015).
- Integrated Environmental Information Management (IEIM), Information Series 5: Companion to the NEMA EIA Regulations of 2010 (DEA, 2010).
- IEIM, Information Series 2: Scoping (Department of Environmental Affairs and Tourism (DEAT), 2002).
- IEIM, Information Series 3: Stakeholder Engagement (DEAT, 2002).
- IEIM, Information Series 4: Specialist Studies (DEAT, 2002).
- IEIM, Information Series 11: Criteria for determining Alternatives in EIA (DEAT, 2004).
- IEIM, Information Series 12: Environmental Management Plans (DEAT, 2004).
- IEM Guideline Series 7: Public Participation in the Environmental Impact Assessment Process (DEA, 2012)
- Birds and Wind-Energy Best-Practice Guidelines: Third Edition (BirdLife SA and EWT, 2015).
- Environmental, Health, and Safety Guidelines for Wind Energy (World Bank Group, 2015).

The following guidelines from the Department of Environmental Affairs and Development Planning (Western Cape) (DEA&DP) were also taken into consideration as best-practice, even though the project is situated in the Northern Cape:

- Guideline for involving biodiversity specialists in EIA process (Brownlie. 2005).
- Guideline for involving heritage specialists in the Environmental Impact Report process (June Winter & Baumann, 2005).
- Guideline for involving visual and aesthetic specialists in the Environmental Impact Report process (Oberholzer.2005).
- Guideline for Environmental Management Plans (Lochner, 2005).
- Guideline for determining the scope of specialist involvement in EIA Processes (2005).
- Guideline for the review of specialist input into the EIA Process (June 2005).
- Guideline on Alternatives, EIA Guideline and Information Document Series. (DEA&DP, 2011).
- Guideline on Need and Desirability, EIA Guideline and Information Document Series. (DEA, 2012).
- Guideline on Public Participation, EIA Guideline and Information Document Series. (DEA&DP, 2011)

3 EIA METHODOLOGY

As outlined in Figure 3-1, there are two distinct phases in the BA process, namely Pre-Application Phase, and the BAR Phase. A description of the activities which have been, and will be, undertaken during each phase is provided in the following sections. Note that this report covers the second phase, viz. the BAR Phase.

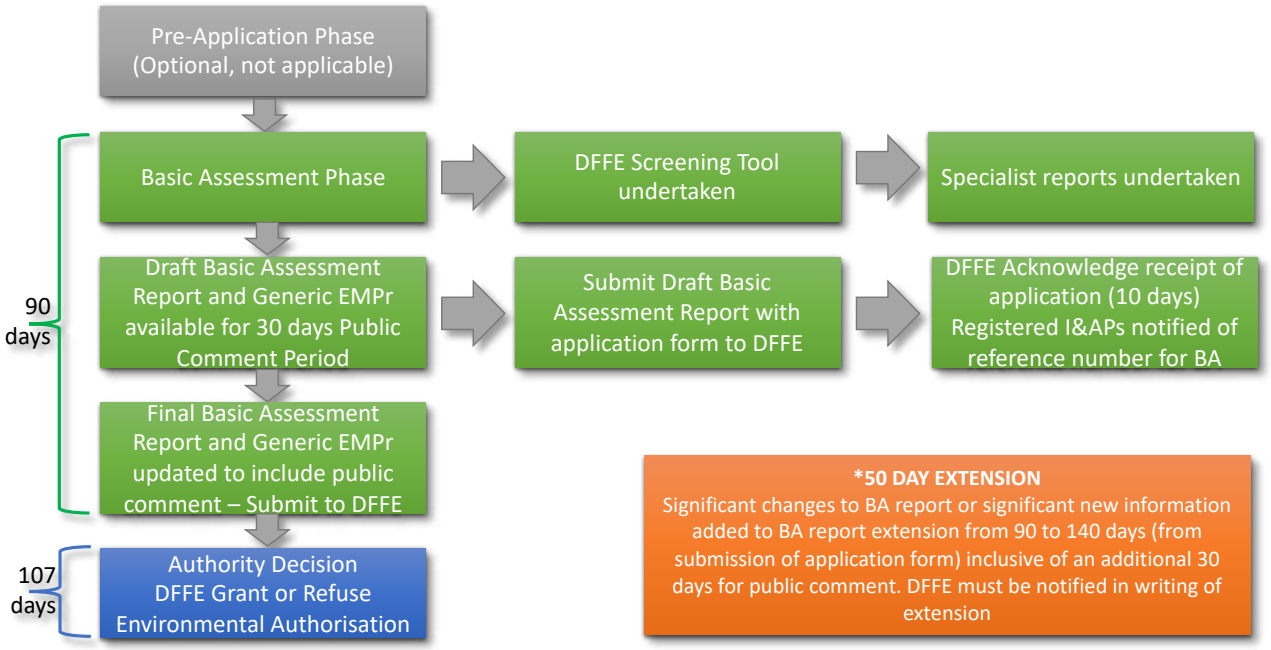


Figure 3-1: The BA process in terms of NEMA

As illustrated in Figure 3-1, only one stage of public participation is included in the BA process, i.e. comment period on the draft BAR. More information on the Public Participation Process (PPP) is included in Section 3.3.

3.1.1 The Pre-Application Phase

No official pre-application phase was undertaken since the proposed project site has been subjected to BA process for similar transmission line developments in 2017-2018 (in addition to EIAs for the Kokerboom 1,2 and 3 WEFs). Typically, the pre-application phase would include a meeting with DFFE and the release of a consultation/pre-application BAR. These where deemed not to be necessary in context of the proposed developments. A PP Plan was approved on 1 July 2021 by DFFE (Annexure B). Furthermore, most of the properties in question have been subject to rigorous specialist investigations for the Kokerboom 1, 2 and 3 WEFs and grid application which provide a notable amount of baseline information to be called on in this draft BAR.

The COVID-19 Disaster Management Regulations, Directions Annexure 3: Services to be provided or obtained by proponent, applicants, environmental assessment practitioners (EAPs), specialists, professionals undertaking actions as part of the environmental authorisation process and organs of state as commenting authorities required in terms of the National Environmental Management Act, the National

Environmental Management: Waste Act, and the Environmental Impact Assessment Regulations, (EIA Regulations) (Annexure 3) have been and will be followed.

3.1.2 BAR Phase

A site visit was undertaken to familiarise the EAP and the specialists with the site and to allow for a rapid site survey, identifying potential areas of concern or opportunity. Site visits by an EAP were undertaken at inception of the BAR phase on 19 June 2021 on which day site notices were also placed.

The objective of the basic assessment process is to, through a consultative process -

a) determine the policy and legislative context within which the proposed activity is located and how the activity;

complies with and responds to the policy and legislative context;

b) identify the alternatives considered, including the activity, location, and technology alternatives;

c) describe the need and desirability of the proposed alternatives;

d) through the undertaking of an impact and risk assessment process, inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine –

i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and;

ii) the degree to which these impacts -

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources; and

(cc) can be avoided, managed or mitigated;

e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity toi) identify and motivate a preferred site, activity and technology alternative;

i) identify suitable measures to avoid, manage or mitigate identified impacts; and

ii) identify residual risks that need to be managed and monitored.

Various methods and sources were utilised to identify the potential social and environmental aspects associated with the proposed project and to develop the ToRs for the specialist studies. The sources of information for the preparation of this report include, inter alia, the following:

- Previous BA process undertaken for the Kokerboom 1,2, and 3 Grid Infrastructure;
- Collection of information specific to the project, as provided by the Proponent;
- Project description;
- Basic methodology for construction of the various project components;
- Basic methodology during operations and decommissioning;
- Expected timeframe for project development;
- Maps and figures, outlining the proposed facilities;
- Technical information relating to design;
- Other relevant BARs/ EIRs prepared for BAs/EIAs undertaken in the area;
- Environmental baseline literature and desktop spatial surveys for this site and surrounding areas;
- Environmental baseline surveys for this site and surrounding areas from site visits by specialists;
- Consultation with the project team (including specialists); and

- Consultation with I&APs, including authorities.

An application form for the project will be submitted to DFFE (in order to register the project on the Department's databases) along with the draft BAR which will be circulated for a 30-day public comment period. All comments received will recorded and responded to in a Comments and Response section within the Public Participation Report (Annexure C), and the BAR will be updated to address I&AP comments, where appropriate. The final BARs will be submitted to DFFE for decision making, with the final BAR being submitted no later than 90 days from the receipt of the application form. The competent authority must then, within 107 days of receipt of the final BAR and generic EMPr, in writing –

(a) Grant environmental authorisation in respect of all or part of the activity applied for; or

(b) Refuse environmental authorisation.

Summary of the key dates of the BAR process:

- Site visit - 19 June 2021
- PP Plan approved by DFFE (1 July 2021)
- Placement of Site notices -19 June 2021 (additional/correction notices 7 July 2021)
- Advertisement in Westlander Newspaper - 25 June 2021 (additional/correction advert 2 July 2021)
- Lodging of Draft BAR at Loeriesfontein Library and on Dropbox - 8 July 2021
- Notification of I&APs and state departments of availability of draft BAR – 9 July 2021
- Last day to submit comment on draft BAR – 10 August 2021
- Submit Final BAR to DFFE - 16 to 20 August 2021
- DFFE provide decision on application – prior to 6 December 2021
- Notification of registered I&APs of DFFE decision and appeal process – upon receipt of DFFE decision

3.2 Methodology

3.2.1 Specialist Assessments

To provide a scientific assessment that is transparent and robust, a clear methodology is required. Although each specialist required a methodology that was specific to their investigation (detailed in their reports in Annexure D), they were each given the following Terms of Reference (ToR):

- Undertake a site investigation to determine the status quo and identify any sensitive features or no-go areas;
- Provide shapefiles of all sensitive features;
- Assess all proposed site alternatives within a 300m buffer[7] associated with the proposed grid connection infrastructure;
- Make use of the Zutari Impact Assessment Methodology (explained below in Section 3.2.2) when assessing impacts for all alternatives proposed as part of the proposed grid connection infrastructure, as well as cumulative impacts (detailed below in Section 3.2.3);
- Provide a detailed description of appropriate mitigation measures that can be adopted to reduce or avoid negative impacts and improve positive impacts for each phase of the project. Indicate the level of significance of impacts pre- and post-mitigation;
- Provide a summary of succinct and practical recommendations based on mitigation measures identified to form the basis of environmental authorisation requirements, should the development be authorised;

[7] A 300m buffer area was assessed by the specialists to allow for micro-sitting of infrastructure prior to construction. For

- Comply with the content requirements for specialist reports listed in Appendix 6 of the 2014 EIA Regulations (GN R982 of 2014). (These have been updated where required to consider the amendments made to the Regulations on 7 April 2017); and
- Comply with procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the NEMA, 1998, when applying for environmental authorisation (GN R320, of 20 March 2020).

3.2.2 Assessment Methodology

This section outlines the proposed method for assessing the significance of the potential environmental impacts. For each predicted impact, criteria are ascribed, and these include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale), as well as the probability (likelihood). The methodology is quantitative, whereby professional judgement is used to identify a rating for each criteria based on a seven-point scale (refer to Figure 3-2); and the significance is auto-generated using a spreadsheet through application of the calculations in Table 3-1. Specialists can comment where they disagree with the auto-calculated impact significance rating.

Calculations

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **intensity** *(*size or degree scale), which also includes the **type** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (intensity + duration + extent)

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative.

Figure 3-2: Calculation of significance

Table 3-1: Assessment criteria for the evaluation of impacts

Criteria	Numerical Rating	Category	Description
Duration	1	Immediate	Impact will self-remedy immediately
	2	Brief	Impact will not last longer than 1 year
	3	Short term	Impact will last between 1 and 5 years
	4	Medium term	Impact will last between 5 and 10 years
	5	Long term	Impact will last between 10 and 15 years
	6	On-going	Impact will last between 15 and 20 years
	7	Permanent	Impact may be permanent, or in excess of 20 years
Extent	1	Very limited	Limited to specific isolated parts of the site
	2	Limited	Limited to the site and its immediate surroundings
	3	Local	Extending across the site and to nearby settlements

Criteria	Numerical Rating	Category	Description
	4	**Municipal area**	Impacts felt at a municipal level
	5	**Regional**	Impacts felt at a regional level
	6	**National**	Impacts felt at a national level
	7	**International**	Impacts felt at an international level
Intensity	1	**Negligible**	Natural and/ or social functions and/ or processes are negligibly altered
	2	**Very low**	Natural and/ or social functions and/ or processes are slightly altered
	3	**Low**	Natural and/ or social functions and/ or processes are somewhat altered
	4	**Moderate**	Natural and/ or social functions and/ or processes are moderately altered
	5	**High**	Natural and/ or social functions and/ or processes are notably altered
	6	**Very high**	Natural and/ or social functions and/ or processes are majorly altered
	7	**Extremely high**	Natural and/ or social functions and/ or processes are severely altered
Probability	1	**Highly unlikely / None**	Expected never to happen
	2	**Rare / improbable**	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
	3	**Unlikely**	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
	4	**Probable**	Has occurred here or elsewhere and could therefore occur
	5	**Likely**	The impact may occur
	6	**Almost certain / Highly probable**	It is most likely that the impact will occur
	7	**Certain / Definite**	There are sound scientific reasons to expect that the impact will definitely occur

When assessing impacts, broader considerations are also taken into account. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in Table 3-2, Table 3-3, and Table 3-4, respectively.

Table 3-2: Definition of confidence ratings

Category	Description
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 3-3: Definition of reversibility ratings

Category	Description
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Table 3-4: Definition of irreplaceability ratings

Category	Description
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere
High	The resource is irreparably damaged and is not represented elsewhere

3.2.3 Assessment of Cumulative Effects

Cumulative effects are commonly understood to be impacts from different projects that combine to result in significant change, which could be larger than the sum of all the individual impacts. The assessment of cumulative effects will therefore be considered for all developments within a 30km radius of the proposed site in particular renewable energy (wind and solar) and their associated grid connections. The projects considered in the cumulative assessment are those projects that have received environmental authorisation, including those projects currently under construction and where construction has not yet commenced.

Where appropriate, the cumulative impacts associated with additional renewable energy projects grid connections should be quantified. For example, land transformed by the development footprints should be determined in hectares.

The relevant projects with potential associated cumulative impacts have been identified as detailed in Table 3-5 and illustrated in a Cumulative Map in Annexure A.

Table 3-5: Cumulative Projects

Development	Status of EIA /development	Proponent	Technology	Capacity	Farm details
Dwarsrug Wind Farm	EA issued	Mainstream Renewable Power	Wind	140MW	• Remainder of the Farm Brak Pan No 212
Khobab Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	• Portion 2 of the Farm Sous No 226
Loeriesfontein 2 Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	• Portions 1 & 2 of the Farm Aan de Karree Doorn Pan No 213
Graskoppies Wind Farm	EA Issued	Mainstream Renewable Power	Wind	235MW	• Portion 2 of the Farm Graskoppies No. 176; and • Portion 1 of the Farm Hartebeest Leegte No. 216.
Hartebeest Leegte Wind Farm	EA issued	Mainstream	Wind	235MW	• Entire part of the Remainder of the Farm Hartebeest Leegte No. 216.
Xha! Boom Wind Farm	EA issued	Mainstream Renewable Power	Wind	235MW	• Entire part of Portion 2 of the Farm Georg's Vley No. 217.
Ithemba Wind Farm	EA issued	Mainstream Renewable Power	Wind	235MW	• Western portion of Portion 2 of the Farm Graskoppies No. 176; and • Western portion of Portion 1 of the Farm Hartebeest Leegte No. 216.
Loeriesfontein PV3 Solar Energy Facility	EA issued	Mainstream Renewable Power	Solar	100MW	• Portion 2 of the Farm Aan de Karree Doorn Pan No 213
Hantam PV Solar Energy Facility	EA issued	Solar Capital (Pty) Ltd	Solar	Up to 525MW	• Remainder of the Farm Narosies No 228
PV Solar Power Plant	EA issued	BioTherm Energy	Solar	70MW	• Portion 5 of the Farm Kleine Rooiberg No 227

Development	Status of EIA /development	Proponent	Technology	Capacity	Farm details
Kokerboom 4 Wind Farm	EIA underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	• Remainder of Farm Aan De Karee Doorn Pan No. 213
Kokerboom 1 Wind Farm	EA issued	Business Venture Investments No. 1733 (Pty) Ltd (BVI)	Wind	240MW	• Remainder of the Farm Leeubergrivier No. 1163; and • Remainder of the Farm Kleine Rooiberg No. 227.
Kokerboom 2 Wind Farm	EA issued	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	256MW	• Remainder of the Farm Springbokpan No. 1164; and • Remainder of the Farm Springbok Tand No. 215.
Kokerboom 3 Wind Farm	EA issued EIA underway (amendment)	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	300MW	• Remainder of the Farm Aan De Karree Doorn Pan No. 213; • Portion 1 of the Farm Karree Doorn Pan No. 214; and • Portion 2 of the Farm Karree Doorn Pan No. 214.

Cumulative effects have been assessed by each of the specialist studies as part of their assessments. The cumulative assessments are included in Section 6.

3.3 Public Participation

Stakeholder engagement has been described by the International Finance Corporation (IFC) of the World Bank Group as a broad, inclusive and continuous process of communication between a Proponent of a project, and those potentially affected by the activities of the proposed development. This can include a wide range of activities that are relevant to the entire life of a project. The aim of stakeholder engagement differs at different stages of the project lifecycle. During the BA process, the aim is to provide an opportunity for stakeholders to be informed of projects occurring in their area and that may affect them directly or indirectly. It also aims to provide an accessible and meaningful opportunity for people to ask questions, raise concerns or grievances and to ensure that these are used to guide the new development, and ongoing operations, in a responsible manner that complements the local socio-economic environment and enhances the benefit of a given project.

South African legislation and guidelines (refer to Chapter 2) have formalised stakeholder engagement in the BA process and refer to it as the Public Participation Process (PPP). PPP therefore forms an integral component of this investigation and enables interested and affected parties (I&APs) to identify their issues, concerns, and suggestions during the BA process. This PPP has been structured to provide I&APs with an opportunity to gain more knowledge about the proposed project, to provide input through the review of documents/ reports, and to voice any issues of concern at various stages throughout the BA process. These stages are described below.

A Public Participation Report has been included in Annexure C and provides detail on the process that has been followed to date. This document will be updated as the project progresses.

3.3.1 Stages of the Public Participation Process

PPP for this project are illustrated in Figure 3-3 below.

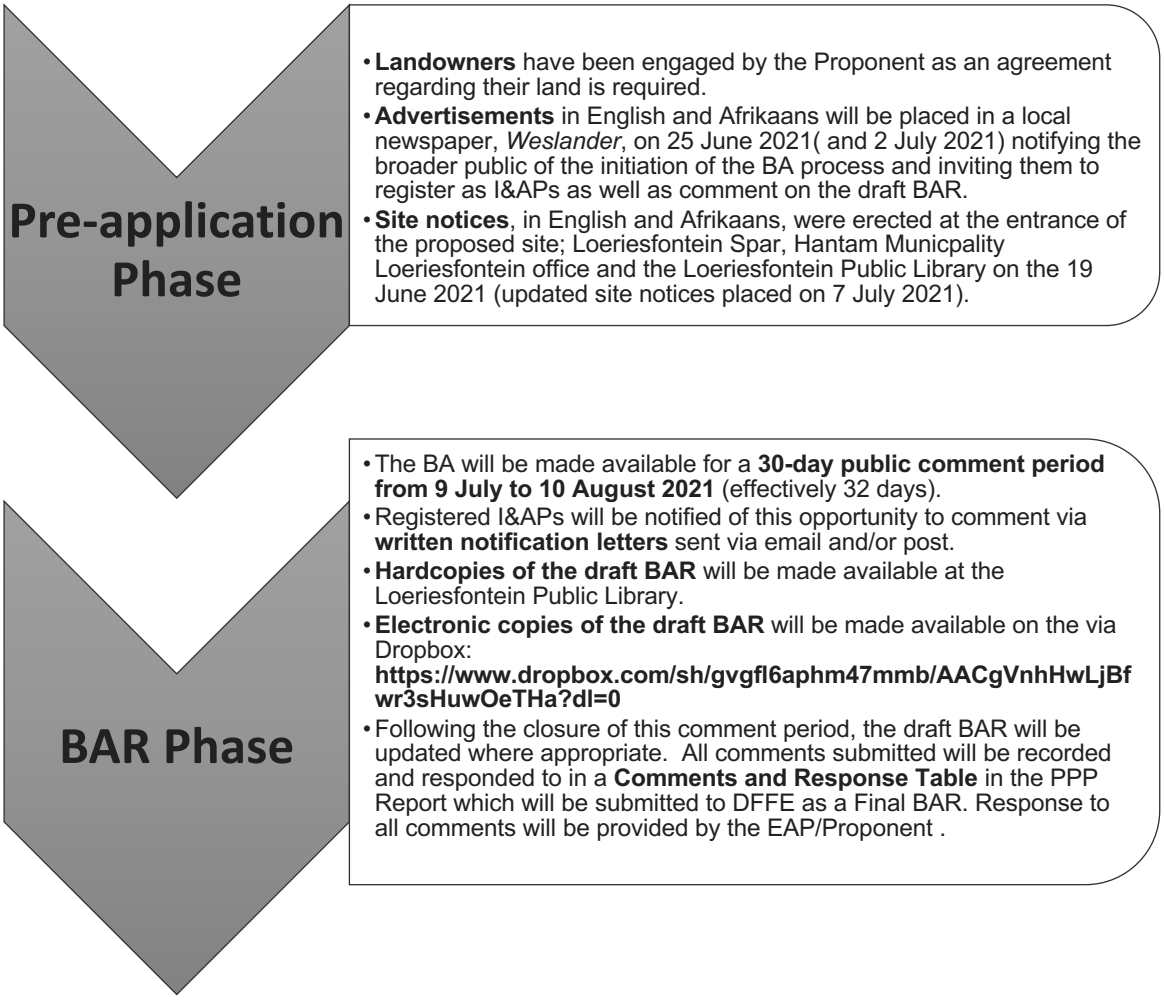


Figure 3-3: Public participation in the BAR process

3.3.2 Identification of Stakeholders

A database of I&APs has been developed for the proposed development based on the previous transmission line BA process and the Kokerboom 1, 2, and 3 WEFs, with cumulative stakeholders identified during the PPP. This database was initiated by including the details of the following affected parties:

- Landowners and adjacent landowners;
- Relevant district and local municipal officials and ward councillor/s;
- Relevant national and provincial government officials;
- Neighbouring renewable energy projects, and
- Organisations in the area.

This database will be augmented via chain referral during the BA process and will be continually updated as new I&APs are identified throughout the project lifecycle. The list of I&APs is included in Annexure C.

3.4 Authority involvement

In terms of Section 24O (2) and (3) of the NEMA, the following state departments and/or parastatal bodies will be sent a copy of the draft BAR for comment.

- Provincial and local authorities, and parastatal organisations:

- Namakwa District Municipality (DM);
- Hantam Local Municipality (LM);
- Northern Cape Provincial Heritage: Boswa ya Kapa Bokone;
- Eskom;
- Northern Cape Department of Agriculture, Environmental Affairs, Land Reform & Rural Development;
- Northern Cape Department of Roads and Public Works; and
- Northern Cape Department of Economic Development and Tourism.

- National departments and organisations:
  - Department of Human Settlement, Water and Sanitation;
  - Department of Agriculture, Land Reform and Rural Development.
  - Department of Health;
  - Department of Transport;
  - Department of Mineral Resources & Energy;
  - Department of Environmental Affairs: Integrated Environmental Management
  - Department of Environmental Affairs: Biodiversity Conservation
  - South African National Roads Agency Limited;
  - South African Heritage Resources Agency;
  - South African National Defence Force;
  - National Energy Regulator of South Africa;
  - Civil Aviation Authority;
  - BirdLife South Africa;
  - Square Kilometre Array (SKA);
  - South African Astronomical Observation (SAAO)
  - WeatherSA; and
  - Conservation agencies: WESSA, EWT and WWF SA.

- Other national/ provincial departments where deemed necessary

3.5 Summary of Comments and Responses

All comments will be added to and responded to in the Comments and Response Report and will be added to the Final BAR.

4 DESCRIPTION OF PROPOSED PROJECT

The proposed grid connection infrastructure is a critical component of the authorised Kokerboom 1, 2 and 3 WEFs to connect to the national Eskom electricity grid. The following subsections provide more information on the project context, location, components, activities and alternatives.

4.1 Project Overview

The proposed development entails the construction of the grid connection infrastructure required to connect the three Kokerboom WEFs to the national Eskom electricity grid at the Helios MTS. The project would entail the development and operation of the following components:

- Three 132kV overhead lines (single or double circuit);
- Three switching stations to connect the respective WEFs to the Helios MTS;
- Access roads/tracks required to construct and maintain the infrastructure (approximately 4m wide); and
- Associated infrastructure such as permanent fencing around the switching stations, and temporary construction site camp and lay down areas (to be rehabilitated once development is complete).

The above-mentioned components are described in detail below.

The proposed three Kokerboom WEFs are located (based on a central point for the project) approximately 53km north of Loeriesfontein, 85km west of Brandvlei and 160km southeast of Springbok and in the Northern Cape. Kokerboom 1 is located on farms Leeuwbergrivier, 1163 and Kleine Rooiberg, RE/227. Kokerboom 2 is located on farms Springbokpan, 1164 and Springbok Tand RE/215; and Kokerboom 3 is located on farms Aan De Karree Doorn Pan RE/213, and Karree Doorn Pan 1/214 and 2/214 (see Figure 4-4).

The Proponent (or their successor in title) proposes to develop the grid connection infrastructure under a Self- Build agreement with Eskom. It is anticipated that construction would commence within 5 years of the date of authorisation (if granted), and the construction phase would last approximately 6 months. Once construction of the grid connection infrastructure is complete, it is envisaged that the infrastructure (and the associated Environmental Authorisation, if granted) will be ceded to Eskom as per Eskom's requirements. Eskom is thus expected to be the eventual owner of the infrastructure and will be responsible for the long-term operation and maintenance of the grid connection infrastructure. Alternately, pending confirmation from Eskom, part or all of the grid connection infrastructure will be owned and maintained by the Proponent instead of Eskom (i.e. Own-Build agreement).

The proposed infrastructure is expected to be permanent and will remain in place for the duration of the lifespan of the associated Kokerboom WEFs (20 years or more). Note that the construction of the proposed grid connection infrastructure is dependent on the construction timelines of the associated Kokerboom WEFs, which are not yet known. The proposed grid connection infrastructure will only be developed if one or more of the Kokerboom WEFs proceeds to construction. If/when the WEFs are decommissioned at some point in the future, the grid connection infrastructure may also be decommissioned. The owner of the grid connection infrastructure (Eskom, or their successor in title) would be responsible for the decommissioning phase.

4.2 Project details and extent

The proposed site for the Kokerboom 1, 2 and 3 transmission lines, switching stations and associated infrastructure is located approximately 53 km north of Loeriesfontein, 85 km west of Brandvlei and 160 km southeast of Springbok in the Northern Cape. The site can be reached via the unsurfaced Granaatboskolk (AP2972, Nuwepos) Road that branches off the main road, R357 (see Figure 4-4 below). A selection of site photos has been included in Annexure H as additional information to the context and location of the proposed project. Approximate coordinates at 150m intervals are provided for each transmission line route in Annexure F.

4.2.1 Kokerboom 1 Transmission line and switching station

Access to the site is off the public Granaatsboskolk Road (AP2972) adjacent the Helios MTS, about 51km from the R357 road turnoff near Loeriesfontein and several farm roads on the farms Sous and Leeubergrivier. The technical specification of the Kokerboom 1 Transmission line, switching station and associated infrastructure are provided in Table 4-1 and illustrated in Figure 1-2 and Figure 4-1. The Kokerboom 1 Transmission line, switching station and associated infrastructure will be located on the farms listed in Table 4-2 below, and as illustrated in Figure 4-1.

Table 4-1: Technical details for Kokerboom 1 Transmission line and switching station

Component	Description
Overhead Powerline (OHL)	132kV single- or double-circuit Extending from the Kokerboom 1 switching station (collector substation) to the Eskom Helios MTS. OHL will be located within a servitude of up to 32m wide to be positioned within a 300m wide corridor (a 300m wide corridor assessed as part of this BA to allow micro-siting).
OHL Pylons	Up to 45m in height (most structures will be up to 32m tall, only increasing to up to 45m when crossing the railway line, existing overhead transmission line and public roads, i.e. Granaatsboskolk Road (AP2972) - depending on the minimum clearance specified by the road, OHL and rail authorities) Monopole (Self-supporting or stayed) and/or lattice may be used. Disturbance footprint per pylon of up to 10m by 10m (100m^2)
OHL footprint	Length ≈16km Construction road / service track (jeep track) width ≈4m (or less) OHL footprint ~6,4ha (16km x 4m), (consideration must be given that part of this road will use existing farm roads and/or WEF roads) Approximate number of pylons (based on average 150m average between pylons) ≈108 Pylon's disturbance footprint ~1,08ha (108 x 100m^2)
Kokerboom 1 Switching Station	Kokerboom 1 Switching Station (collector station) adjacent to authorised Kokerboom 1 WEF facility substation.
Switching station coordinates	Lat: -30.468494°(approx. centre point) Long: 19.438095°
Switching station footprint	Footprint of up to 1,5ha (100m wide and 150m long)
Laydown Areas	Temporary laydown area of ≈5000m^2 will be required at the switching station.
Site Access	The existing approved access roads to the Kokerboom 1 WEF substations will be used to access the proposed switching station locations. Roads to be developed as part of the Kokerboom WEFs will be utilized to access the OHL as far as possible, however a service track (jeep track) will be required along the OHL route for construction and maintenance purposes.

Table 4-2: Farm details for Kokerboom 1 Transmission line and switching station (switching station in bold)

Name of landowner	Erf number	21-digit SG code	Name of farm	Farm Size (ha)
Rona Rupert Trust (Francois van der Merwe)	RE/226	C01500000000022600000	Sous	9127,10
Van Der Westhuizen Family (Heinie van der Westhuizen)	RE/227	C01500000000022700000	Kleine Rooiberg	4231,23
AJ Van Heerden Familie Trust (Herman van Heerden)	**RE/1163**	**C01500000000116300000**	**Leeubergrivier**	**4586,01**
Eskom	1/226	C01500000000022600001	Helios MTS	35,99
Transnet SOC Limited (Freight and Rail)	3/226	C01500000000022600003	Sishen-Saldanha Railway line	30,84
Transnet Limited SOC (Freight and Rail)	7/227	C01500000000022700007	Sishen-Saldanha Railway line	26,37

4.2.2 Kokerboom 2 Transmission line and switching station

Access to the site is off the public Granaatsboskolk Road (AP2972) adjacent the Helios MTS, about 51km from the R357 road turnoff near Loeriesfontein and several farm roads on the Farms Leeubergrivier Sprinbok Tand and Sprinbokpan. The technical specification of the Kokerboom 2 Transmission line, switching station and associated infrastructure are provided in Table 4-3 and illustrated in Figure 1-2 and Figure 4-2. The Kokerboom 2 Transmission line, switching station and associated infrastructure will be located on the farms listed in Table 4-4 below, and as illustrated in Figure 4-2.

Table 4-3: Technical details for Kokerboom 2 Transmission line and switching station

Component	Description
Overhead Powerline	132kV single- or double-circuit Extending from the Kokerboom 2 switching station to the Kokerboom 1 switching station (collector station). OHL will be located within a servitude of up to 32m wide to be positioned within a 300m wide corridor (a 300m wide corridor assessed as part of this BA to allow micro-siting).
OHL Pylons	Structures will be up to 32m tall (may increase to 45 depending minimum clearance specified by authorities) Monopole (Self-supporting or stayed) and/or lattice may be used. Disturbance footprint per pylon of up to 10m by 10m (100m^2)
OHL footprint	Length ≈10km Construction road / service track (jeep track) width ≈4m (or less) OHL footprint ~4ha (10km x 4m), (consideration must be given that part of this road will use existing farm roads and/or WEF roads) Approximate number of pylons (based on average 150m average between pylons) = ≈68 Pylons disturbance footprint ~0,68ha (68 x 100m^2)
Kokerboom 2 Switching Station	Kokerboom 2 Switching Station to be located directly adjacent to the authorised Kokerboom 2 WEF Facility substation.
Switching station coordinates	Lat: -30.386079° (approx. centre point) Long: 19.398545°
Switching station footprint	Footprint of up to 1ha (100m wide and 100m long)
Laydown Areas	Temporary laydown area of ≈5000m^2 will be required at each switching station.
Site Access	The existing approved access roads to the Kokerboom 1 and 2 WEF substations will be used to access the proposed switching station locations. Roads to be developed as part of the Kokerboom 1 and 2 WEFs will be utilised to access the OHL as far as possible, however a service track (jeep track) will be required along the OHL route for construction and maintenance purposes.

Table 4-4: Farm details for Kokerboom 2 Transmission line and switching station (switching station in bold)

Name of landowner	Erf number	21-digit SG code	Name of farm	Farm Size (ha)
AJ Van Heerden Familie Trust (Herman van Heerden)	RE/1163	C01500000000116300000	Leeubergrivier	4586,01
GA Van Der Westhuizen Familie Trust (Deon Van Der Westhuizen)	**RE/1164**	**C01500000000116400000**	**Sprinbokpan**	**4465,03**
Van Der Westhuizen Family (Heinie van der Westhuizen)	RE/215	C01500000000021500000	Springbok Tand	7335,21

4.2.3 Kokerboom 3 Transmission line and switching station

Access to the site is off the public Granaatsboskolk Road (AP2972) adjacent the Helios MTS, about 51km from the R357 road turnoff near Loeriesfontein and several farm roads on the Farms Leeubergrivier Sprinbokpan, Springbok Tand and Karree Doorn Pan. The technical specification of the Kokerboom 3 Transmission line, switching station and associated infrastructure are provided in Table 4-5 and illustrated in Figure 1-2 and Figure 4-3. The Kokerboom 3 Transmission line, switching station and associated infrastructure will be located on the farms listed in Table 4-6 below, and as illustrated in Figure 4-3.

Table 4-5: Technical details for Kokerboom 3 Transmission line and switching station

Component	Description
Overhead Powerline	132kV single- or double-circuit Extending from the Kokerboom 3 switching station to the Kokerboom 1 switching station (collector station). OHL will be located within a servitude of up to 32m wide to be positioned within a 300m wide corridor (a 300m wide corridor assessed as part of this BA to allow micro-siting).
OHL Pylons	Structures will be up to 32m tall (may increase to 45 depending minimum clearance specified by authorities). Monopole (Self-supporting or stayed) and/or lattice may be used. Disturbance footprint per pylon of up to 10m by 10m (100m^2).
OHL footprint	Length ≈19km Construction road / service track (jeep track) width ≈4m (or less) OHL footprint ~7,6ha (19km x 4m), (consideration must be given that part of this road will use existing farm roads and/or WEF roads) Approximate number of pylons (based on average 150m average between pylons) = ≈127 Pylons disturbance footprint ~1,27ha (127 x 100m^2)
Kokerboom 3 Switching Station	Kokerboom 3 Switching Station to be located directly adjacent to the Kokerboom 3 WEF Facility substation.
Switching station coordinates	Lat: -30.360189° (approx. centre point) Long: 19.516336°
Switching station footprint	Footprint of up to 1ha (100m wide and 100m long)
Laydown Areas	Temporary laydown area of ≈5000m^2 will be required at each switching station.
Site Access	The existing approved access roads to the Kokerboom 1, 2 and 3 WEF substations will be used to access the proposed switching station locations. Roads to be developed as part of the Kokerboom 1, 2 and 3 WEFs will be utilised to access the OHL as far as possible, however a service track (jeep track) will be required along the OHL route for construction and maintenance purposes.

Table 4-6: Farm details for Kokerboom 3 Transmission line and switching station (switching station in bold)

Name of landowner	Erf number	21-digit SG code	Name of farm	Farm Size (ha)
AJ Van Heerden Familie Trust (Herman van Heerden)	RE/1163	C01500000000116300000	Leeubergrivier	4586,01
GA Van Der Westhuizen Familie Trust (Deon Van Der Westhuizen)	RE/1164	C01500000000116400000	Sprinbokpan	4465,03
Van Der Westhuizen Family (Heinie van der Westhuizen)	RE/215	C01500000000021500000	Springbok Tand	7335,21
TR2 Immobilien GmbH	2/214	C01500000000021400002	Karree Doorn Pan	5,094.24
Gert Johannes Lombard	**1/214**	**C01500000000021400001**	**Karree Doorn Pan**	**5,094.23**

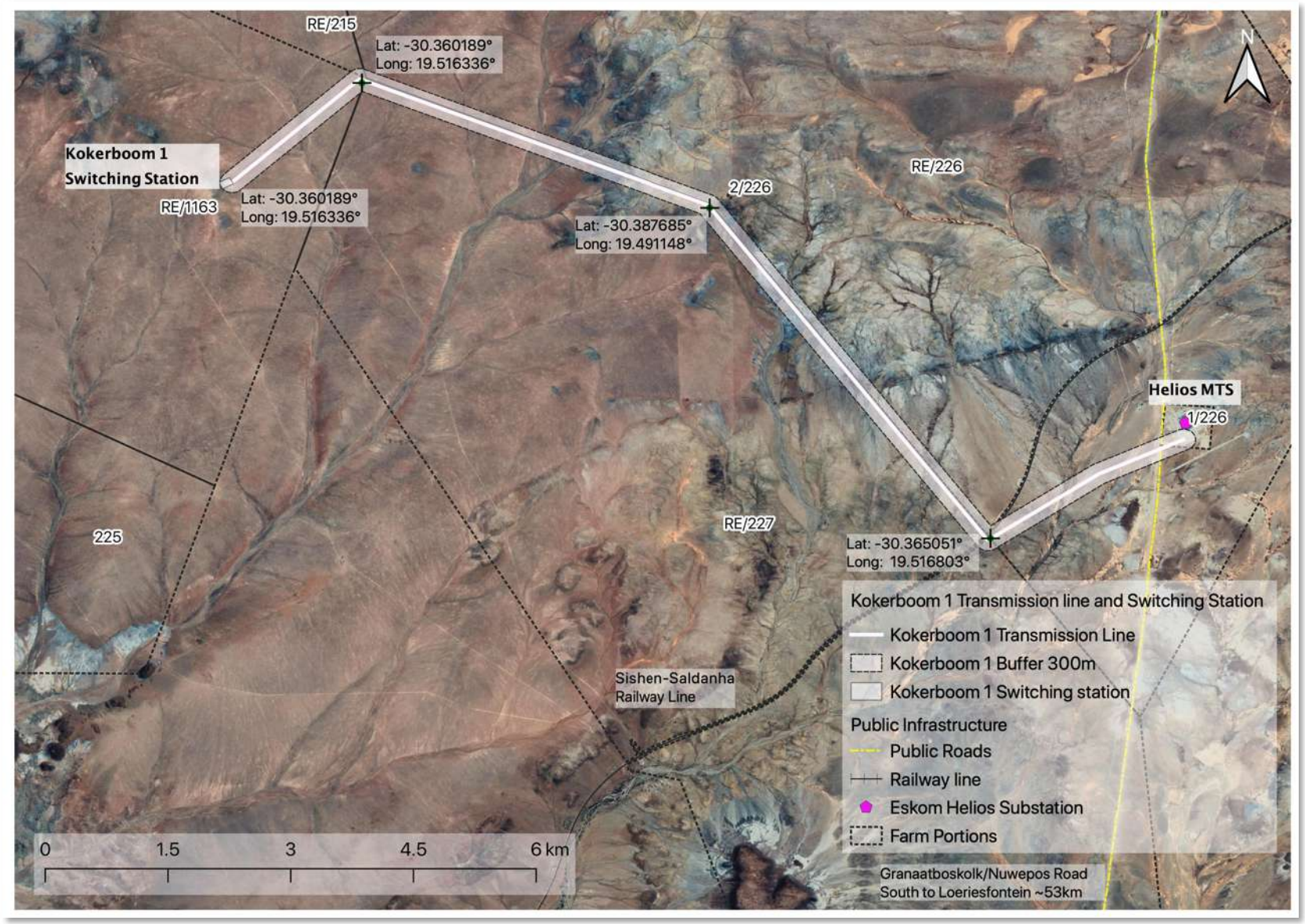


Figure 4-1: Location of Kokerboom 1 Transmission line and switching station, near Loeriesfontein in the Northern Cape

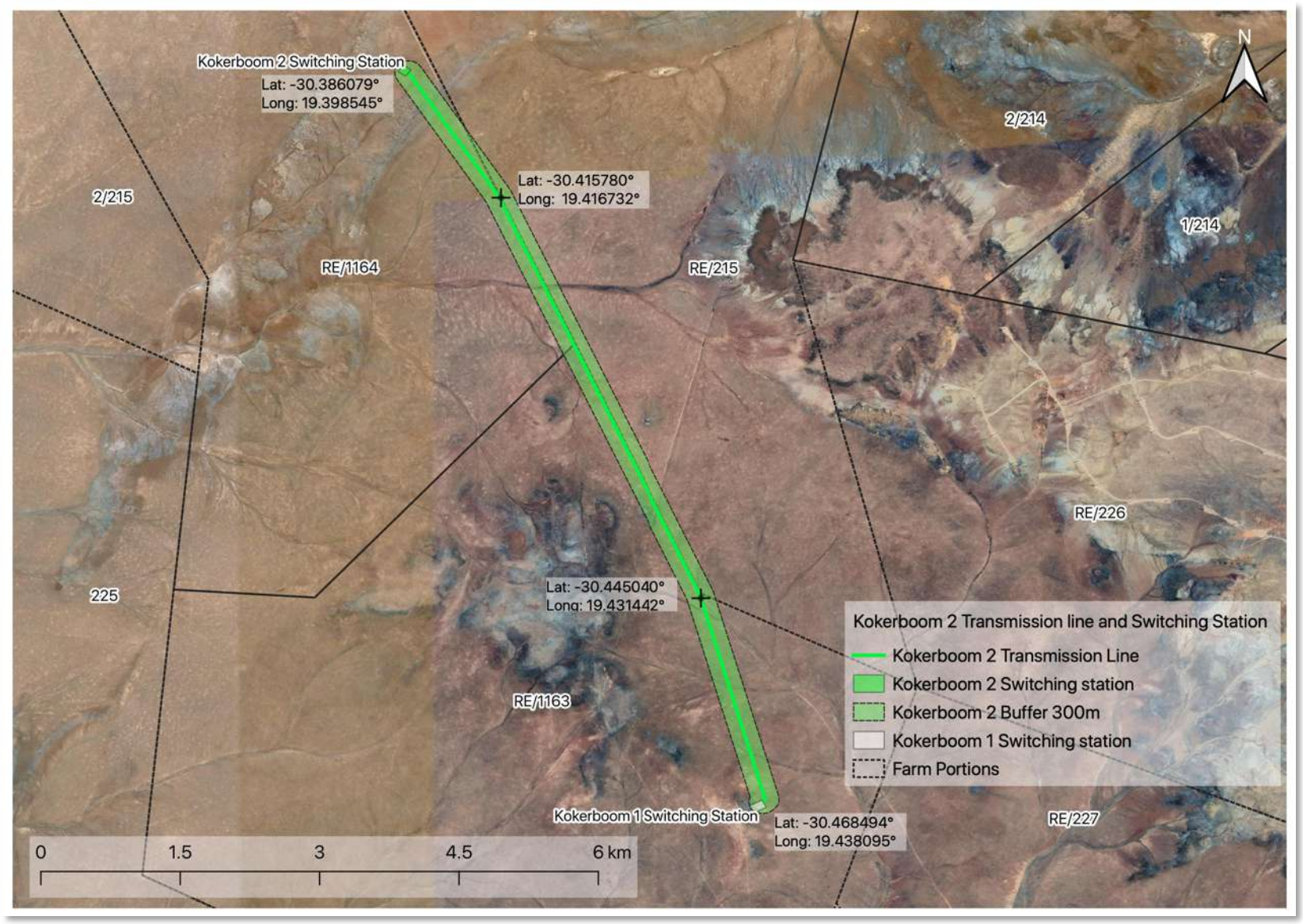


Figure 4-2: Location of Kokerboom 2 Transmission line and switching station, near Loeriesfontein in the Northern Cape

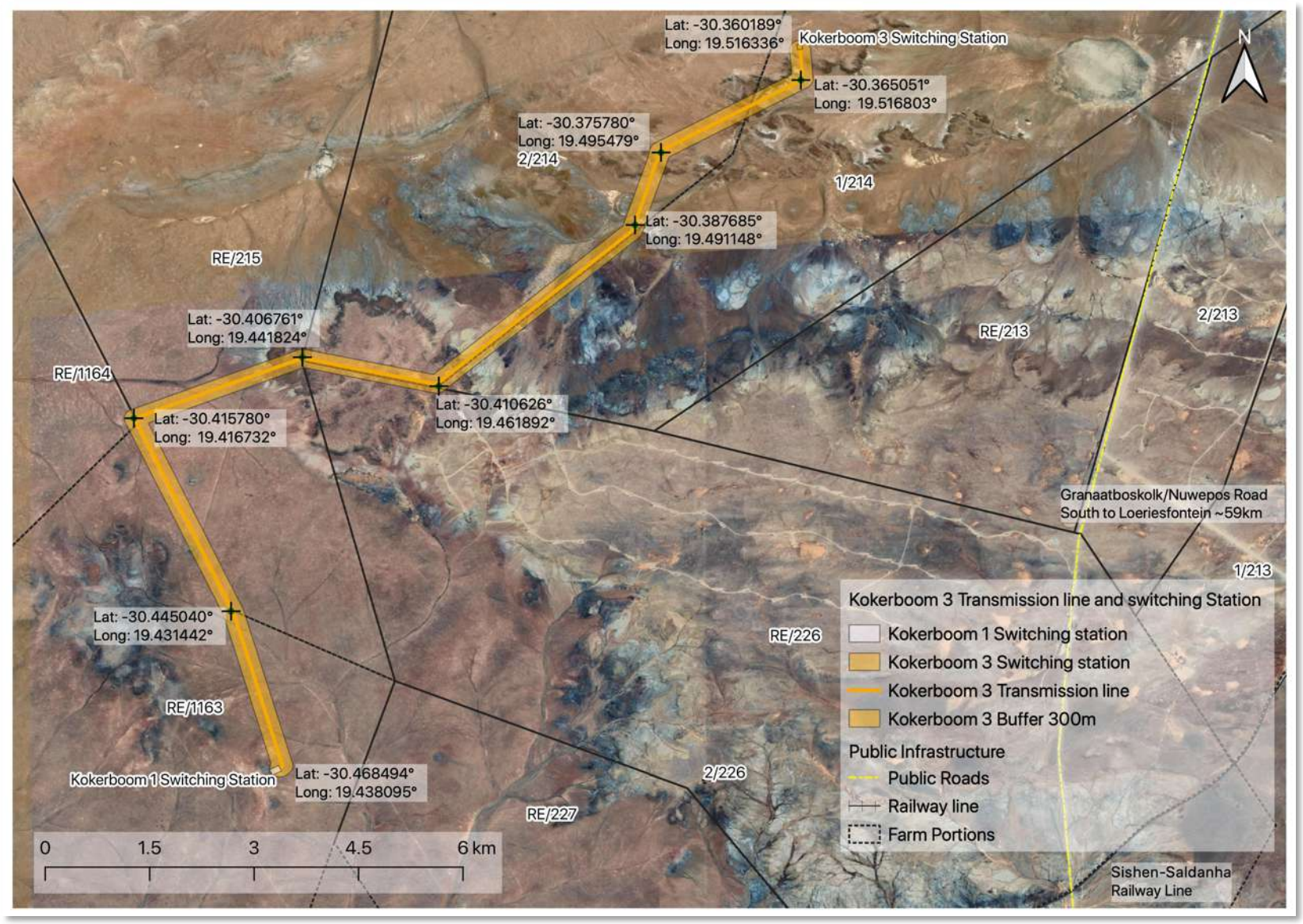


Figure 4-3: Location of Kokerboom 3 Transmission line and switching station, near Loeriesfontein in the Northern Cape

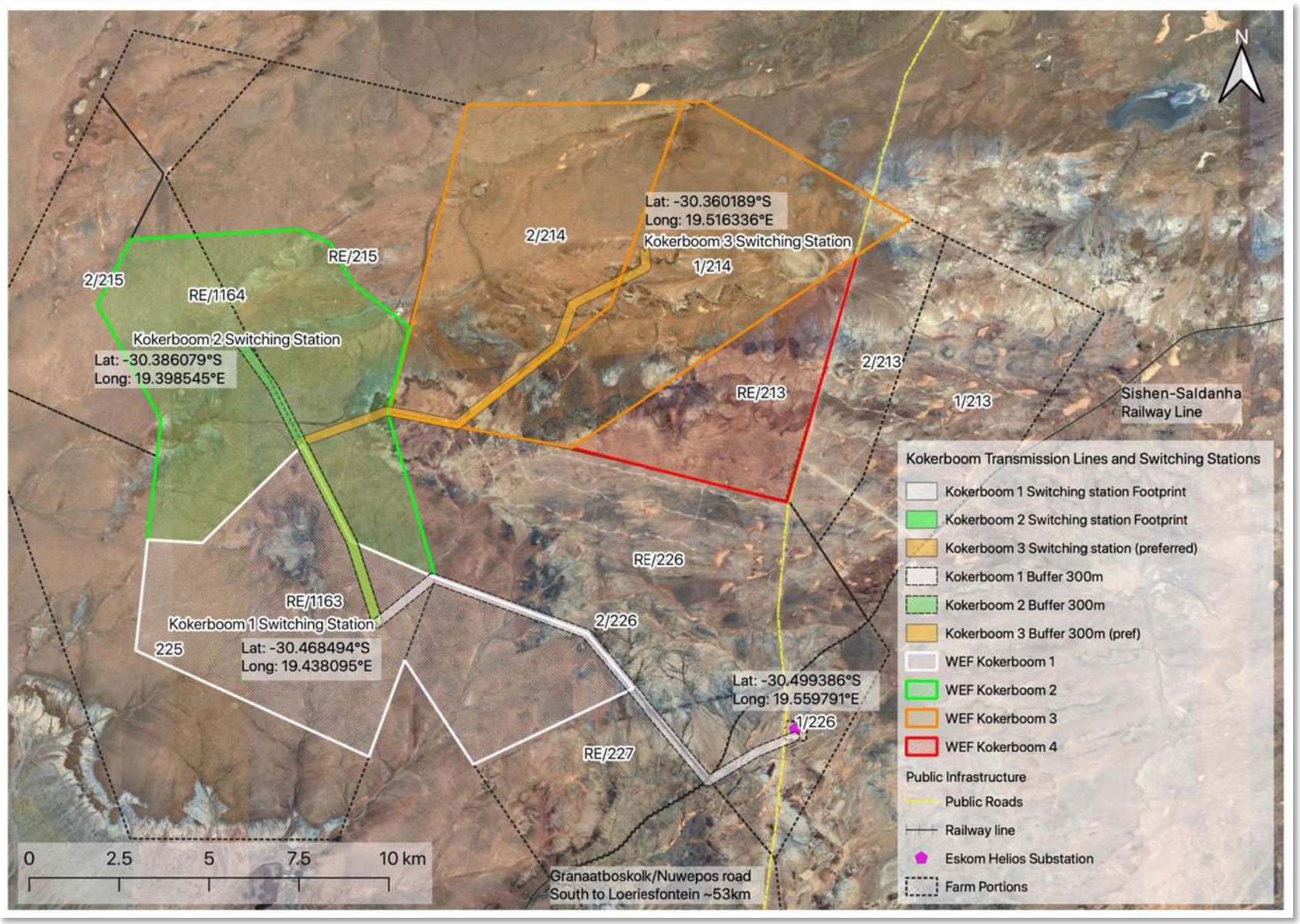


Figure 4-4: Kokerboom 1, 2 and 3 WEFs (the Kokerboom 4 WEF and associated infrastructure is dealt with under a separate application).

4.2.4 Components and Activities

4.2.4.1 Switching Stations

Three switching stations are proposed each adjacent the respective Kokerboom 1, 2 and 3 WEF substations. The Kokerboom 1 switching station will serve as a collector station for Kokerboom 1, 2 and 3 WEFs. The three switching stations will be connected to each other and the Helios MTS by the proposed 132kV overhead lines. The purpose of the switching station is for Eskom to collect power generated from various independent power producers (IPPs) at high voltage (132kV) for distribution into Eskom's Helios MTS (Figure 4-5) which is located east of the Kokerboom WEFs and has been identified as suitable to connect the facility to the national grid. Note that should one or more of the Kokerboom WEFs not be developed for any reason, then the switching station associated with that WEF may also not be developed. Only the grid connection infrastructure required to connect the developed WEFs to the national grid will be developed. For this assessment, it is assumed that all three Kokerboom WEFs will be developed, and therefore all three-transmission line and switching stations will be developed. According to the Eskom policies and other regulatory requirements regarding the transmission and distribution of electricity by IPPs, a switching station must be located on the same property where the electricity is generated[8] as is the case with the proposed Kokerboom 1, 2 and 3 WEFs and their associated switching stations.

The switching station comprises partly of a control room, containing instruments and equipment to protect and control the 132kV electrical circuits, measure voltage and current of power generated or consumed, power fluctuations and other performance information. The remainder of the switching station comprises a high voltage switchyard containing a number of concrete plinths onto which switchgear, instrument transformers and protection equipment are mounted. A subterranean earthing mat, together with a number of earthing rods and conductors, will provide an earth path for lighting and possible earth fault currents. The control room will be fitted with a remote monitoring system to monitor technical aspects associated with the operation of the switching station. The typical layout of the infrastructure is illustrated below in Figure 4-6. The Kokerboom 2 and 3 switching stations will require a footprint of approximately 10,000m^2 (approximately 100 x 100m) and the Kokerboom 1 switching station will require a footprint of approximately 15,000m^2 (approximately 100 x 150m). The area will be levelled and compacted, with a fencing erected around its perimeter. If required, imported material will be sourced or excess material from the Kokerboom turbine foundations will be used as fill. The area may be covered with a permeable geotextile and surfaced with approximately 50mm of crushed stone. This may serve as a fire protection measure and prevent erosion and dust production.

Figure 4-5: The Helios MTS east of the proposed Kokerboom WEF developments

[8] If the switching station is not located on the same property as the wind energy facility substation, then a Distribution License is required from NERSA

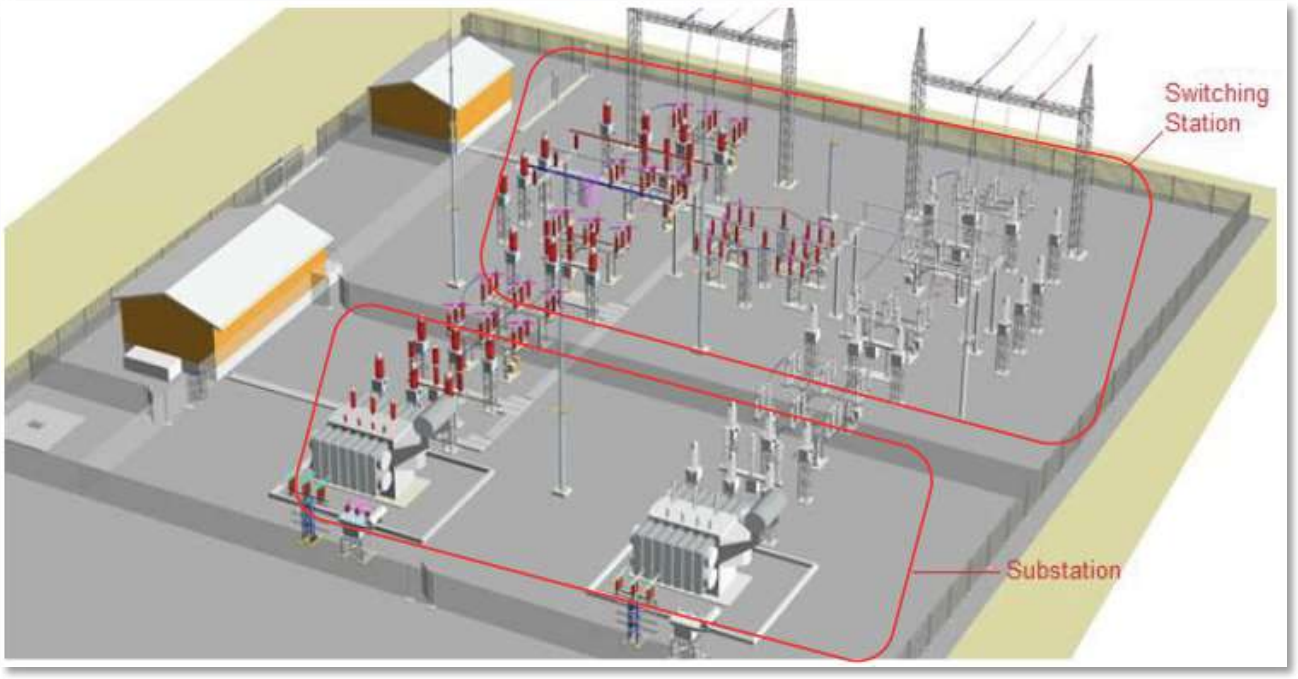


Figure 4-6: A modelled image of a typical facility (substation and switching station) designed by Zutari, for illustrative purposes

4.2.5 Transmission line infrastructure

The infrastructure considered for the 132 kV transmission line includes the structure (pylon) that will hold up the transmission lines, the foundations required for the pylons and the access roads and servitude areas. In addition, to reduce the potential negative impacts on avifauna in the area, Bird Flight Diverters will be required to be installed on the power line, as recommended by the avifauna specialist (refer to Annexure D for avifauna report).

4.2.5.1 132kV Pylon structures

A single- or double-circuit 132kV overhead transmission line will be used for the proposed Kokerboom 1, 2 and 3 transmission lines, in consultation with Eskom Standards[9]. Self-supporting monopole structures and/or stayed/ suspension monopoles (see Figure 4-7) are proposed along the straight sections of the transmission line, while guyed intermediate structures or guyed suspension structures, angle strain structures (see Figure 4-8) or lattice structures may be used at bend or strain points in the transmission line alignment. These monopoles may be constructed of wood, steel or concrete and vary in height, but may be up to 45 m tall. The size of the footprint depends on the type of structure, i.e. whether it is a self-supporting, guyed suspension or an angle strain pole structure. A typical monopole footprint ranges from approximately 0.6 x 0.6m (self-supporting monopole) to approximately 1.5 x 1.5m, with the larger footprint associated with the guyed suspension and angle strain pole used as bend/strain structures. Lattice structures (if required) may have a footprint of up to 6 x 6m. During construction, the disturbance footprint may be up to 10 x 10m, but this would be rehabilitated down to the minimum footprint of the actual pylon structure after construction. The average span between two pylons is 150m, but can vary between 150m and 375m depending on the ground profile (topography) and the terrain to be spanned. The final tower sizes and positions will only be determined once the project has received Environmental Authorisation, and detailed geotechnical assessments and site walk-throughs completed. Pylon structures will be selected and installed in accordance with the latest industry standards and Eskom's technical requirements at the time of construction, and within the parameters of this assessment.

[9] The final choice of a single or double circuit line will be determined by Eskom's requirements, and whether one, all three of the Kokerboom WEFs are ultimately developed. This Basic Assessment has considered both single and double circuit, with the impact assessment based on the worst case scenario of a double circuit.

Figure 4-7: Example of a Self-supporting Monopole (foreground) and Lattice Structure (background)

Figure 4-8: Example of a Guyed-suspension

The transmission line may be installed as either a single or double circuit on a single set of pylons. This BAR is based on the assumption that the worst-case scenario (being a double circuit configuration) would be utilised. It is important for these lines, regardless of the technology chosen, to adhere to the Occupational Health and Safety Act No. 85 of 1993 which provides statutory clearances to ensure minimum safety standards. These standards include input from various organisations and institutions such as Eskom, the Roads Department, Transnet and Telkom, etc.

4.2.5.2 Pylon foundations

The monopoles are anchored to the soil through a suitable foundation system. A soil investigation through a geo-technical assessment must be performed prior to construction, at which point the prevailing soil or rock type classification is confirmed, and a suitable foundation system is designed for the various types of structure.

Foundations are designed according to the following geotechnical classification:

- Type 1 – Hard engineering strong granular soil;
- Type 2 – Less competent soil, stiff clay or dense sand;
- Type 3 – Very incompetent soil i.e. loose sand or soft clay;
- Type 4 – Saturated or submerged soft ground below the seasonal water table;
- Hard rock – Solid continuous moderately fractured; and
- Soft rock – Very fractured, weathered or decomposed rock.

Load safety factors are incorporated into the foundation designs allowing for variations in geotechnical conditions, construction inconsistencies and long-term performance. The soil type nomination to be done by the construction contractor will form the base for subsequent foundation selection, to be finalised on site during construction. Once the soil type nomination has been conducted, suitable foundations will be designed.

Foundations can either be planted foundations, pad and plinth, or pile type foundations.

4.2.5.3 Pylon placement and servitudes

The pylons will be placed during a pre-construction walk through that will determine the micro-sited location. All pylons will be placed within the 300m wide assessed corridor.

Beyond the footprint of each pylon, a linear servitude would be required for the overhead line. This would need to remain for the lifespan of the transmission line. The standard servitude width as specified by Eskom for a 132kV transmission line is 32m, with a distance of 16m on either side of the centre line of the transmission line. It is proposed to position the majority of the transmission line as close to the cadastral boundary as possible (with servitude falling wholly within the subject properties) so as to minimise encroachment on the properties concerned. The transmission line will however need to deviate from the cadastral boundary as the transmission line approaches Helios MTS, and to avoid environmental sensitivities.

For this reason, a transmission line corridor of 300m wide has been assessed by the specialists and considered in this BAR. The assessment of a servitude within an assessment corridor will allow for minor servitude alignment deviations within the corridor should sensitive features be identified, or unsuitable founding conditions be discovered during the detailed design phase. The final pylon positions will therefore take into consideration the sensitive areas and/or no-go areas.

4.2.5.4 Access and service roads

Access roads would run the length of the proposed servitudes and would be directly below the transmission line. Therefore, the access roads are not displayed on the maps. The roads/ tracks will be required for construction purposes, and would remain in place for the operational lifespan of the infrastructure. Existing roads would be used as far as possible and upgraded if necessary. New access tracks (unsurfaced “jeep tracks” approximately 4m wide) will only be developed where no access road/track currently exists. A substantial portion of the proposed transmission line will run alongside existing farm tracks and the proposed access roads for the Kokerboom WEFs and these access roads can be utilised to access and service the proposed transmission line and switching stations.

The access network would be negotiated with all respective landowners to ensure that servitude agreements are in place, and security measures (such as access gates) are agreed upon.

4.2.5.5 Temporary laydown areas and site camps

During construction, temporary laydown and site camp areas will be required. These areas will be utilised for the temporary storage of materials, equipment and waste and will also serve as a logistical centre for construction activities. Eating and ablution areas may be provided for labourers. These temporary construction areas will be restricted to the minimum size practically required to facilitate construction and will be located in the most disturbed locations possible. Selection of the laydown areas will be done in consultation with the Environmental Control Officer (ECO), as per the requirements of the Environmental Management Programme (EMPr). The temporary construction camp and lay down areas will be rehabilitated once construction is complete.

Figure 4-9: An area heavy impacted by overgrazing near a water source which may be suitable as laydown and site camp adjacent the proposed Kokerboom 1 switching station (Khobab WEF in the background)

4.2.5.6 Specifications for Bird Flight Diverters installation on a power line

The avifaunal specialist identified that there is potential for the large priority species Ludwig's Bustard (*Neotis ludwigii*), Karoo Korhaan (*Eupodotis vigorsii*), Northern Black Korhaan (*Afrotis afraoides*) and Secretarybird (*Sagittarius serpentarius*) to be impacted by collisions with the proposed 132kV line (regardless of any alternatives). It has therefore been recommended that bird flight diverters (BFDs) be installed on sections of the overhead transmission lines, as determined by an avifaunal specialist during the pre-construction walkthrough and micro-siting process. Further information on the efficacy of BFDs is detailed in the avifaunal specialist report in Annexure D.

It has been found in South Africa and internationally that most collisions happen with the transmission line itself along the inter-pylon spans. It is likely that this is because the transmission lines are thin and less visible than the conductors. Typically, birds with large wingspans have less manoeuvrability and therefore have limited time to react to the approaching line. BFDs are therefore installed to make the transmission line more visible, allowing birds to take evasive action earlier and thereby reducing the risk of collision.

Specifications: The avifaunal specialist has recommended that specific sections of the transmission lines should be marked with BFDs on the earth wire of the line, at five metre intervals, alternating between black and white. Appendix D of the avifaunal report (Annexure D of the BAR) and the EMPr provide detail on the preferred BFDs that have been approved by Eskom: Distribution in April 2009.

4.2.6 Provision of services required during construction

4.2.6.1 Labour required

The construction phase would be approximately six months, however this would vary depending on the seasonal and environmental conditions at the time of construction. Up to 75 temporary employees will be required, with 25 of the employment opportunities being unskilled, 40 semi-skilled and 10 highly-skilled. The unskilled labourers are generally trained by the contractors and sourced from local communities. The transmission line should not be viewed in isolation as it creates the connection of the proposed Kokerboom WEFs and provides the combined benefits to the local communities.

4.2.6.2 Water supply

Water within the Local Hantam Municipality is principally sourced from boreholes (36%) and dams (60%). Loeriesfontein (the entire Greater Karoo) has been experiencing an extreme water crisis with many boreholes running dry. However, within Hantam Municipality's IDP the identification of new water sources in Loeriesfontein has been identified as a key project, and the Municipality is in the process of developing a water augmentation scheme to supply additional water to Loeriesfontein from additional boreholes on surrounding farms.

Water will be required during the construction phase for concrete mixing for the switching station and pylon foundations, sundry construction purposes, and drinking water for the construction workers. Approximately 950m^3 concrete would be required to construct the three switching stations which would require approximately 120kℓ of water. Water will be trucked to site for this purpose, or alternately the construction contractor may obtain water from the site (ground water abstractions), subject to the necessary agreements with the landowners concerned, water quality assessments and receipt of the necessary authorisation from the Department of Water and Sanitation (DWS). The re-use and recycling of water is unlikely to be financially viable based on the small quantity of water required.

4.2.6.3 Waste

The Hantam Municipality currently has four active general waste landfill sites, located at Calvinia, Brandvlei, Nieuwoudtville and Loeriesfontein. The Calvinia landfill site is located next to the town's sewage works approximately 3km from the town centre. In 20110, it was estimated that the remaining life[11] of the site was approximately 13 years.

Loeriesfontein landfill site is located approximately 1km from Loeriesfontein next to the sewage works, the remaining life of the site in 2012 was estimated to be approximately 22 years. The Nieuwoudtville landfill is located approximately 1km from the town and has a remaining life of approximately 14 years (2012 estimation).

The municipality also has five sewage treatment plants which are in the process of being licensed. Portable toilets will be used across the site and waste will be collected at regular intervals and transported to an equipped disposal facility. Solid waste and effluent associated with the construction phase is anticipated to be of minimal volume and would be disposed of via the municipal waste streams. Please note however that the Proponent cannot commit to a specific waste disposal or treatment facility at this stage for solid waste or wastewater. This can only be confirmed closer to the time of construction, and once the Contractor has been appointed.

During the construction phase, the construction contractor will be responsible for collecting and disposing of waste at an appropriate disposal site. Where possible, waste will be diverted for recycling or reuse rather than disposal. During the operational phase, Eskom will take ownership of the grid connection infrastructure and will be responsible for disposing of the minimal amounts of waste generated during servicing/ maintenance operations.

4.2.7 Maintenance during the operational phase

The estimated lifecycle of the transmission lines and switching stations is a minimum of 20 years and will require intermittent maintenance and repair work. It is expected that Eskom staff and contractors will undertake all maintenance and repair work.

4.3 Project Phases

A summary of activities associated with project phases are provided in Figure 4-10.

[10] Aurecon. 2012. Cost Estimate for Solid Waste Management for Hantam Municipality. Report No. 6421.

[11] Landfill estimates are made on average waste disposed per annum. Considering the amount of waste generated by large scale projects developers need to consider strong mitigation measures in terms of reduce, reuse and recycling of waste and as last resort disposal to landfill.

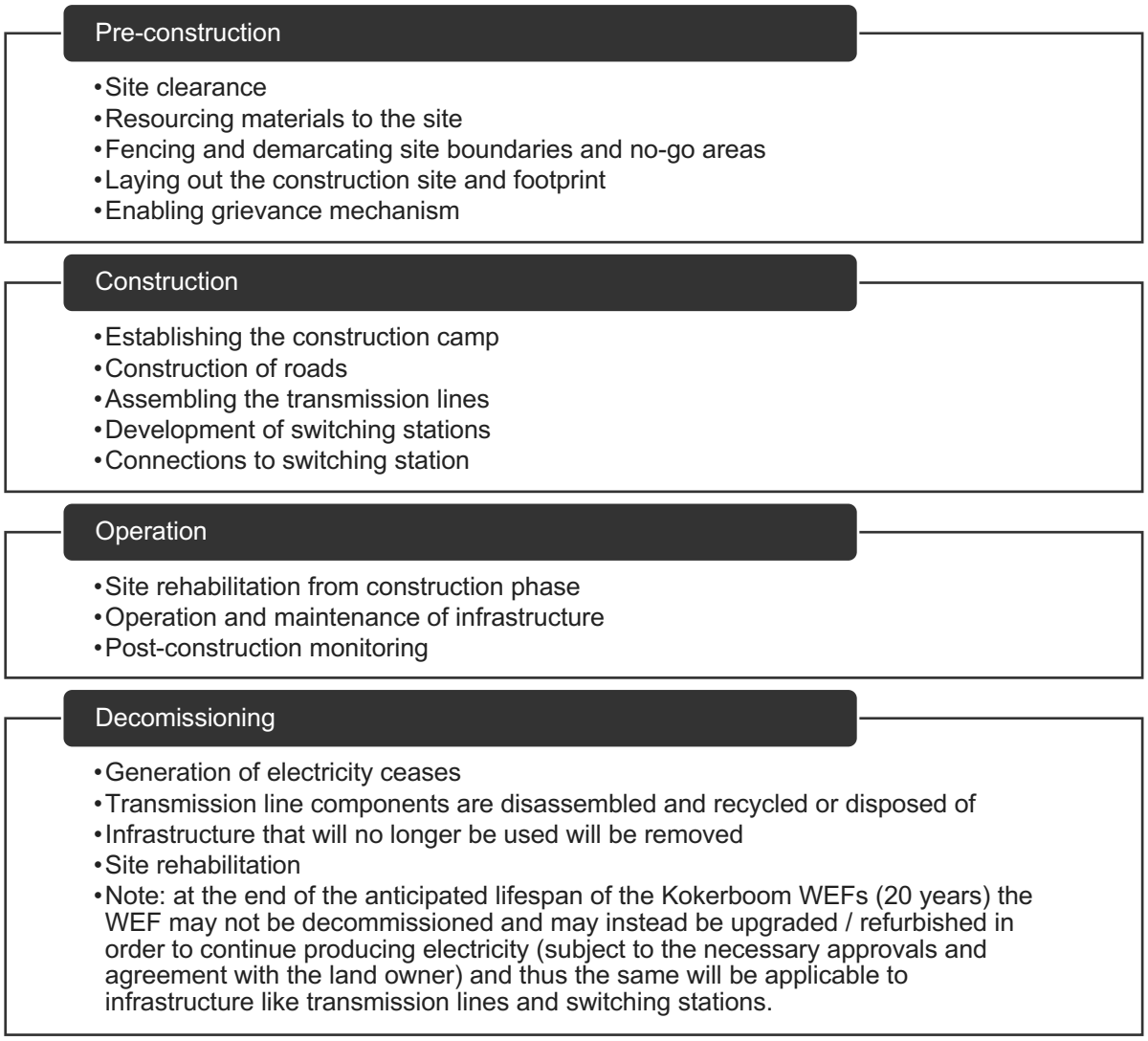


Figure 4-10: Summary of activities associated with project phases

4.3.1 Pre-Construction

Pre-construction activities involve tasks that establish the site, both in terms of the construction activities, as well as the social and environmental management systems. During this time, all effort should be made to ensure that the planning of the project is completed effectively to ensure that there are no delays to the project and that no unnecessary environmental degradation occurs.

During this period, the site layout will be confirmed on site through a micro-siting process. The footprint boundaries will be demarcated, and no-go areas will be identified. Site clearance will occur for the formal laydown areas, pylon footprints, access routes, construction camps and switching station. Storage areas for materials and spoil and topsoil piles should be identified.

Within the formal laydown area/s, a maintenance and storage building along with a guard cabin will be established for the duration of the construction period. The components of the pylons will be placed on the laydown area.

It is also important to ensure that social risk is addressed during the construction period by ensuring that an appropriate grievance mechanism is put in place. Furthermore, all the Contractors' staff must undergo training to ensure they understand the environmental sensitivities of the site.

The proponent intends to apply for an Independent Power Producer (IPP) contract in an upcoming bid round of the Department of Energy's (DoE) *Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)*.

4.3.2 Construction Phase Activities

The construction period for the Kokerboom 1, 2 and 3 Transmission line and switching station is anticipated to last approximately 6-12 months. During this phase, environmental degradation will be limited to the certain necessary areas. A construction camp will be fenced off and will include a site office, storage areas as well as areas for the management of dangerous and hazardous substances such as fuel.

At the start of the construction period, access roads to the site and between the pylons will need to be established. Where possible, existing farm roads will be used and upgraded. The roads will be up to 4 m wide and largely unimproved jeep tracks unless specific sections require minor cut or fill improvements. At each pylon site, an approximate area of ≈10m X 10m will need to be cleared (brush cut) to allow for the pylon foundations to be cast.

Potential waste streams during construction will include general site waste and spoil (some of which can be reused). Bins will be placed at suitable locations within the construction camp and a waste management hierarchy (reduce, reuse, recycle) will be required as a condition of the EMPr. Waste mitigation measures are detailed in the EMPr.

Rehabilitation during the construction phase will be undertaken in a phased approach and will continue into the operational phase. The construction phase period will provide employment opportunities to the local community, mostly in the low and semi-skilled level. Most of these employment opportunities are likely to be accrued by the historically disadvantaged.

Most of the low and semi-skilled employment opportunities will be available to residents in the area, specifically residents from Loeriesfontein and potentially Niewoudtville, Calvinia and other nearby settlements. Most of the beneficiaries are likely to be historically disadvantaged (HD) members of the community. This would represent a significant positive social benefit in an area with limited employment opportunities. To maximise the potential benefits, the developer should commit to employing local community members to fill the low and medium skilled jobs, as far as possible.

4.3.3 Operational Phase Activities

Transmission lines and switching stations are designed to run on low maintenance requirements as such few job opportunities will be available and limited to Eskom staff which will undertake the maintenance of the infrastructure. There would be basic operation and maintenance buildings, including a storage facility, site office and workshop area associated with the Kokerboom WEFs which will suffice for any requirements for the proposed transmission lines and switching stations. The laydown area/s and construction site camp will be decommissioned and form part of the rehabilitation of the area.

During the operational phase, the site will remain available to the farmers as rangeland or retained as wilderness area. The areas disturbed during the construction phase will be rehabilitated in a phased approach during this operational phase.

A post construction monitoring programme for birds and bats will also continue into the operational phase, in accordance with the best-practise applicable at the time.

Approximately 25% of the operational employment opportunities would be for low- or semi-skilled people. The remainder of the positions are likely to be highly skilled, and it's unlikely that these skills will be available in the local community (i.e. only a portion (up to 25%) of all positions will be available for local HDIs

4.3.4 Decommissioning Phase Activities

The proposed Kokerboom WEFs have an intended project lifespan of at least 20 years, based on the mechanical characteristics of the turbines, and the fact that a maximum of a 20-year power purchase agreement can be signed with Eskom under the REIPPPP programme. At the end of the 20-year operational phase, the lifespan of the Kokerboom WEF may be extended (subject to the necessary authorisations and agreements with the landowners, Eskom and the DoE), in which case the transmission lines and switching stations will remain operational and/or upgraded and/or refurbished. Alternatively, should the lifespan of the Kokerboom WEFs not be extended beyond the 20-year operational phase, the facility will be decommissioned and therefore also the associated grid infrastructure.

The decommissioning of the grid infrastructure is expected to take between 3-6 months. After disconnecting the infrastructure from the electricity network, the components of the facility would be disassembled, removed and reused or recycled as far as possible. The rehabilitation of the disturbed areas would form part of the decommissioning phase. The aim would be to restore the land to its original substratum characteristics (or as near as possible). The decommissioning phase will comply with the applicable legislation in effect at the time.

4.4 Project Need and Desirability

As introduced in Section 1.6 and supported by the numerous policies and legislation described in Chapter 2, the need for renewable energy is well documented. In order to evacuate energy from generation plants reliable and efficient grid infrastructure is required. Wind energy is desirable as it:

- Creates a more sustainable economy by promoting South Africa's energy policy towards energy diversification;
- Reduces the demand on scarce resources such as water by promoting energy generating facilities which are less resource intensive;
- Assists in meeting nationally appropriate carbon emission targets in line with global climate change commitments by reducing reliance on coal as an energy source;
- Reduces and, where possible, eliminates pollution by using cleaner energy generating mechanisms and reducing the demand on carbon-based fuels;
- Promotes local economic development by creating jobs and promoting skills development; and
- Enhances energy security by diversifying generation to reduce reliance on coal, which is non-renewable, as a primary energy source and promoting renewable energy generation.

Therefore, the proposed transmission lines and switching stations must be seen in context of the already authorised Kokerboom 1, 2 and 3 WEFs. In addition, transmission lines to services these WEFs have already been authorised which substantiates the need and desirability of these infrastructure components. However, the routing of the lines have to be amended to accommodate changes in the WEF layouts and therefore the need and desirability in the current context needs to be established. Table 4-7 below provides project specific answers to questions included in the Needs and Desirability Guideline[12].

Table 4-7: The need and desirability of the proposed grid connection infrastructure is motivated in the following table.

Need and Desirability	
Need (Timing)	
Question	Response
1. Is the activity permitted in terms of the property's existing land use	Yes. The Kokerboom WEF properties are zoned for Agricultural Use with a special use for renewable energy and associated infrastructure. A

[12] DEA&DP. 2011. Needs and Desirability Guideline.

rights?	servitude may need to be registered across each of the affected properties, in terms of the applicable legislation. The proponent is in the process of concluding agreements with all affected land owners for the necessary servitude. The proposed switching stations are located within the footprint of the Kokerboom WEFs, which have been rezoned as described above. The landowners involved with the Kokerboom WEFs have signed long term lease agreement with the proponent for the development of the Kokerboom WEFs and associated infrastructure. The current agricultural practices will continue once the transmission lines have been constructed.
2. Will the activity be in line with the following? (a) Provincial Spatial Development Framework (PSDF)	The Provincial Spatial Development Framework (PSDF) promotes the provision of electricity to all and supports economic development through sustainable green initiatives on a national scale. The PSDF also identifies the need to promote renewable energy, awareness on biodiversity and improvement through Public Participation. This is to be realised through a diverse range of clean energy options and to accelerate the construction of new electricity generation capacity, in accordance with the IRP2019, to meet the needs of the economy and address historical imbalances. The proposed construction of the 132 kV transmission lines and associated infrastructure will allow electricity, generated through renewable technology, to be evacuated from the Kokerboom WEFs to the national grid.
(b) Urban edge / Edge of Built environment for the area	N/A - The proposed grid connection infrastructure fall outside of the urban edge.
(c) Integrated Development Plan (IDP) and Spatial Development Framework (SDF) of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	Yes. The Hantam Local Municipality IDP specifically includes the importance of renewable energy in the 2020/2021 development plan. The proposed project comprises the provision of infrastructure for the transmission of electricity (from a renewable source i.e. wind) into the national grid, which is compatible with the IDP and SDF of the Hantam Local Municipality. The transmission line will complement the current land use as the current low-intensity agricultural practices will be able to continue once the transmission line is operational. Furthermore, the construction of the transmission line will also result in both direct and indirect employment opportunities for members of the local community. Apart from providing the business plans for attracting renewable energy projects to the area, the IDP also includes strategies relating to PPP and raising public awareness on green energy and energy saving, as well as climate change awareness programmes. The Hantam LM IDP (specifically ward 5 (Loeriesfontein)) identifies the need for the paving of roads, identification of new water sources, promotion of renewable energy, awareness on biodiversity and improved engagement through PPP. The proposed project can assist with the above mentioned through an increase of scientific assessment in the area.
(d) Approved Structure Plan of the Municipality	The proposed project entails transmission line infrastructure, which is compatible with the Local Economic Development (LED) which promotes job creation, skills development, green energy and enhancing the energy security by diversifying energy generation.
(e) An Environmental Management Framework (EMF) adopted by the Department (e.g. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability	No, the approval of this application will not compromise the integrity of the existing environmental management priorities for the area as provided in the Namakwa District Municipality Environmental Management Framework and Strategic Environmental Management Plan (2011, not adopted by Department). The proposed grid infrastructure can therefore be justified in terms of sustainability considerations, i.e. the generation of renewable energy which in context

considerations?)	of the proposed Kokerboom WEFs and associated infrastructure can be viewed as sustainable over a 20 year period.
(f) Any other Plans (e.g. Guide Plan)	N/A - No other plans are applicable to this application.
3. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?	The SDF does not provide a timeframe associated with the activity being applied for, but the local 2020/2021 IDP does identify the promotion of renewable energy as a priority for the period. Renewable Energy projects have been prioritised in strategies at various municipal scales in the area. The Northern Cape Province aims to provide a "home" for Renewable Energy[13]. The Namakwa District Municipality (DM) aims to "enable development around the construction of the 100 MW WEF[14]". This would suggest that the site for Kokerboom WEFs would be supported by the DM. The Hantam Local Municipality (LM) specifically includes the importance of renewable energy in the 2015 to 2020 development plan indicated in the 2020/2021 IDP. Apart from providing the business plans for attracting renewable energy projects to the area, the IDP also includes strategies relating to PPP and raising public awareness on green energy and energy saving, as well as climate change awareness programmes. The LM's support for the Kokerboom WEF projects is evidenced by the rezoning approval granted for the Kokerboom WEF properties (rezoned to Agriculture with special use for renewable energy). The leased land has very low agricultural potential and grazing could continue below the turbines and as such it would not negatively affect the economic viability of the farm. The additional income would safeguard the economic sustainability of the farms.
4. Does the community/area need the activity and the associated land use concerned (is it a societal priority)? (This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate.)	Yes. The construction of the transmission line would facilitate the connection of the proposed Kokerboom WEFs to the national grid. Without the proposed grid connection infrastructure, energy could not be evacuated from the WEFs and the development of the WEFs would not be able to proceed. The need for renewable energy in South Africa is well documented and reasons for the desirability of wind energy include (but are not limited to), the following: • utilisation of resources available to South Africa, • meeting nationally and appropriate emission targets in line with global climate change commitments; • enhancing energy security by diversifying generation; and • using renewable energy as a driver for local economic growth. However, not only is the use of renewable energy suitable for South Africa at a strategic level. The local area in which the proposed Kokerboom WEFs (and transmission line) are proposed will benefit the local community as well, through the creation of local employment and investment in local socio-economic development and enterprise development initiatives. The Loeriesfontein ward region is a very arid region of the Northern Cape where agricultural potential is very low. Sheep farming forms the predominant land use and large expanses of land are required for grazing. Large farms (exemplified by those on which this project is proposed) hold limited economic opportunity for the farmers with little access to water.

[13] Northern Cape Department of Economic Development and Tourism. 2012. Northern Cape Province Economic Potential and Investment Profile.

[14] It is assumed that this refers to the 140 MW Loeriesfontein WEF and/or the 140MW Khobab WEF, as these projects were awarded preferred bidder status in bidding window three of the REIPPPP. Construction of Loeriesfontein WEF began in May 2015, as did the construction of Khobab WEF.

	During an interview with one of the affected landowners of the Kokerboom WEFs, the socio-economic specialist identified that many of the farmers are unable to employ farm workers permanently, and generally only employ seasonal workers for sheep shearing. The biophysical environment is typical of the arid environment that stretches across the Northern Cape. Through the many specialist assessments (Annexure D) very few environmental aspects were deemed to be considered sensitive. Furthermore, these sensitive areas were avoided (as far as possible) during the detailed layout undertaken by the design engineers.
5. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	Yes. No municipal services (water, sewerage, electricity) will be required at the site, as the project contractor or appointed sub-contractor/s will be responsible for providing the necessary services to the site during the construction and decommissioning phases. The eventual owner of the infrastructure (Eskom) will be responsible for supplying the necessary services during the operational/maintenance period, and may sub-contract these services to appropriate private service providers as needed. Electricity will be supplied to the site via generators and/or on-site renewable energy installations (e.g. solar panels), and/or direct from the Helios MTS (under agreement with Eskom) or from the Kokerboom WEFs themselves during the operational phase. Waste produced at the site will be collected and taken to an appropriate facility with sufficient capacity to accept the waste, for recycling, re-use, treatment or disposal (as appropriate). No municipal waste collection will be required at the site. Approximately 50m^3 of waste will be produced per month during the construction phase. Negligible volumes of waste are expected during the operational phase. Should any need for other services arise the relevant authority will be communicated with, and the necessary approvals/ agreements obtained before proceeding. Furthermore, construction is complete on the Loeriesfontein and Khobab WEFs and therefore infrastructure in the area (such as roads) has already been improved.
6. Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)?	No additional services are required once the transmission line is operational – there will thus be no impact on infrastructure planning. Water, sanitation and electrical services required for the construction of the proposed grid connection infrastructure will be provided by the appointed contractor, and additional municipal services are not expected to be required for the proposed development (e.g. potable water will be trucked to site, waste water will be collected in conservancy tanks and transported to an appropriate wastewater treatment site, on-site generators will be utilised etc.).
7. Is this project part of a national programme to address an issue of national concern or importance?	Yes. The establishment of the proposed transmission line would strengthen the existing electricity grid for the area. Moreover, given that the development is an essential component of the three proposed Kokerboom WEFs, the project would contribute towards meeting the national energy targets as set by the DoE in the 2019 IRP, of a share of all new power generation being derived from IPPs. The Industrial Policy Action Plan (IPAP, 2018/19 – 2020/21) recommends a sector focussed approach identifying key sectors with potential to be developed. The sectors identified in the IPAP document include green energy saving industries especially renewables. The

	proposed transmission line thus further facilitates the realisation of this development objective. The 2019 Integrated Resource Plan (IRP) developed by the DoE aims to achieve a balance between an affordable electricity price to support a globally competitive economy, a more sustainable and efficient economy, the creation of local jobs, the demand on scarce resources such as water and the need to meet nationally appropriate emission targets in line with global commitments". The final IRP (2019) provides for an additional 14 400MW wind energy in the electricity mix in South Africa by 2030. In addition, please refer to point 4 above.
8. Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)	Yes. The proposed grid connection infrastructure provides the critical link from the proposed Kokerboom WEFs to the national grid. Suitability of the site includes the wind resources; the accessibility of terrain from a construction and access perspective; the topographical features; the low agricultural potential on site; the support of the landowners concerned as well as various economic considerations which include the feasibility of the project in terms of technical and financial perspective. Furthermore, as described further in Section B, the environment affected by the proposed transmission line holds little environmental aspects that were considered sensitive, and in most cases these areas have been avoided by the layout. In addition, please refer to point 4 above.
9. Is the development the best practicable environmental option for this land/site?	Yes. The proposed transmission line transverses mostly farmland which is predominantly used for grazing. Once the transmission line is constructed, the land can be returned to grazing and due to the relatively small footprint of the pylons, the grazing capacity of the land will not be reduced significantly. The site has generally low environmental sensitivity, and is suitable for development. In addition, a number of existing transmission lines currently enter and exit the Helios MTS. Therefore, the current proposal would not be out of place in the existing landscape.
10. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	Yes. The negative impacts for the proposed development are of very low to medium magnitude, local extent and long term and very low to low (-) significance with mitigation. Therefore, the proposed developments impacts with mitigation measures are reduced and are considered to be acceptable. The proposed development would also enable positive impacts to be realised, largely through the support of the Kokerboom WEFs through job creation, clean energy production, and reduction in reliance on fossil fuels. These positive impacts would be of low-medium (+) significance, without mitigation measures and low-high (+) significance with mitigation measures.
11. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	Yes. The area surrounding Loeriesfontein within the Hantam LM has been targeted as an area for renewable energy developments, limited only by the connection capacity at the existing Eskom Helios MTS. The area is generally suitable for these projects as the environmental sensitivity of the area, as well as the existing socio-economic benefits are considered low. This therefore reduces the opportunity cost. The construction of Khobab and Loeriesfontein WEFs on the neighbouring properties, as well as the Helios MTS and numerous other powerlines in the vicinity have already set a precedent for this type of development in the area, among many others in the Northern Cape Province.

	It is also noted that the project itself is unlikely to attract future similar development to the area – rather it is the excellent solar and wind resources of the area that may attract further similar renewable energy developments.
12. Will any person's rights be negatively affected by the proposed activity/ies?	No. No juristic or person's right will be adversely affected as land use agreements have been negotiated with the relevant landowners.
13. Will the proposed activity/ies compromise the "urban edge" as defined by the local municipality?	No. The proposed development occurs outside the urban edge, therefore the urban edge will not be compromised.
14. Will the proposed activity/ies contribute to any of the 17 Strategic Integrated Projects (SIPS)?	Indirectly, as the grid connection infrastructure will support the realisation of the Kokerboom WEFs. The proposed projects will align with the following SIPS if one or more of the Kokerboom WEFs is selected as a preferred bidder in terms of the REIPPPP: SIP 8: Green Energy in support of the South African economy • The proposed WEFs are seen as a sustainable green energy initiative diversifying the range of clean energy options on a national scale. SIP 9: Electricity generation to support socio-economic development • The proposed WEFs are renewable energy projects designed to support socio-economic development through provision of job opportunities and skills development. • The proposed transmission line will extend the benefits felt by the proposed WEFs by distributing the power to the national grid. SIP 10: Electricity transmission and distribution for all • The proposed transmission line will contribute to expanding the transmission network.
15. What will the benefits be to society in general and to the local communities?	The Northern Cape is an arid area, the towns are generally small and many residents operate on a survival socio-economic level. Hantam LM has a high unemployment rate of 29.1% in the second half of 2019 (2020/2021 IDP). The need to improve the quality of life for all, and especially for the poor, is critical in these towns. It is expected that the proposed project together with the proposed Kokerboom WEFs will contribute directly to the upliftment of individuals through direct and indirect employment opportunities and the societies in which they live. The construction of the grid connection infrastructure will result in the creation of an estimated 75 temporary employment opportunities, with the majority of unskilled (≈25) and semi-skilled (≈40) opportunities being available to members from the local community. Of greater significance, the development of the proposed Kokerboom WEFs will be associated with significant socio-economic benefits including direct and indirect job opportunities, skills development and the creation of a community trust that will fund local socio-economic development projects. Each of the three Kokerboom WEFs would create approximately 350 temporary job opportunities during the construction phase (18-24 months) consisting of ~50 highly skilled, ~100 semi-skilled and ~200 unskilled people. An estimated 35 permanent job opportunities will be created per WEF for the duration of the operational phase (20 years or more). The WEFs and associated grid connection development will also create a demand for upstream and downstream goods and services (transport, worker accommodation, construction materials etc.) which will indirectly contribute to economic development. The proposed project would also be a source of income to the landowners, which would help to promote

	the economic viability of the properties. The proposed grid connection infrastructure is required to connect the three Kokerboom WEFs to the national electricity grid. Without the proposed grid connection, it would not be possible to export the electricity generated by the WEFs, and the WEF developments would not be able to proceed – resulting in the substantial socio-economic developments associated with the WEFs being foregone. The proposed development is an essential component of the Kokerboom WEFs, and is essential to ensure that all socio-economic benefits associated with the WEFs are realised (including direct and indirect job creation, skills development, local socio-economic development and the provision of renewable energy). In addition, the proposed development would bring benefits associated with providing technical advice on wind energy to local farmers and municipalities. As an essential component of the Kokerboom WEFs, the development would also facilitate the provision of affordable renewable energy, which is of benefit to society in general.
16. Any other need and desirability considerations related to the proposed activity?	It is important to highlight that there are few areas in South Africa that hold such low levels of both biophysical sensitivity and minimal sensitive human receptors. If the proposed Kokerboom WEF, and associated grid connection, is not constructed, the need for additional electricity supply will not decrease and a more sensitive part of the country's land and people could be negatively impacted.
17. How does the project fit into the National Development Plan for 2030?	The National Development Plan for 2030 aims to create jobs, develop and expand infrastructure, transition to a low carbon economy and unify South Africa. This project, along with the construction of the proposed Kokerboom WEFs, will fit into the National Development Plan as follows: <u>Create jobs:</u> • Both the proposed Kokerboom WEFs and proposed grid connection infrastructure will result in jobs for the construction phase and the operational phase. • Indirect opportunities for small businesses would be generated such as accommodation, food and service industries through the increased number of people travelling to the proposed area. • Many indirect jobs, such as the hospitality industry, transportation industry and manufacturing industry would also be created. <u>Infrastructure development and expansion:</u> • The proposed WEFs and grid connection infrastructure will assist in increasing the supply of electricity and thereby facilitate further expansion of the electrical network through additional capacity to help meet South • Africa's current and future electricity demands. <u>Transition to a low-carbon economy:</u> • This project, together with the proposed WEFs, is a renewable energy project and will result in the expansion of South Africa's renewable generation capacity. • The construction of the WEF together with the associated transmission line will assist in diversifying South Africa's energy portfolio. • Wind Power is a proven source of renewable energy and does not rely on carbon fuels. <u>Transformation and unity:</u>

	• Employment equity will be met through the Operation and Maintenance Project Company and the contractors responsible for the construction of the transmission lines, as set out in the requirements of the REIPPPP Tender Process. • Economic development is one of the most important requirements of the REIPPPP. The programme incorporates stringent requirements for investment in local economic development in various ways. Emphasising its importance, the economic development criteria is allocated a weighting of 30% in the bid evaluation scoring system, against 70% for the price. The seven criteria of the economic scorecard are job creation and local content, followed by local ownership and socio-economic development, management control and enterprise development.
18. Please describe how the general objectives of Integrated Environmental Management as set out in section 23 of NEMA have been taken into account.	The purpose of section 23 of NEMA is to promote the application of appropriate management tools in order to ensure the integrated environmental management of activities. Table 4-8 below lists the general objectives of integrated management and provides a motivation as to how the proposed development has taken the objectives into account.

Table 4-8: Consideration of NEMA objectives

Section 23(2) of NEMA: The general objective of integrated environmental management is to:	**Description as to how the proposed development has taken these general objectives into account.**
(a) promote the integration of the principles of environmental management set out in section 2 of NEMA into the making of all decisions which may have a significant effect on the environment;	The underlying principle of this Basic Assessment process is to ensure that the development is socially, environmentally, and economically sustainable. This has guided the assessment of impacts of the project by Specialists to ensure that the project will be undertaken in an environmentally responsible manner. In recognition that social responsibility is something which needs to be actively developed, a public participation process (PPP) will be undertaken. This process will be undertaken in such a manner to promote active participation and foster a clear understanding of the project and transparent sharing of information.
(b) identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management set out in section 2;	This BAR includes the list of potential impacts associated with this project. Each aspect was evaluated to determine the significance of the impact and mitigation measures have been proposed to reduce negative impacts and to enhance positive impacts. The generic Environmental Management Programme (EMPr) has been updated to include the recommendations from the respective specialists to guide the construction and operational phases in an environmentally and socially sound manner (Refer to Annexure G).
(c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them.	Specialist studies were commissioned to ensure that specific impacts are adequately assessed and appropriate mitigation measures are proposed.
(d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment.	The PPP that will be undertaken for the proposed grid infrastructure is described in detail in Section 4 The PPP will be done in accordance with Regulation 41 of the 2014 EIA Regulations (GN R982 as amended) and the applicable best practise guidelines.
(e) ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment.	The locations for the three switching stations and 132kV OHLs were proposed once the specialists had been to site and had analysed their findings. The areas of environmental sensitivity (illustrated in a map in Figure 1-2) have been avoided in the layout determination.
(f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.	Recommendations and mitigation/ enhancement measures for each of the impacts identified in Section 6 have been included in the Generic EMPr in Annexure G. The purpose of these recommendations is to minimise the disturbance to the environment, and enhance possible opportunities associated with locating the proposed development at this particular site. Where negative impacts are unavoidable, strict management and rehabilitation is recommended to minimise the potential negative impacts.

	Section 2 of NEMA lists a number of principles that underpin the role of Sustainable Development and the consideration of environmental impact within the Act. These principles are critical to achieve Sustainable Development as it is important to find the balance between the competing demands for resources from the Economic system, the Social system, and the Ecological system. These principles are applicable to the "actions of all organs of state that may significantly affect the environment" and it is therefore crucial to apply them to the proposed development, for decision-makers to be confident that their decision to allow a development, promotes Sustainable Development. The underlying principle of this BA process is to ensure that the development is socially, environmentally, and economically sustainable. This has guided the assessment of impacts of the project to ensure that the project will be undertaken in an environmentally responsible manner. Recognising that social responsibility is something that needs to be actively developed, PPP will be undertaken (as detailed above in Section 3.3). This process will be undertaken in such a manner to promote active participation and foster a clear understanding of the project and transparent sharing of information. A socio-economic specialist undertook site visits in June 2016 and January 2017 during which he interviewed landowners in the area to understand their thoughts and feelings towards the proposed Kokerboom WEFs, and associated grid connection infrastructure. Furthermore, knowledge from I&APs will be included in all forms, including traditional or ordinary knowledge. The PPP and consultation with the directly affected landowners will also aim to improve environmental awareness in the area (Section 2(4)(h) of NEMA).
19. Please describe how the principles of environmental management as set out in section 2 of NEMA have been taken into account.	Key organs of state that may have interest in the project have been proactively identified, and an effort has been made to promote intergovernmental coordination as far as possible to reduce the potential for conflicts of interest, caused by lack of information or inappropriate communication channels. Proof of this correspondence is detailed in Section 3.3 and Annexure C. Environmental management has been considered to place people and their needs at the forefront of its concern, aiming to serve their physical, psychological, developmental, cultural and social interests equitably (Section 2(2) of NEMA). However, it is crucial that ecological considerations are also considered through this process and avoidance, minimising or rehabilitating measures are detailed for the disturbance of ecosystems and loss of biodiversity, pollution and degradation of the environment, disturbance of landscapes, and sites that constitute the nation's cultural heritage, waste, and the use and exploration of non-renewable natural resources (Section 2(4)(a)(i-v) of NEMA). Where a negative impact is unavoidable, measures have been considered to remedy the disturbance and address the effects (Section 2(4)(p) of NEMA). However, fortunately, this proposed development, inclusive of the proposed Kokerboom WEFs, are located in an area that is not highly sensitive, vulnerable, highly dynamic, or overly stressed (Section 2(4)(r)). The nature of this BA process has been undertaken in a risk-averse and cautious approach, and where relevant the worst case scenario has been assessed. Each specialist has detailed their methodology as well as their assumptions and limitations about their assessments, and these reports have been included in full in Annexure D. The specialists undertook their site visits between October 2015 and January 2017 and again in June 2021 (to investigate additional routes and verify previous

	findings) the findings of their investigations have been considered in determining the proposed layout of the grid connection infrastructure for this application. The findings of these assessments have been amalgamated into this BAR which has not only assessed the impact of this proposed development, but also the cumulative impacts of the other similar developments authorised within a ≈30km radius (Section 2(4)(a)(vii & viii) and 2(4)(b)). Should this BAR be granted a positive environmental authorisation, approximately 6 months of construction will be required to build the proposed grid connection infrastructure. During this construction period (and also the rest of the lifecycle of this project), stringent environmental health and safety standards will be required. It will also acknowledge the right of workers to refuse work that is harmful to human health, or the environment, and be informed of any potential dangers (Section 2(4)(e & j). In addition, this process been undertaken in a manner that meets the principles and objectives of the South African legislation, and also meets global and international responsibilities relating to the environment by contributing to the renewable energy targets, and reducing the reliance on carbon heavy energy sources using fossil fuels (Section 2(4)(n)).

5 CONSIDERATION OF ALTERNATIVES

The NEMA requires that alternatives are considered during the BA process. An alternative can be defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004).

The DEA&DP Guideline on Alternatives (2013)[15] states that: "every EIA process must identify and investigate alternatives, with feasible and reasonable alternatives to be comparatively assessed. If, however, after having identified and investigated alternatives, no feasible and reasonable alternatives were found, no comparative assessment of alternatives, beyond the comparative assessment of the preferred alternative and the option of not proceeding, is required during the assessment phase. What would, however, have to be provided to the Department in this instance is proof that an investigation was undertaken and motivation indicating that no reasonable or feasible alternatives other than the preferred option and the no-go option exist."

The 2014 EIA Regulations (GN R982) (as amended) provide the following definition: "*Alternatives*", in relation to a proposed activity, means different ways of meeting the general purpose and requirements of the activity, which may include alternatives to the -

(a) property on which or location where the activity is proposed to be undertaken;
(b) type of activity to be undertaken;
(c) design or layout of the activity;
(d) technology to be used in the activity;
(e) operational aspects of the activity; and
(f) includes the option of not implementing the activity ("No-Go" alternative).

Three 132kV transmission line corridors and three switching stations related directly to these transmission lines from each of the Kokerboom WEFs are proposed. These routes have been assessed by the EAP and specialists within a 300m wide corridor for each alternative (i.e. 150m either side of the proposed centreline of the OHL). This allows for minor realignment adjustments to be made based on sensitive features and areas that were identified as no-go areas and based on underlying geo-technical considerations during the detail design (pre-construction) & micro-siting phase. The design of the route has been determined by considering the proposed transmission infrastructure and the sensitive areas (or features) as identified by specialists, as well as the location of existing transmission lines and other infrastructure.

Geotechnical considerations for pylon (tower) positions would require a final survey and profiling to be undertaken for the authorised routing during the detail design phase. As such, the final location of pylon positions would only be finalised during the detail design phase and would be dependent on approval as required by Eskom, but will be restricted to within the 300m assessment corridor. Within the route corridor, only one servitude (32m) per OHL would be required for the transmission line (single or double circuit).

The proposed infrastructure will be constructed in accordance with the relevant standards for such infrastructure, and in accordance with Eskom's technical requirements. Pylon structures (stayed and self-supporting monopoles, with possible lattice structures at bend/ strain points) will be selected and installed in accordance with the latest industry standards and Eskom's technical requirements at the time of construction, and within the parameters of this assessment. The final pylon structures to be utilised will also be informed by the local geotechnical and topographical conditions on site, which will be confirmed during the detailed design phase. Note that the transmission line may be constructed as a single or double circuit, but the worst-case scenario (being double circuit) has been assessed in this BAR.

[15] This guideline has been used as a best practice tool since it is the most recent guideline on alternatives.

The most appropriate technologies for the environmental conditions, based on technical and topographical factors and which incorporate Eskom's specifications and best international practice, have been presented in Section 4.2.4. The proposed pylons have also been selected to reduce potential visual, agricultural and avifauna impacts.

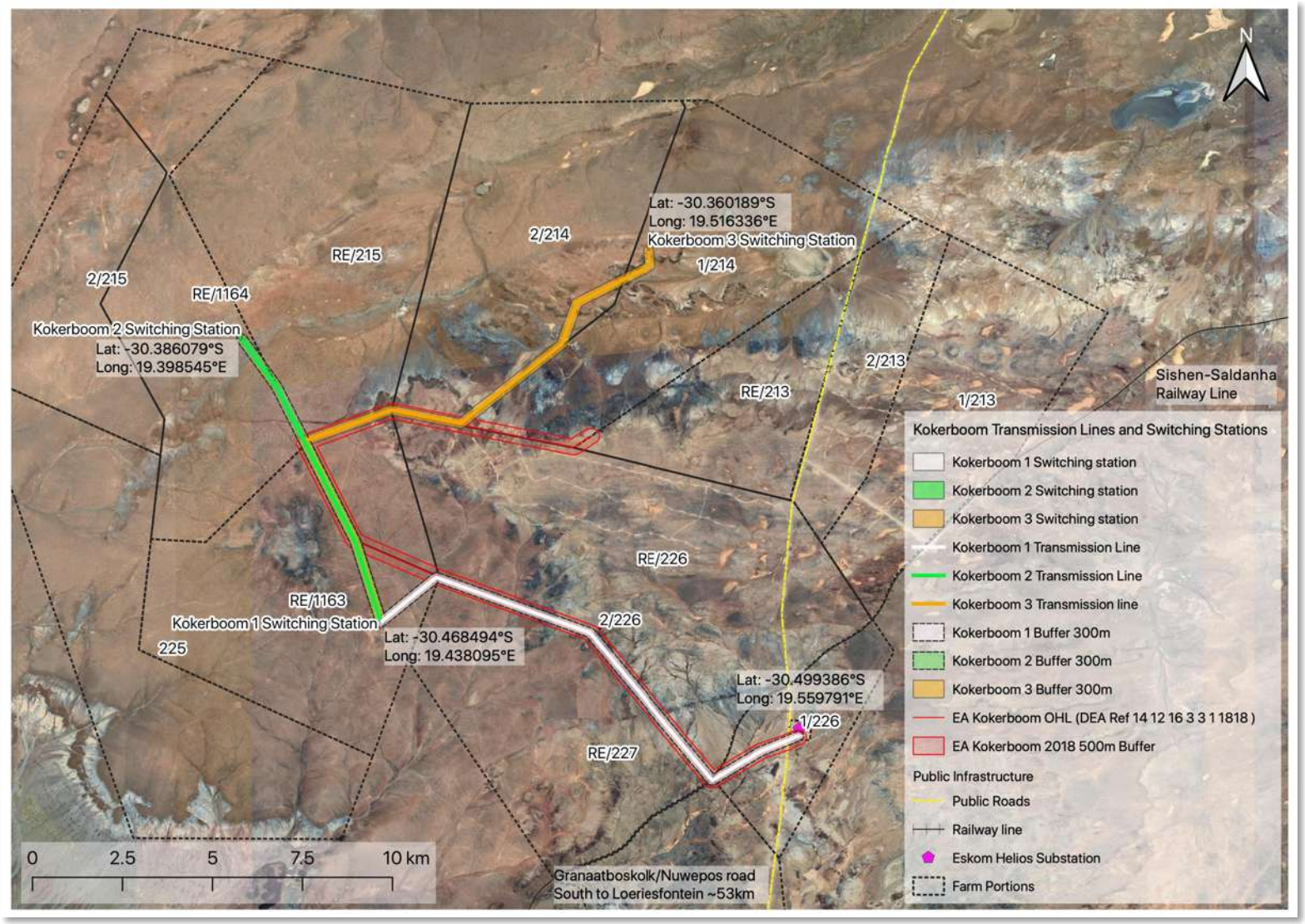


Figure 5-1: Proposed Kokerboom Transmission lines 1, 2 and 3 and associated switching stations in comparison to the previously authorised Kokerboom OHL Grid.

5.1 Location Alternatives

The location for the Kokerboom 1, 2 and 3 transmission lines are directly associated to the respective authorised Kokerboom WEFs and the Helios MTS. The switching stations will be constructed adjacent the respective WEF substations and the transmission lines will all feed into the Helios MTS. Thus the start and end points of the transmission lines are known and its matter of finding an optimal route to connect these two points. Consequently, there are no pertinent location alternatives as such since the grid connection infrastructure is directly related to the WEFs.

The switching stations are optimally placed adjacent the WEF substations and therefore no location alternatives are provided for them.

5.2 Routing Alternative for transmission lines

The three 132 kV overhead transmission lines will be used to evacuate the power from the proposed WEFs into the national grid at the Eskom MTS. Considerations for transmission line routing include:

- Reducing the transmission line length as far as possible;
- Aligning it with existing infrastructure such as roads;
- Aligning it with property borders to reduce fragmentation;
- Combining routes to different WEFs to share pylon infrastructure;
- Visual impacts of the proposed lines;
- Avoidance of sensitive environmental features;
- Potential interference with WEF infrastructure; and
- Maintaining necessary setbacks between grid connection infrastructure and the transmission lines.

Construction and maintenance roads will align with the transmission lines and will be designed to make use of existing farm tracks and WEF roads as far as possible, while minimising total road length and avoiding environmental sensitivities as far as possible. Prior to this assessment, specialists were commissioned to assist with the design and placement of associated infrastructure, through the identification of sensitive features and or constraints. This provided input into the design process, allowing the proponent to avoid and or minimise potential impacts by aligning the layout to avoid impacts prior to finalising the design. This layout refinement and optimisation approach was used in place of alternatives assessment, and thus only a “no go” alternative has been assessed. Three optimised transmission line routes within a 300m buffer (150m each side of the centre line) considering all the above features and requirements have been assessed in this BAR.

It should be noted that during the specialist assessments associated with this BA process it became apparent the Kokerboom 3 transmission line was not optimally aligned in terms of avoiding an alluvial watercourse which borders farms 2/214 and 1/214 (Figure 5-2). In consideration of the available environmental sensitivity layers, existing farms roads, property alignments (fences), landowner requirements, required setbacks to turbines and technical design considerations the routing was revised. The current alignment allows for the alluvial watercourse to be spanned by the transmission line without having to place pylons within the watercourse. The impact to the watercourse will thus be limited to the access and maintenance track, not dissimilar to the existing tracks on the property crossing the alluvial watercourse.

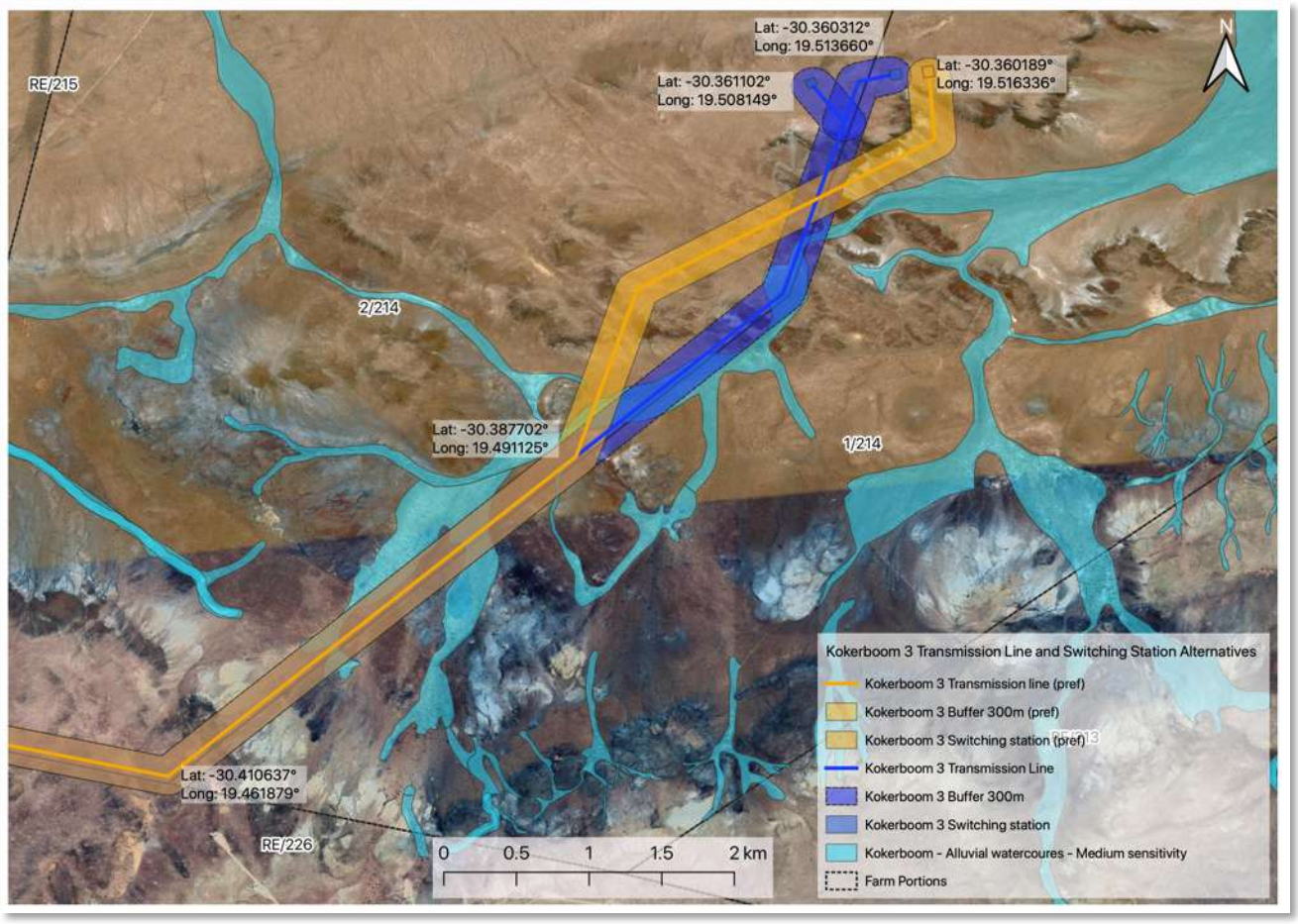


Figure 5-2: Revised route for Kokerboom 3 transmission line (orange) to avoid medium sensitivity alluvial watercourse (original routing alternatives in blue).

5.3 No-Go Alternative

The assessment of alternatives must always include the “no-go” option as a baseline against which all other alternatives must be measured. The no-go option represents the status quo which normally presents the option of not implementing the activity. However, the no-go in this instance would be the currently authorised transmission line grid infrastructure for the Kokerboom WEFs (Figure 5-1). This design is no longer feasible given the changes made to the Kokerboom WEF layouts subsequent to the original grid connection BA process. The No-Go Alternative (i.e. using the currently authorised grid connection solution) would require amendment of the WEF layouts in order to accommodate the authorised grid connection (now considered unfeasible), which would reduce optimal energy production of the WEFs and in so doing impact the WEF competitiveness. The No-Go Alternative would thus suggest that either the energy from the Kokerboom WEFs could not be exported to the national grid, or the Kokerboom WEF layouts would need to be amended to accommodate the existing sub-optimal grid connection, which would impact WEF energy production and efficiency.

6 BASELINE ENVIRONMENT AND ENVIRONMENTAL IMPACT ASSESSMENT

The description of the affected environment provided below draws on existing knowledge from published data, previous studies, site visits to the site and surround area, specialist studies and discussions with various role players.

The high-level identification of potential impacts which may occur as a result of the proposed activities described in Section 4.3 above is broad and covers the four phases of the project (i.e. pre-construction, construction, operation and decommissioning). Cumulative impacts form existing infrastructure, proposed projects (renewable including associated infrastructure) have been assessed per environmental aspect in the BAR and by specialists.

Impacts of negligible significance have been screened out, to ensure that the BA is focused on the potentially significant impacts only. The following environmental aspects are further discussed in this chapter below:

- Climate
- Agricultural production, potential and soils
- Terrestrial and Aquatic ecology (excluding birds and bats)
- Avifauna
- Heritage and archaeology
- Palaeontology
- Socio-economic aspects
- Visual landscape
- Nuisance (Noise, Dust and Traffic)
- Electromagnetic Interference (EMI) & Radio Frequency Interference (RFI)

6.1 Climate

6.1.1 Description of Climate

According to the Köppen-Geiger climate classification[16], the Kokerboom transmission line sites span over three climatic units. These are described as cold and arid desert (BWk), hot and arid desert (BWh) and hot and arid steppe (BSk).

The following graphs describe the climatic parameters based on 30 years of hourly weather model simulations from a central point in Loeriesfontein[17]. Figure 6-1 illustrates the average temperatures and precipitation levels over a calendar year. The solid red and blue lines indicate the mean daily maximum and minimum respectively per month. The dashed red and blue lines show the average hottest day and coldest night of each month for the last 30 years. Precipitation falls throughout the year, with most falling in the winter months.

[16] Koppen climate classification. *Encyclopaedia Britannica.* (Online). https://global.britannica.com/science/Koppen-climate-classification [Accessed 15 October 2020].
[17] Meteoblue. 2020. Climate Loeriesfontein (30.95°S 19.44°E 902m). (Online). https://www.meteoblue.com/en/weather/forecast/modelclimate/loeriesfontein_south-africa_3364501 [Accessed 15 October 2020].

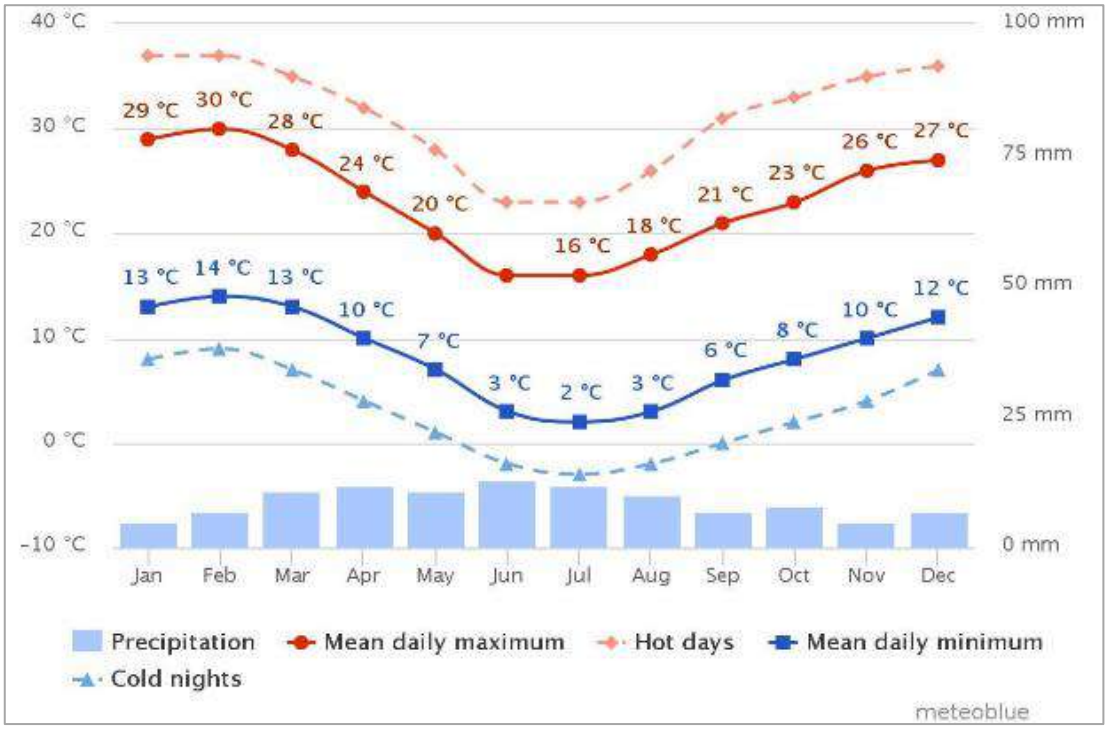


Figure 6-1: Average temperature and rainfall for Loeriesfontein

Although the average maximum temperature for February is 30°C (as an example), the temperature can go beyond 35°C for approximately six to seven days in the same month. This monthly distribution is illustrated below in Figure 6-2.

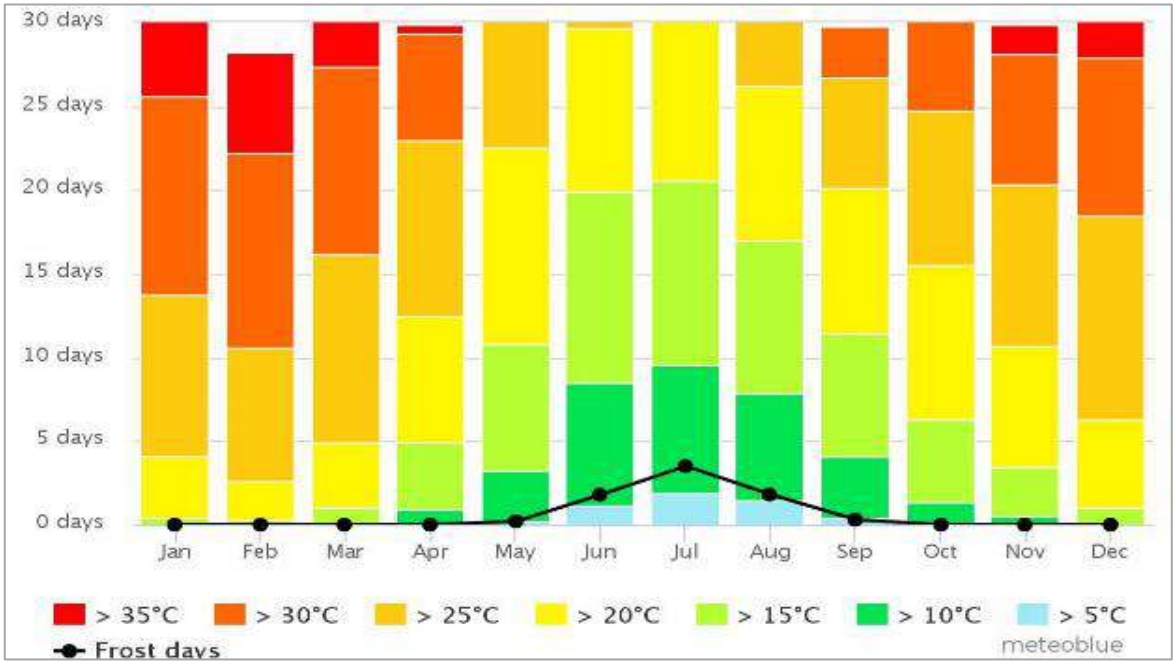


Figure 6-2: Monthly maximum temperature

Wind in the area is highest in summer reaching average speeds of 28 to 38 km/h. Figure 6-3 illustrates how these wind speeds are spread per month over a calendar year. In the graph, June to September have included days of exceptionally high wind speeds of higher than 38 km/h. Figure 6-4 illustrates that the dominant wind direction is from the southwest. The wind rose shows how many hours per year the wind blows in a particular direction. Meteorological masts on the proposed site for the Kokerboom WEF will assist in refining the climate data for the technical design of infrastructure.

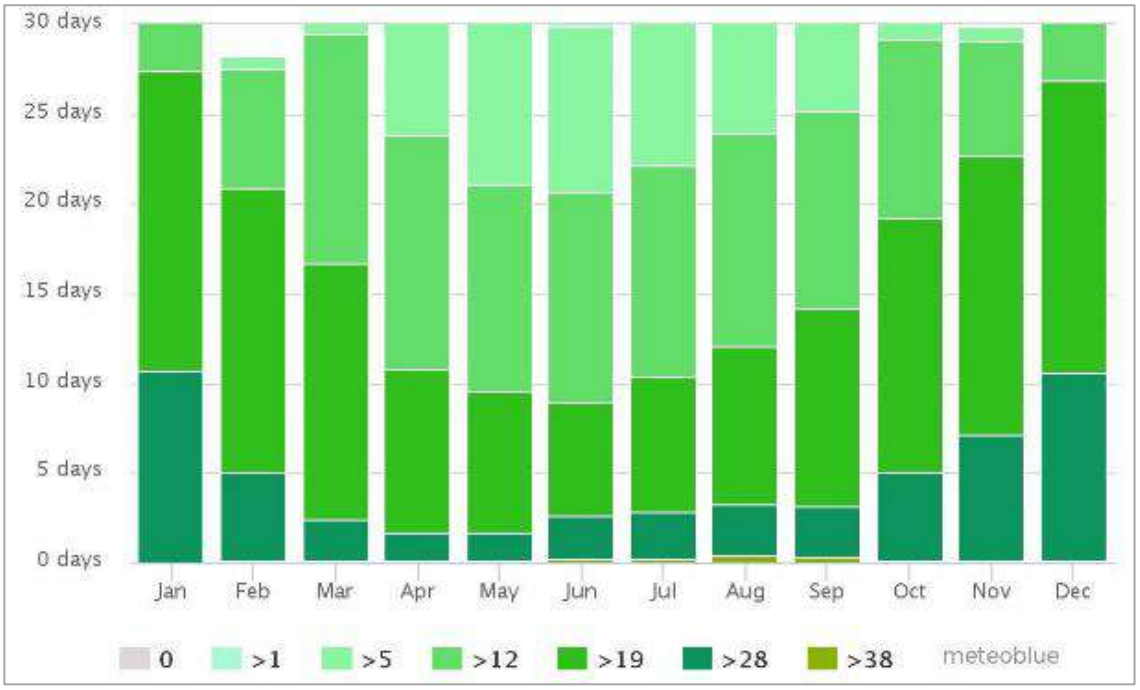


Figure 6-3: Monthly average wind speeds.

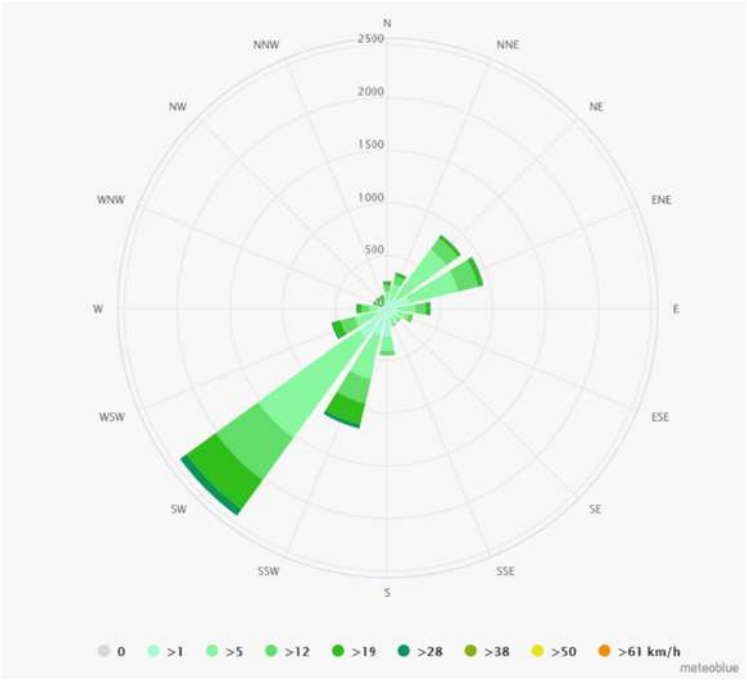


Figure 6-4: Wind rose for Loeriesfontein

6.2 Socio-economic context

This section provides a summary of the social report compiled by Barbour & Van der Merwe (2020) for the Kokerboom WEFs which the proposed grid infrastructure will connect to[18]. Thus, the proposed development should be seen in light of the greater socio-economic context. The socio-economic impact is not assessed in this section but it is required to contextualise impact being disused and assessed in the preceding sections.

The socio-economic aspects of the project need to be considered in an BA process as the population and communities affected by this project will contribute to whether this project is a success or failure. It is important to consider the socio-economic environment in which the project is located, in accordance with the legal and planning framework.

Baseline Description

The proposed development is located within the Namakwa DM of the Northern Cape Province. Namakwa DM is bordered by the Siyanda and Pixley ka Seme DMs to the northeast and east, respectively. To the south, the Western Cape Districts of the West Coast, Boland and Central Karoo are found.

The Hantam LM is one of six municipalities in the Namakwa DM. Hantam LM was named after a Khoi name that means "*mountains where the bulbs grow*" after the Hantam Mountains in the area. The administrative centre of the municipality is in the town of Calvinia. In this section baseline information relating to Hantam Locality Municipality is provided, as the project will physically be located within these boundaries.The project site is located in the Northern Cape Province, which is the largest province in South Africa and covers an area of 361 830 km^2 and constitutes approximately 30% of South Africa. The province is divided into five district municipalities, namely the Frances Baard, John Taolo Gaetswe, Namakwa, Pixley ka Seme and ZF Mgcawu District Municipalities.

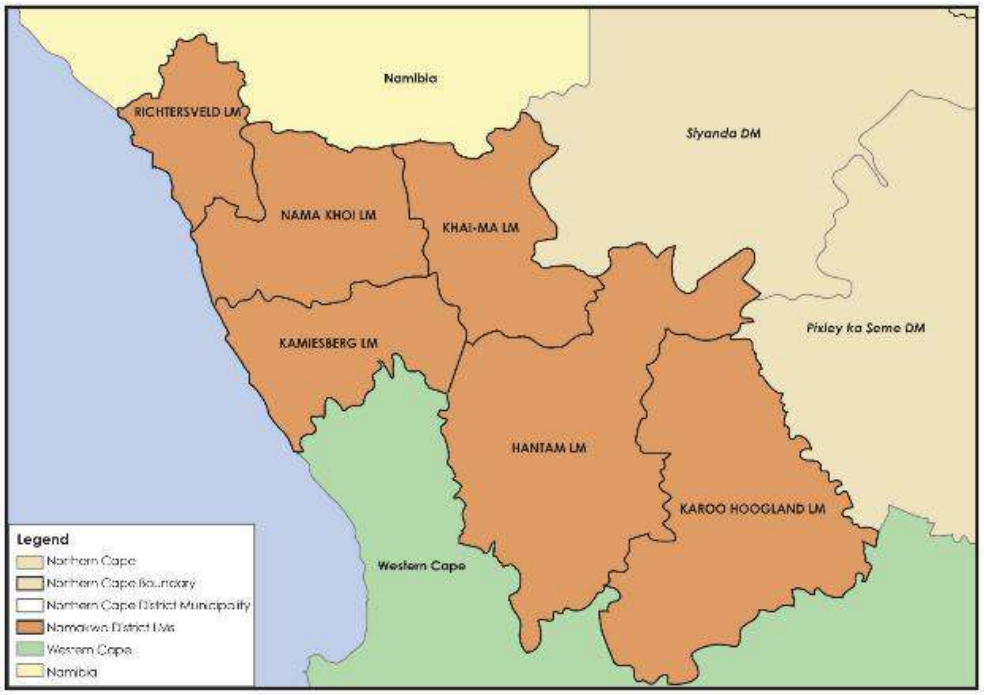


Figure 6-5:| Location of the Hantam LM within the Namaqua DM (source: Barbour, T. 2020)

[18] Note that according to the outcomes for the DFFE Screening tool no Socio-Economic Impact Assessment is required for the proposed development. As such this information is provided as baseline information to provide context of the prosed development.

Land use

Ninety six percent (96%) of the land is used for stock farming, including beef cattle and sheep or goats, as well as game farming in the Northern Cape. Food production and processing for the local and export market is also growing significantly. The wind farm itself is primarily used for agriculture in the form of sheep farming. Other land uses within the surrounding area include the Eskom Helios substation, which is located adjacent to the Nuwepos Road, east of the Kokerboom WEF site. Two existing Eskom transmission lines currently links Helios. Sishen-Saldanha railway line will also be spanned by the Kokerboom 1 transmission line. Three large salt pans, Konnes se Pan, Dwaggas Salt Pan and Commissioner's Salt Pan, are located 15-25 km to the north and north east of the Kokerboom sites.

There are a number of Renewable Energy Facilities (REF) currently proposed or under construction in the study area. These include two existing WEFs. Three proposed ones, as well as one Solar PV facility. The five WEF facilities are contiguous, a number which would be increased to six with the addition of Kokerboom 3. Kokerboom 2 is proposed adjacent to the west of Kokerboom 3 on two properties, namely Springbokpan and Springboktand farms. Kokerboom 1 is proposed on Klein Rooiberg and Leeubergfontein adjacent to the south and south-west of Kokerboom 2, approximately 4.7 km south of Kokerboom 3. The Khobab and Loeriesfontein WEFs were approved in the Third REIPPP Bid round. Both facilities are owned by Mainstream Renewable Power. At least two other REFs have also been proposed in the study area, i.e. the Dwarsrug WEF and the Orlight Solar PV. Both projects have been granted environmental authorisations.

Demographics

The Hantam LM had a population of 21 505 in 2017, which is a decrease from the 2011 population (21 685). The number of households in the Hantam LM was estimated at 6 196 in 2017, with an average household size of 3.5. A large percentage (82.2%) of the population in the HLM is coloured, followed by whites (12.1%) and black africans (4.4%). (Census, 2011). This is contrasted with the information provided by the municipal 2017 IDP, coloured (83.4%), followed by whites (11.7%) and black africans (4.9%). The dominant language within the municipality is Afrikaans (93.1%), followed by the other languages spoken including English (1%) and Xhosa (0.6%). (Census, 2011).

The dependency ratio has increased from 59.5 (2011) to 62 (2017). The increase represents a deterioration in local socio-economic conditions. indicating that there are an increasing number of people dependent the economically active 15-64 age group. The age dependency ratio is the ratio of dependents, people younger than 15 or older than 64, to the working, age population, those ages 15-64. The dependency ratio for the HLM was essentially the same as the ratio for the Northern Cape as whole, 55.7 in 2011. The dependency ratio for the HLM in 2011 was also higher than the national average of 52.7.

Employment and Sectors

HLM unemployment rate has decreased for the ten-year period between 2001 and 2011 period from 19.8%, a drop of 7.9%. the unemployment rate in 2017 was 10.3%. The decrease in the unemployment rate is a direct result of the renewable energy sector growth within the region, specifically the town of Loeriesfontein.

Mining and agriculture forms the backbone of the greater Namakwa District, with diamond and copper mining being the primary commodities being extracted. Mining activities have since declined in the last two decades, leading to massive layoffs and disinvestment in the DM. Another key sector is agriculture and agri-processing, especially within the Northern Cape Province. Approximately 2% percent of the province is used for crop farming, mainly irrigation in the Orange River Valley and Vaalharts Irrigation Scheme.

Agriculture and small-scale salt mining are traditionally the key economic activities in the study area. The key - and essentially only - agricultural resource in the study area is grazing. The resource is almost exclusively used for sheep farming.

Educational Levels

The education levels in the HLM improved for the period 2001 to 2011, with the percentage of the population over 20 years of age with no schooling decreasing from a high 26.8 % to 15.3 %. While there has been a significant improvement the figure for the HLM was higher than the provincial average of 11.3 %. The percentage of the population over the age of 20 with matric also increased in the HLM, from 14.9% to 18.8% in the HLM. Despite these increases the figure are significantly lower than the provincial (27.7%) and national (28.4%) averages. Low education levels, specifically higher education, therefore, remains a challenge in the HLM.

Availability of Municipal Services

Access to basic services has both improved and deteriorated in the municipal area. The number of households with electricity for lighting deteriorated negligibly from 76.3% of all households in 2011 to 76.2% in 2017, but down from 80.9% in 2016. The proportion of households with flush toilets connected to the sewerage system, however, has improved substantially from 53.4% in 2011 to 75.5% in 2017, but again, down from 78.3% in 2016. The provision of piped water inside dwellings has deteriorated very slightly from 59.8% of all households receiving the service in 2011 compared to 58.8% of households in 2017. Refuse removal available to households has improved somewhat from 72% in 2011 to 72.6% in 2017.

Potential Impacts

A number of impacts are associated with the proposed development are listed below. The EAP is of the opinion that **the proposed grid infrastructure is likely to minorly contribute to the below impacts, both positive and negative due to the scale of the project**, however they remain pertinent and relevant and are therefore elaborated upon.

Construction Phase Impacts

The following potential construction phase impacts have been identified :

- Creation of local employment (positive)
- Impact of construction workers on local communities (negative):
- Influx of job seekers (negative)
- Risk to safety, livestock and farm infrastructure (negative)
- Increased risk of grass fires (negative)
- Impacts associated with movement of heavy vehicles and on-site construction related activities (negative)
- Impacts associated with loss of grazing resources (negligible negative)

Operational Phase

The following potential construction phase impacts have been identified:

- Implementation of clean, renewable energy infrastructure (positive)
- Creation of employment (positive)

Cumulative

The establishment of the proposed grid infrastructure associated with the Kokerboom 1,2 and 3 WEF and other renewable energy projects in the area also has the potential to create a number of cumulative socio-economic opportunities for the HLM and NDM, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, creation of downstream business opportunities.

No-Go Alternative

The No-Development option would represent a lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producers of carbon emissions in the world, this would represent a negative social cost. However, at a provincial and national level, it should be noted that the proposed development is not unique. In this regard, a significant number of other similar developments are currently proposed in the Northern Cape and other parts of South Africa. Foregoing the proposed establishment of the proposed grid connection infrastructure (and thus the associated Kokerboom WEFs) would therefore not necessarily compromise the development of renewable energy facilities in the Northern Cape Province and/ or South Africa. However, the socio-economic benefits for the local communities in the HLM would be forgone. This loss should be viewed within the context of the area's low agricultural and tourism potential. The establishment of a WEFs would therefore create a unique opportunity for investment in the area. The no-development option would therefore represent a negative socio-economic impact for the local area.

Conclusion and Recommendations

The above findings indicate that the development of the proposed switching station will create employment for locals during both the construction and operational phase of the project. The main positive feature from the prosed grid infrastructure would be the establishment of the Kokerboom WEFs which represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The potential negative social impacts can be effectively mitigated due to the small scale of the project and low population density.

6.3 Agricultural Production, Potential and Soils

In 2017, Soil Scientist, Johann Lanz, completed the study, "Agricultural and Soils Impact Assessment for Proposed 132 KV Transmission Line Corridor from proposed Kokerboom WEF to existing Helios MTS, near Loeriesfontein, Northern Cape". The new proposed Kokerboom grid infrastructure layouts were provided to Johann Lanz in June 2021 to assess the potential new impacts. The agricultural impact of the proposed grid connection infrastructure was assessed in the original study as having very low significance. This was due to the very low agricultural potential of the farms as well as the fact that grid connection infrastructure has very little actual impact on agriculture, regardless of the agricultural environment. Johann Lanz reviewed the latest layouts as provided in this assessment and confirmed that it will in no way change the findings of the original impact assessment. It will not change the nature or significance of any of the impacts assessed in the original study. No changes or additions to the mitigation measures for agricultural impacts that were recommended in the original assessment are required, and there are therefore no required changes to the EMPr (previous recommendation included in the generic EMPr). The agricultural impact of the infrastructure proposed in this BAR will therefore be identical to the impact that was assessed in the original specialist assessment report.

A summary of the of the findings on agricultural production, potential and soils and impact assessment tables are provided below. The assessment report and confirmation letter of the latest layout is attached as Annexure D1.

6.3.1 Baseline Description

The proposed development is on properties used and zoned for Agricultural use with a special use for renewable energy and associated infrastructure. Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for cultivation. The proposed development is located in a sheep farming agricultural region and this is the only agricultural land use on the site and surrounds. With an average rainfall of 140 mm, and an evaporation value of 1600 mm, the proposed site is constrained in terms of its possible agricultural productivity (incl. grazing). There is little agricultural infrastructure in the study area, apart from a few farmsteads, fencing into camps and wind pumps with stock watering points.

Soils across the site are predominantly shallow, sandy soils on underlying rock or hardpan carbonate, of the Coega, Mispah, Glenrosa and Askham soil forms. The major limitations to agriculture are the extremely limited climatic moisture availability and the poor soils. As a result of these limitations, the site is unsuitable for cultivation and agricultural land use is limited to low intensity grazing. The land capability is classified as Class 7 - non-arable, low potential grazing land. The site has a very low grazing capacity of 41-60 hectares per large stock unit.

6.3.2 Site Sensitivity

Agricultural sensitivity, in terms of environmental impact, is a direct function of the capability of the land for agricultural production. This is because a negative impact, or exclusion of agriculture, on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability.

The screening tool classifies agricultural sensitivity according to two criteria - the cultivation status and the land capability. All cultivated land is classified as high/very high sensitivity (of which there is none within the area of the proposed development). This is because there is a scarcity of arable production land in South Africa, in terms of how much is required for food security. Uncultivated land is classified by the screening tool in terms of the land capability. Land capability is defined as the combination of soil,

climate and terrain suitability factors for supporting rain fed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land to produce cultivated crops, while the lower suitability classes are only suitable as non- arable, grazing land (as found within the greater proposed development area), or at the lowest extreme, not even suitable for grazing.

In 2017 DAFF released updated and refined land capability mapping across the whole of South Africa. This has greatly improved the accuracy of the land capability rating for any piece of land anywhere in the country. The new land capability mapping divides land capability into 15 different categories with 1 being the lowest and 15 being the highest. This land capability data is used by the screening tool. The proposed site is identified by the screening tool as being of predominantly low sensitivity for agricultural resources, but it also includes patches of medium sensitivity (Figure 6-6). The agricultural capability of all land in the study area is severely constrained by the aridity of the climate. The further basis for the agricultural sensitivity classification of land within the site is summarised in Table 6-5. The agricultural specialist and on ground verification found that the proposed site is on land which is of very low agricultural potential, and which is only suitable as grazing land. There are no agriculturally sensitive areas and no parts of the site need to be avoided by the development from an agricultural perspective.

Table 6-1: Description of different agricultural sensitivity classes that occur in the study area.

Sensitivity category	Cultivation status	Land capability evaluation values	General description
Low	Uncultivated	3 to 5	Constrained by aridity. Also constrained by shallow, sandy soils on underlying rock or hard-pan carbonate.
Medium	Uncultivated	6 to 7	Constrained by aridity. Also constrained by shallow, sandy soils on underlying rock or hard-pan carbonate.

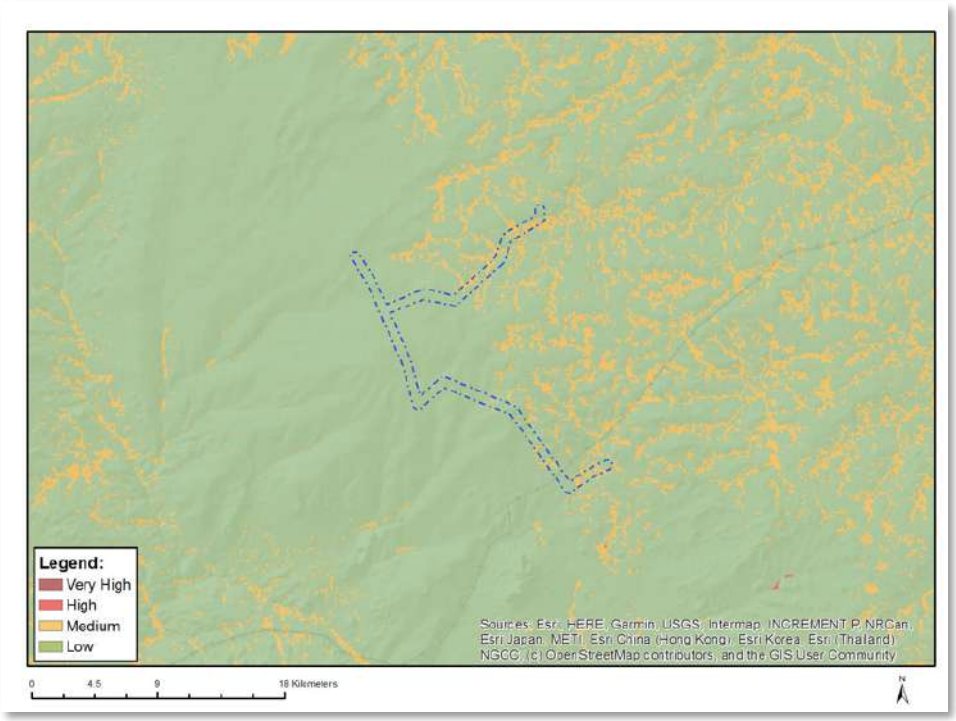


Figure 6-6: The proposed site is identified by the screening tool as being of predominantly low sensitivity for agricultural resources, but it also includes patches of medium sensitivity

6.3.3 Impact assessment

The significance of agricultural impacts is a direct function of the degree to which an impact will affect current or future agricultural production of an area, whether it be positive (enhances current and/or future agricultural production) or negative (compromise current and/or future agricultural production). Therefore, no impact on production would result in no agricultural impact. Impacts that degrade the agricultural resource base, pose a threat to production and therefore are within the scope of an agricultural impact assessment. For agricultural impacts, the exact nature of the different infrastructure within a facility has very little bearing on the significance of impacts. What is of most relevance is simply the occupation of the land, and whether it is being occupied by a pylon or a switching station makes no difference. What is of most relevance therefore is simply the total footprint of infrastructure. The components of the project that can impact on agriculture are; occupation of the land by the total, direct, physical footprint of the proposed project including all its infrastructure and construction activities that may disturb the soil profile and vegetation, for example for levelling, excavations etc.

The significance of all potential agricultural impacts is kept low by two factors:

1. the actual footprint of disturbance is very small in relation to the available grazing land;
2. the proposed site is on land of extremely limited agricultural potential that is only viable for low intensity grazing.

Therefore, all agricultural impacts, including loss of agricultural land use, erosion and soil degradation will not be widespread and can at worse only affect a very limited proportion of the surface area. All agricultural activities will be able to continue unaffectedly on all parts of the farms other than the small development footprint for the duration of and after the project.

The negative impact is a loss of agricultural production and potential as a result of the following mechanisms:

- Loss of agricultural land use caused by direct occupation of land by the development footprint.
- Soil Erosion caused by alteration of the surface characteristics.
- Generation of dust caused by alteration of the surface characteristics.
- Loss of topsoil in disturbed areas, causing a decline in soil fertility.
- Degradation of surrounding grazing land due to vehicle trampling.

The overall impact was assessed by the agricultural specialist as having very low significance, which is in fact negligible (Table 6-2 and Table 6-3).

Construction Phase Impacts

The following potential construction phase agricultural impacts have been identified:

- **Loss of agricultural land use (negative)** - Agricultural land directly occupied by the development infrastructure will become unavailable for agricultural use. This impact is relevant only in the construction phase. No mitigation is required.
- **Soil degradation (negative) -** Soil can be degraded by impacts in three different ways: erosion; topsoil loss; and contamination. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related excavations. Hydrocarbon spillages from construction activities can contaminate soil. Soil degradation will reduce the ability of the soil to support vegetation growth

Decommissioning Phase Impacts

The following potential decommissioning phase agricultural impacts have been identified by the specialist:

- **Soil degradation (negative)-** Soil can be degraded by impacts in three different ways: erosion; topsoil loss; and contamination. Erosion can occur as a result of the alteration of the land surface run-off characteristics, which can be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard surface areas including roads. Loss of topsoil can result from poor topsoil management during construction related excavations. Hydrocarbon spillages from construction activities can contaminate soil. Soil degradation will reduce the ability of the soil to support vegetation growth.

Cumulative impacts

The cumulative assessment for this project is an assessment only of the impacts associated with this project but seen in the context of all surrounding impacts. It is concerned with this project's contribution to the overall impact, within the context of the overall impact. But it is not simply the overall impact itself. The most important concept related to a cumulative impact is that of an acceptable level of change to an environment. A cumulative impact only becomes relevant when the impact of the proposed development will lead directly to the sum of impacts of all developments causing an acceptable level of change to be exceeded in the surrounding area. If the impact of the development being assessed does not cause that level to be exceeded, then the cumulative impact associated with that development is not significant.

The potential cumulative agricultural impact of importance is a regional loss (including by degradation) of agricultural land, with a consequent decrease in agricultural production. In quantifying the cumulative impact, the area of land taken out of grazing as a result of all the developments proposed within the larger surrounding area is well within an acceptable limit in terms of loss of low potential agricultural land, of which there is no scarcity in the country. It should also be noted that there are few land uses, other than renewable energy, that are competing for agricultural land use in this area. The cumulative impact from developments, other than renewable energy and their associated infrastructure components, is therefore likely to be low. It is preferable to incur a cumulative loss of agricultural land in a region such as the one being assessed, which has no cultivation potential, and low grazing capacity, than to lose agricultural land that has a higher potential, and that is much scarcer, to renewable energy development elsewhere in the country. The limits of acceptable agricultural land loss are far higher in this region than in regions with higher agricultural potential. Due to the considerations discussed above, the cumulative impact of loss of agricultural land use will not have an unacceptable negative impact on the agricultural production capability of the area.

No-go alternative

In the case that the proposed grid connection infrastructure is not developed, farming will continue as status quo. The site falls within a very arid region of the Northern Cape, receiving approximately 170mm of rainfall per annum20[19]. It is predicted in the Climate Change Model Projections for Northern Cape Province[20] that by 2050 there will be changes in the following areas: average temperatures, very hot days, heat wave days, high fire danger days, average rainfall, extreme rainfall events and dry spell days. It is anticipated that the province will get hotter and drier, with more rain falling in extreme rainfall events which could lead to flooding events. These changes would impact the water availability of the area, as

[19] South African Rain Atlas http://wsopuppenkiste.wiso.uni-goettingen.de/rainfall
[20] EnviroTech Solutions. 2016. Climate Change Model Projections for the Northern Cape Province. Report prepared for the Department of Environment and Nature Conservation for presentation to the DEA and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

well as future drainage patterns. It will also make the farming in the landscape even more difficult than it currently is.

The no-go alternative anticipates changes to the agricultural environment that would occur in the absence of the proposed development. No significant changes are anticipated in the no-go scenario, compared to the negligible negative impact for the development.

Table 6-2: Loss of agricultural potential (land)

Project phase	**Construction, Decommissioning**			
Impact	**Loss of agricultural potential (land)**			
Description of impact	The loss of agricultural production and potential results from the following mechanisms: • Loss of agricultural land use caused by direct occupation of land by the facilities' footprint; • Soil erosion caused by alteration of the surface characteristics; • Generation of dust caused by alteration of the surface characteristics; • Loss of topsoil in disturbed areas, causing a decline in soil fertility; and • Degradation of surrounding grazing land due to vehicle trampling.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• Maintain, where possible, all vegetation cover and facilitate revegetation of denuded areas to stabilise the soil against erosion. • Implement an effective system of storm water runoff control using berms (raised, low walls of soil) and ditches, where it is required (i.e. points where water might accumulate). • Strip and stockpile topsoil from all areas where soil will be disturbed below surface, for example, excavations for cabling and mounting structures. It is not necessary to strip topsoil from the whole development area, if the soil below surface is not being disturbed. • All soil above the rock or hardpan, to a maximum depth of 25cm should be stripped and stockpiled. Any additional soil overburden from below that depth must be stripped and stockpiled separately. • After cessation of disturbance, re-spread topsoil over the surface and revegetate. Any additional overburden where they will not bury the topsoil of agricultural land, must be disposed of appropriately.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	impact will last between 1 and 5 years	Short term	impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None.			
Cumulative impacts	It is preferable to incur a cumulative loss of agricultural land in such a region, without cultivation potential, than to lose agricultural land that has a higher potential, to renewable energy development elsewhere in the country.			

Table 6-3: Loss of grazing resources (social)

Project phase	**Construction & Decommissioning**			
Impact	**Loss of grazing resources (social)**			
Description of impact	The activities associated with the construction and decommissioning phases have the potential to result in the loss of land available for grazing and other agricultural activities. The key construction phase related issues are linked to the movement of heavy construction vehicles on the site and the establishment of laydown areas and access roads. The loss of grazing land could impact on sheep farming activities. The owner of Sous Farm indicated to the social specialist that the construction of Khobab WEF has resulted in some unnecessary damage to the veld in places due to careless activities, including off-road driving. This concern would also apply to the establishment of power lines. Given the low rainfall, damaged veld can take many years to recover. The final disturbance footprint can be reduced by careful site design and placement of power lines. The impact on grazing associated with the construction phase can therefore be mitigated by minimising the footprint of the construction related activities and ensuring that disturbed areas are fully rehabilitated on completion of the construction phase.			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	• The final location of pylons, access roads, laydown areas, switching stations etc. should be discussed with and confirmed with the locally affected landowners before being finalised. • The footprint areas for the establishment of infrastructure should be clearly demarcated prior to commencement of construction activities. All construction related activities should be confined to the demarcated area and minimised where possible. • All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase. The rehabilitation plan should be informed by input from an appropriately qualified professional, with experience in arid regions. • The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed. • The implementation of the Rehabilitation Programme should be monitored by the ECO.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	Could be very low negative pre-and post-mitigation but the sensitivity of the assessment methodology does not allow for such fine scale differentiation. The impacts would be closer to negligible than low negative.			
Cumulative impacts	None.			

6.3.4 Conclusion and Recommendations

The site has very low agricultural potential because of, predominantly, aridity constraints, but also due to soil constraints. It is totally unsuitable for cultivation, and agricultural land use is limited to low density grazing. Most of the land within the development area is of low agricultural sensitivity, but it includes areas

of medium sensitivity. Two potential negative agricultural impacts were identified, loss of agricultural land use and land degradation, both are of negligible significance post decommissioning.

The conclusion of this assessment is that the proposed development will not have an unacceptable negative impact on the agricultural production capability of the site. The proposed development is therefore acceptable. This is substantiated by the facts that the amount of agricultural land loss is within the allowable development limits, and that the proposed development poses a low risk in terms of causing soil degradation. From an agricultural impact point of view, it is recommended that the development be approved.

The deduction of this assessment on the acceptability of the proposed development and the low agricultural potential, and the very low agricultural impact, there are no restrictions relating to agriculture which would preclude authorisation of the proposed development.

6.4 Terrestrial and Aquatic Ecology (excluding birds and bats but inclusive of a butterfly sensitivity study)

In 2017, Ecologist, Simon Todd, completed the study, "Fauna & Flora Specialist Basic Assessment Report for Proposed 132 KV Transmission Line Corridor from proposed Kokerboom WEF to existing Helios Substation, near Loeriesfontein, Northern Cape". Also in 2017, Ecologist, Brian Colloty, completed the study, "Aquatic Assessment Kokerboom Wind Energy Facility Grid Connection" for the Proposed 132 KV Transmission Line Corridor from proposed Kokerboom WEF to existing Helios MTS, near Loeriesfontein, Northern Cape.

The new proposed Kokerboom grid infrastructure layouts were provided to Ecologist, Brian Colloty and Dr Edge (Lepidopterist and ecologist) in June 2021 to assess the potential new impacts on both terrestrial and aquatic ecology.

A summary of the of the findings on terrestrial and aquatic ecology and impact assessment are provided below. The assessment report is attached as Annexure D2.

6.4.1 Baseline Description

The site is located within the low rainfall region of South Africa, with a Mean Annual Precipitation (MAP) of between 100 -200 per annum usually in the summer months. However in the four of the five occasions the author has visited the region since 2014, significant rainfalls had occurred in winter. Annual average temperatures range between -2 and 39 ^{o} C (Mucina & Rutherford, 2007).

The site is underlain with a rocky to sandy substrate derived from Mudstones and Shales from the Ecca Group and Dwyka Tillites (Figure 6-8). The area is thus characterised by very shallow soils, mostly with limestone/calcrete present (Mucina & Rutherford, 2007). The presence of very shallow soils in an important consideration when considering rehabilitation post construction.

The region is characterised by irregular plains, either bisected by shallow alluvial water courses or Endorheic Pans and Depressions, that vary in size. Only the flat plains with small depressions were observed in close proximity to the activities being assessed in this report (Figure 6-9)

The site is predominately located within Bushmanland Basin Shrubland (NKb 6) as defined by the National Vegetation Type Map (Mucina & Rutherford, 2007, updated in 2017/2018) (Figure 6-7 and Figure 6-10). This vegetation unit is dominated by dwarf shrubs, mostly succulents, interspersed in areas with grasses. No natural trees were observed within the site, with the exception of two alien *Prosopis* trees. A secondary vegetation unit, associated with the large pans further north of namely the Bushmanland Vloere (Azi 5). This vegetation unit is described in more detail in the aquatic environment section of this report, but is not associated with smaller depressions located within this study area (Grid area), i.e. this vegetation unit is only found in associated with the large Endorheic Pans, located more than 5km from any of the infrastructure assessed in this report.

The Bushmanland Basin Shrubland and Bushmanland Vloere vegetation types are not listed as a Threatened Ecosystem as per the National Environmental Management Biodiversity Act, this is due to the vast area this vegetation units occupy, with little in terms of human / agricultural use.

Table 5 lists the typical species associated with the shrubland unit, highlighting those that were observed. Overall, the species assemblage was moderately represented, with 115 of 236 potential species being observed (49%). A higher number of forbs (bulbs) and grasses could occur but were not observed due to the prevailing conditions, that and the large shale plains that dominate portions of the site are typically

devoid of plant species. This was also reflected in the low number of Protected Plant species (NCNCA & NFA), with 36 species being observed, most of which are listed under Schedule 3 Protected (33) and will require removal / relocation permits before disturbance occurs.

The DFFE Screening Tool lists the grass species *Dregeochloa calviniensis*, which was actively searched for, but suitable habitat and or the presence / absence of this species was not confirmed.

Based on the number, density and type of species observed within the site, it was clear that was dominated by species associated with the Bushmanland Basin Shrubland. Dominant species included: *Brownanthus ciliatus, Euphorbia rhombifolia, Prenia tetragonia, Ruschia robusta, Zygophyllum retrofractum, Lycium pumilum, Aridaria noctiflora, Sceletium tortuosum, Phyllobolus nitidus, Cephalophyllum rigidum Drosanthemum lique, Octompoma quadrisepalum, Ruschia abbreviata, Galenia fruticosa, Exomis microphylla, Tetragonia fruticosa, Tripteris sinuata,* (Figure 6-8 to Figure 6-11)

Depressions (Figure 6-12), ranged from bare sandy areas to vegetated area, some with saline tolerant species such as S*alsola aphylla and Salsola tuberculate*. These small systems ranged from 2.4 to 3.4ha in size. Further these contained no signs of any obligate aquatic vegetation but had contained water for a short period in June 2021.

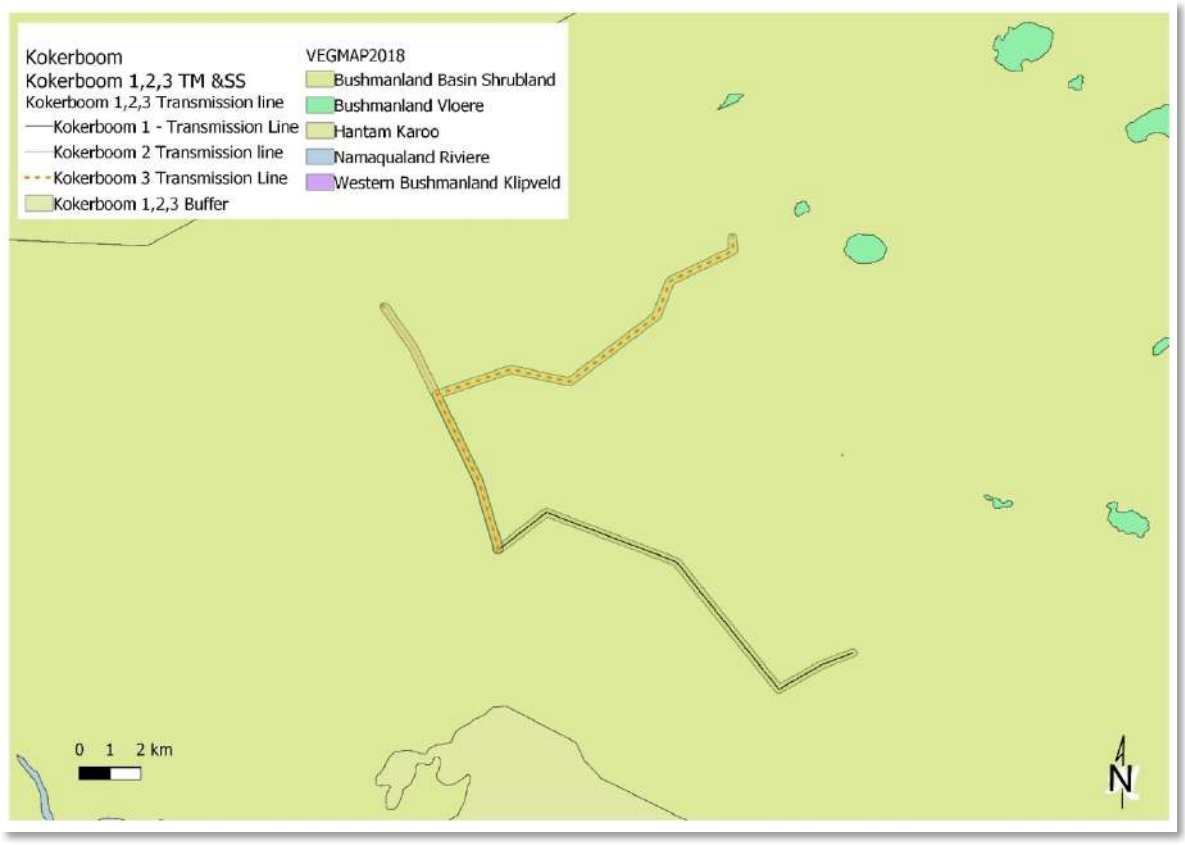


Figure 6-7: Project locality map indicating regional vegetation types as per the National Vegetation Type map updated 2017/2018

Figure 6-8: A view extensive of shale plains in the southern half of the site, at the proposed entrance

Figure 6-9: An alluvial dominated water course, with visibly taller vegetation that will need to be spanned by the Kokerboom 2 alignment

Figure 6-10: A general view of the dominant vegetation type (Bushmanland Basin Shrubland) within the Kokerboom 1 alignment within the site

Figure 6-11: Bushmanland Vloere vegetation unit associated with the floor of the large Pan more than 5km from the proposed alignments

Figure 6-12: One of the small sandy depressions near the proposed alignments (Kokerboom 3)

Terrestrial fauna

A detailed review of past literature as well as spatial species databases / atlases was also conducted to produce a species checklist prior to the field work being conducted (Appendix 1 of Annexure D2). The animal species observed were limited to invertebrates, birds and reptiles.

Faunal diversity observed due to the state and size of the site was thus low, when compared to the anticipated species known to occur in the region. It is also anticipated that the invertebrate and reptile species numbers could be higher, but limited by the dry conditions prior to the survey period in May 2020 (Figure 6-13). A much higher number of reptiles was observed during the June 2021 survey period, possibly due to the recent rains coupled to the higher than normal temperatures (24-26^{O}C). A total number of 16 small female Karoo Tented Tortoises were observed near the various grid alignments, while higher numbers of the *Pedioplanis namaquensis* (Namaqua Sand Lizard) and *Meroles suborbitalis* (Spotted Desert Lizard) were observed when compared to the colder May 2020 survey.

No species observed on site are listed as IUCN Red Data species, but all indigenous fauna is protected under the NCNCA, i.e. provincially protected.

Reference is also made to the Butterfly assessment attached (Appendix 4 of Annexure D2) to this report where it is anticipated that the Trimen's Opal, *Chrysoritis trimeni* listed as Vulnerable is not likely to occur within the site.

Anticipated mammal diversity was also low within the site, with approximately 40 species likely to occur within the region. Species observed were mostly small mammals, found on the higher lying ridges or rocky outcrop area within the site. No Red Data listed species were observed, but do receive protection under the provincial NCNCA.

Figure 6-13: Karoo Tent tortoise exhibiting signs of distress, possibly due to dehydration or injury

Aquatic environment

The study area is dominated by four main aquatic features associated with catchments and watercourses and associated vegetation types as described in this report and are as follows:

- Riverine Alluvial watercourses, with no distinct riparian zone
- Riverine Minor drainage lines
- Pan (wetland) Small depressions dominated by bare sand / clays that retain water for a few days
- Artificial Dams and reservoirs

Notably most of the aquatic features within the broader study area are located near or within the riverine valleys and alluvial floodplains, with no direct linkage to any mainstem rivers associated with the D35F & E31c quaternary catchments (Figure 6-14), all within the Nama Karoo Ecoregion located in the Orange Water Management Area and Berg-Olifants Water Management Area. Furthermore, the study area is not located within any Strategic Water Resource areas or wetland clusters.

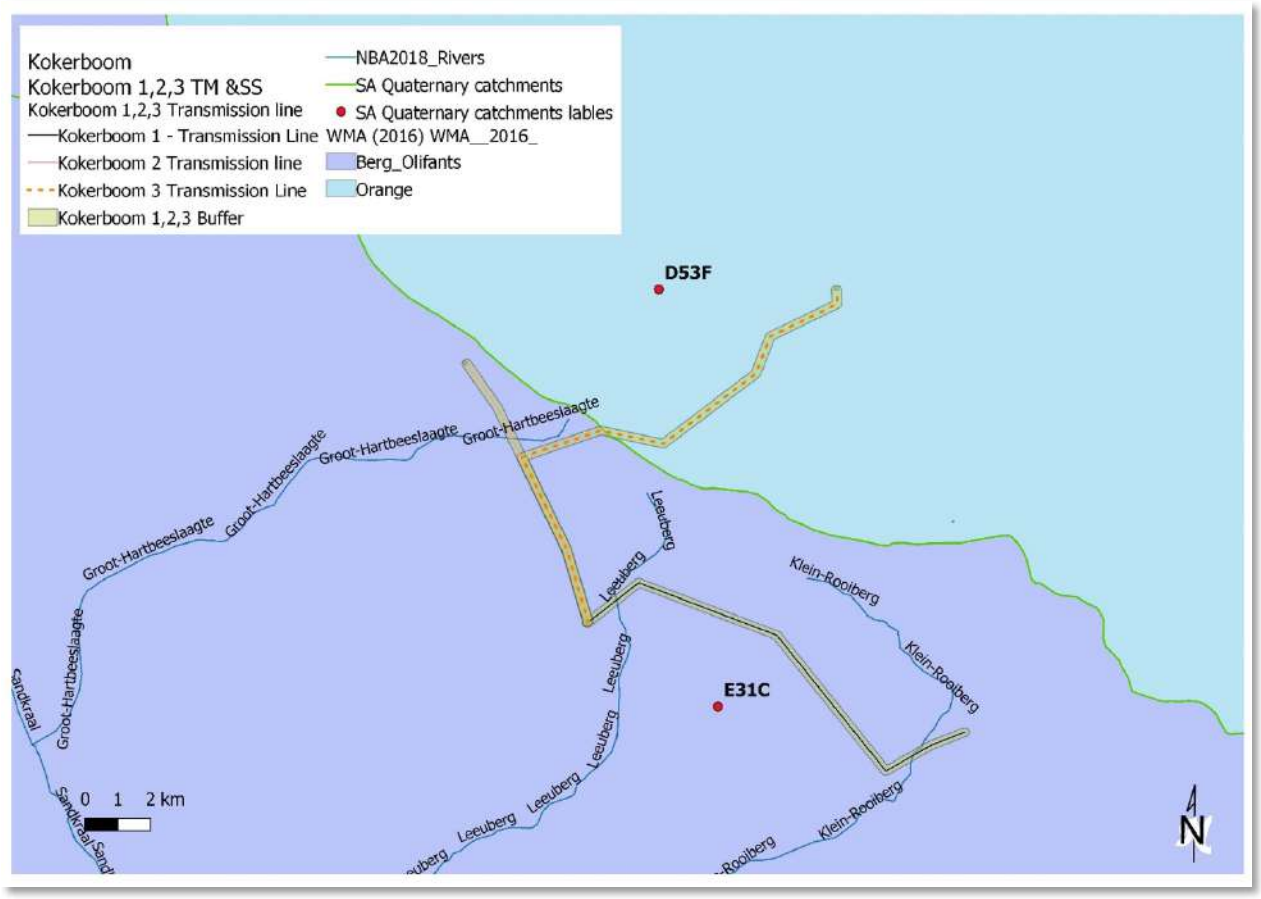


Figure 6-14: Project locality map indicating the various quaternary catchments and mainstem rivers (Source DWS and NGI)

The groundtruthed delineations were then compared to current wetland inventories (van Deventer *et al*., 2020), 1: 50 000 topocadastral surveys mapping (Figure 6-15) only differ with regard the delineation of the alluvial watercourses and the depressions observed. A baseline map was then developed and refined using the May 2020 survey data, noting that due to the complex nature of the topography and geology, the systems were digitised at a scale of 1:2000 (Figure 6-16). Notably several of the pans/depressions shown in the National spatial database (Figure 4) where confirmed to be small shale and or calcrete outcrops, which on aerial images do have the appearance of small pans.

A clear distinction was made, between the Endorheic Pans and the depressions, as these are located in different topographical parts of the broader study area, i.e. the pans have their own distinct catchments and vegetation units. While the proposed alignments are only in close proximity to several of the small depressions.

Coupled to the aquatic delineations, information was collected on potential species that could occur within the wetlands and water courses, especially any areas that would contain open water for long periods and or conservation worthy species (Listed or Protected).

Similarly, amphibian species are known to occur within the region, but little is known of the actual distribution of frogs within the study area based on mapping data contained in Minter *et al*. (2004) and the FrogMAP spatial database. Only two frog species were observed during this assessment more than 30km from the site. The only obvious habitat would be the pans in the broader study area, but as these are saline and dry for extended periods, the majority of the potential frog species are unlikely to occur.

None of these plant and animal species are listed by the IUCN, but several of the plant species are protected under the NCNCA.

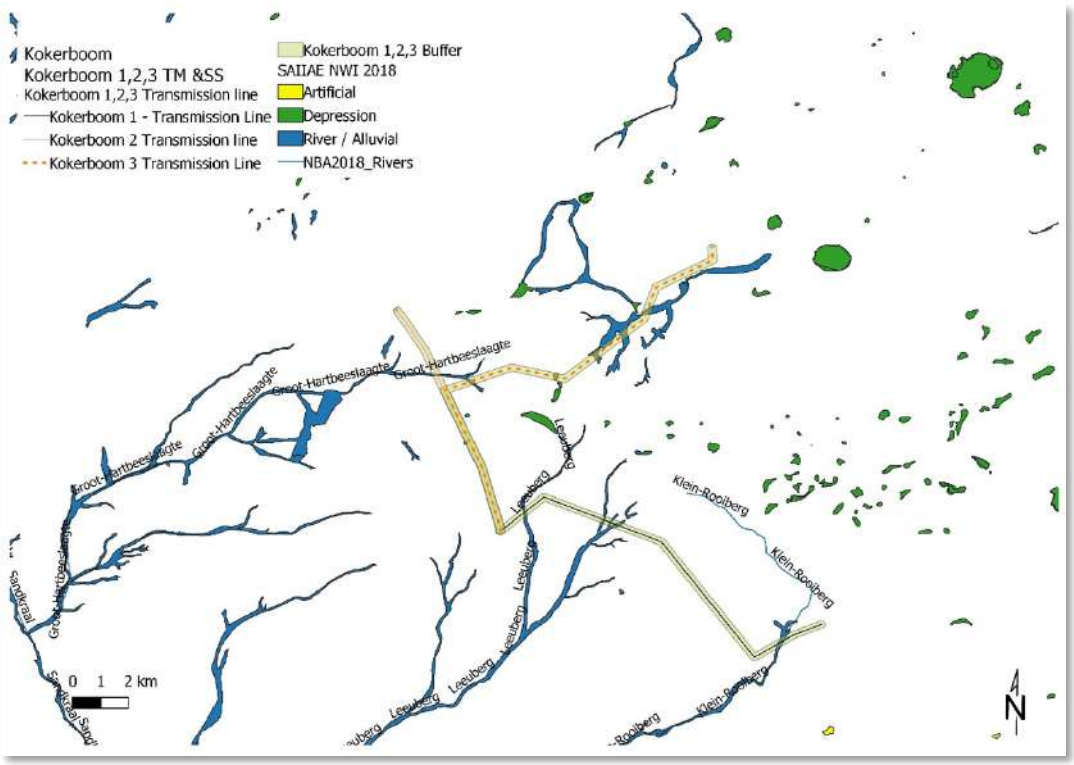


Figure 6-15: National Wetland Inventory wetlands and waterbodies (van Deventer *et al*., 2018) for the wind farm

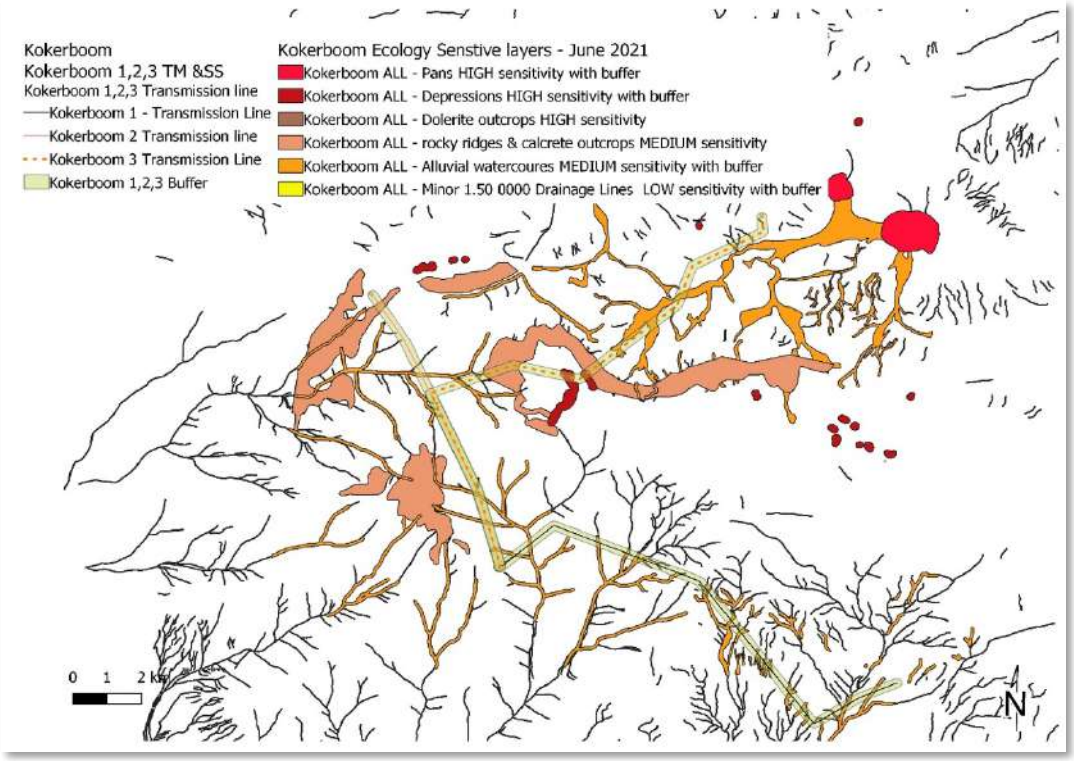


Figure 6-16: The fine-scale delineations of the systems based on this assessment and May 2020 site survey

Aquatic Present Ecological State and conservation importance

The PES of a river, watercourse or wetland represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E).

The PES scores have been revised for the country and based on the new models, aspects of functional importance as well as direct and indirect impacts have been included (DWS, 2014). The new PES system incorporates Ecological Importance (EI) and Ecological Sensitivity (ES) separately as opposed to Ecological Importance and Sensitivity (EIS) in the old model, although the new model is still heavily centred on rating rivers using broad fish, invertebrate, riparian vegetation and water quality indicators. The Recommended Ecological Category (REC) is still contained within the new models, with the default REC being B, when little or no information is available to assess the system or when only one of the above-mentioned parameters are assessed or the overall PES is rated between a C or D.

All of the systems assessed by DWS on a Subquaternary level adjacent the study area were rated as PES = B or Largely Natural. While these were also rated as Moderate / Medium in terms of Ecological Sensitivity and Ecological Importance.

Based on the information collected during the field investigations, these ratings are verified and upheld for the riverine / alluvial systems. The natural wetlands were also rated independently and achieved PES scores of B, while the EIS was rated as HIGH. This high rating was due to the fact that these systems retained water during the dry periods, and contained a higher faunal diversity.

The Moderate and High EIS rating for both natural water courses and wetlands, is further substantiated by the fact that the affected catchments are included in both the National Freshwater Priority Atlas and the provincial Biodiversity Spatial Plan Critical Biodiversity Area spatial layers (Figure 6-17 and Figure 6-18). The study area therefore contains Ecological Support Areas (ESA) related to the Pans and is linked to an NFEPA catchment (Figure 6-17 and Figure 6-18), which then resulted in the Very High Sensitivity rating of the study area in the DEFF Screening Tool.

Overall, these catchment areas and subsequent rivers / watercourses are largely in a natural state with localised impacts in some areas, which include the following:

- Erosion and sedimentation associated with road crossings;
- Grazing and trampling.

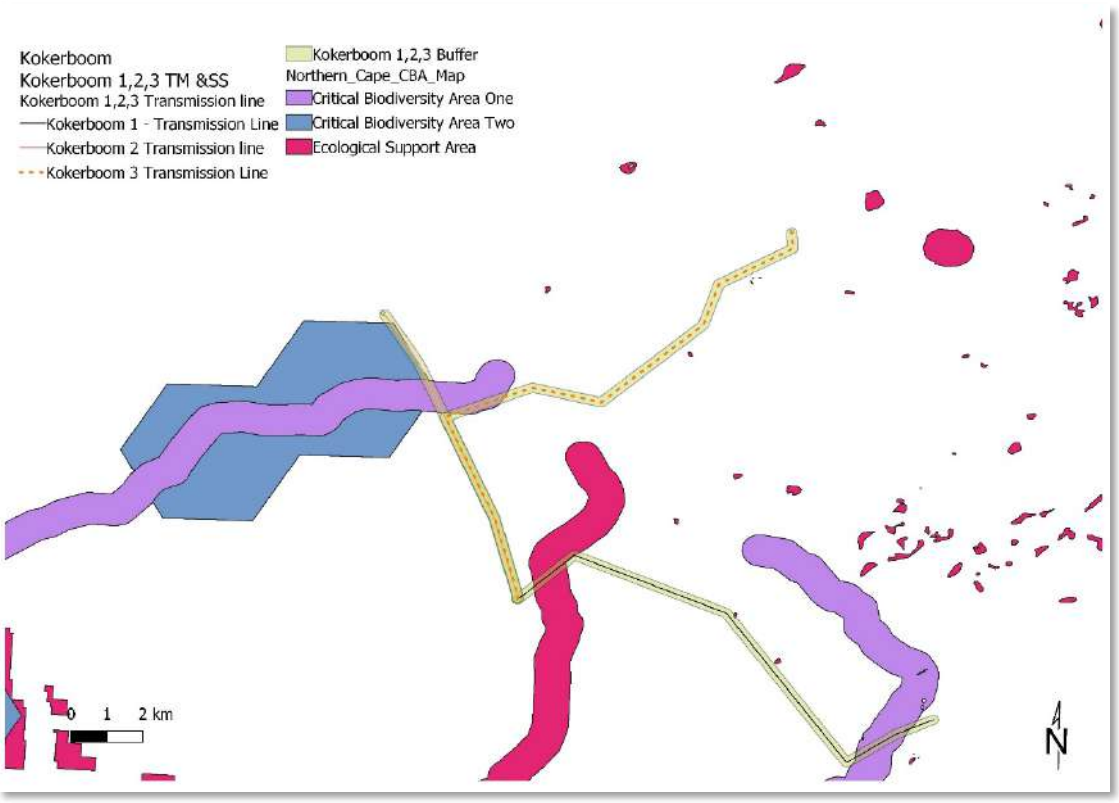


Figure 6-17: The Critical Biodiversity Areas as per the Northern Cape Biodiversity Spatial Plan (Oosthuysen & Holness 2016) in relation to the Wind Farm study area

Figure 6-18: The respective Sub-quaternary catchments rated in terms of Freshwater Ecosystem Priority Areas (FEPAs) (Nel *et al.*, 2011)

6.4.2 Site Sensitivity

This report fulfils the Biodiversity Specialist Assessment Report criteria for assessment listed under the various Theme Sensitivity Protocols, where the following sensitivity ratings were contained in the Screening Tool Report:

1. Animal Species Combined – **HIGH** related to a potential bird species which are assessed in a sperate assessment
2. Aquatic Biodiversity – **Very High** sensitivity related to presence of wetlands and Freshwater Ecosystem Priority Areas (NFEPA)
3. Plant Species – **Medium** sensitivity due to the potential presence of *Dregeochloa calviniensis*
4. Terrestrial Biodiversity – **Very High** sensitivity related to the presence the NFEPA listed under Point 2 above as well as the presence of Critical Biodiversity Area Type 1, Type 2 and Ecological Support Areas.

The verification of any of the Very High Sensitivity rated habitats / species localities is thus critical as the proposed development should then avoid these areas. During the screening assessment, a four-day site visit of the area was conducted in May 2020, in which the habitats / species listed above were considered, together with a description of the general environment and species assemblages found present. A site-specific assessment was conducted in June 2021, to ground truth the proposed infrastructure contained in this assessment.

This spatial data was then supplied to the Proponent to develop the layout outside of these areas (inclusive of suitable buffers) as a mechanism of impact avoidance using fine scale mapping data. The study area had received some much-needed winter rainfall, which aided in critically assessing the ecological character of the site, with reference to any linkages between the aquatic and terrestrial environment as indicated in the Screening Tool Results. The information collected, was also compared to previous assessments within the region by members of EnviroSci, used in the assessment of the wind farms that have been completed.

Several important national and provincial scale conservation plans were also considered, with the results of those studies where relevant being included in this report. Most conservation plans are produced at a high level, so it is important to verify or ground truth the actual status of the study area.

Using the baseline description and field data while considering the current disturbances and site characteristics, the following features were identified, then categorised into one of a number of pre-determined sensitivity categories to provide protection and/or guide the layout planning and design processes and shown in Figure 6-19.

Table 6-4: Pre-determined sensitivity categories to provide protection and/or guide the layout planning and design processes

High / No Go	Legislated "no go" areas or setbacks and areas or features that are considered of such significance that impacting them may be regarded as fatal flaw or strongly influence the project impact significance profile or areas / features that are considered to have a high sensitivity or where project infrastructure would be highly constrained and should be avoided as far as possible. Infrastructure located in these areas are likely to drive up impact significance ratings and mitigations
Moderate/ Medium	Areas that are deemed to be of medium sensitivity and should be avoided by all infrastructure with the exception of limited linear infrastructure which may traverse these areas with appropriate mitigation in place.
Low	Areas of low sensitivity or constraints that should be avoided by towers and buildings etc, but suitable for roads and transmission lines
Neutral	Unconstrained areas (left blank in mapping)

These proposed constraints which include the buffers related to the aquatic features (the most sensitive within the site) where complete avoidance is not possible are assessed in the impact assessment section later and suitable mitigation measures recommended to manage these residual impacts are proposed (i.e. any water course crossings).

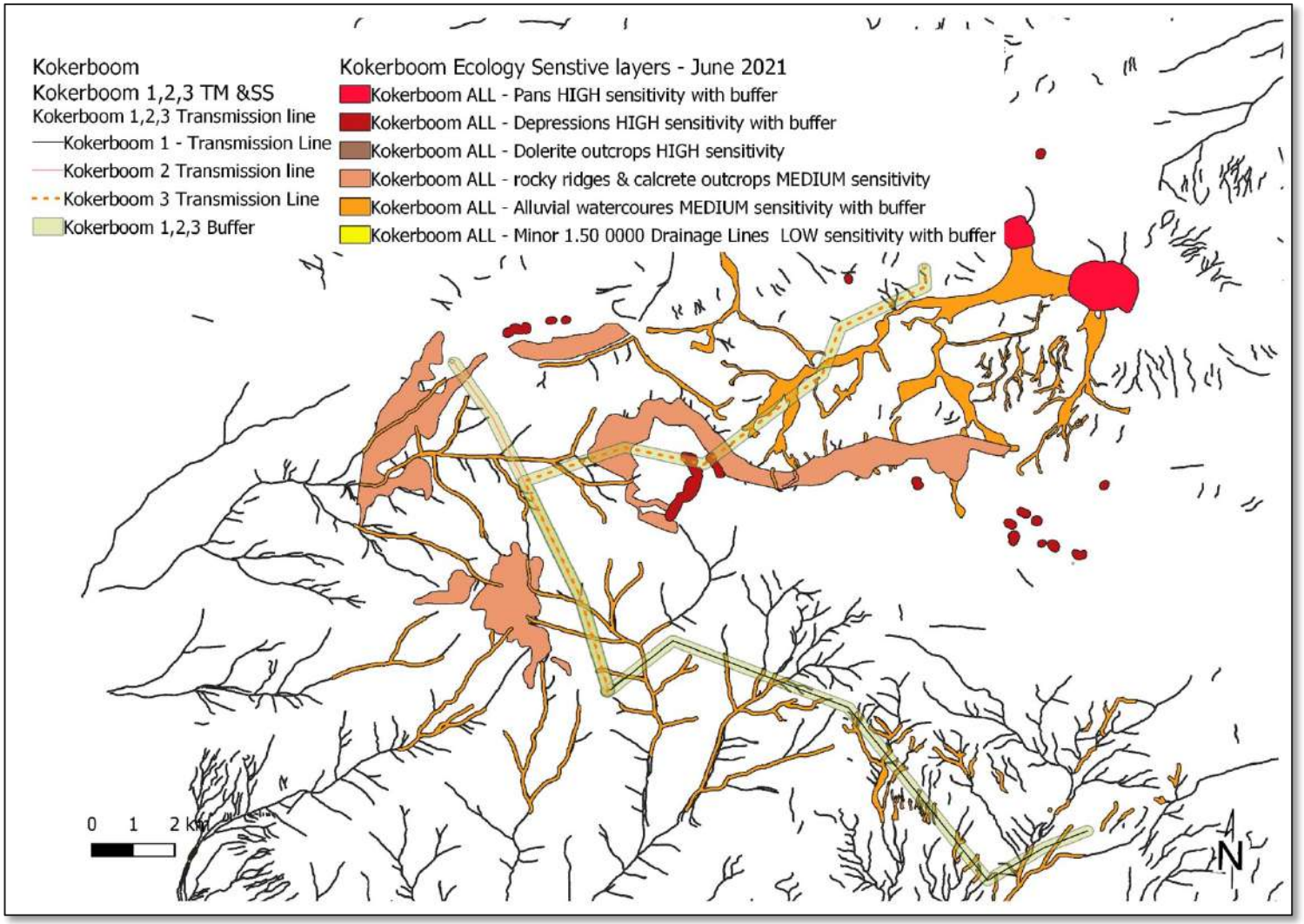


Figure 6-19: The respective sensitivity ratings for each of the various habitat types observed / delineated in this assessment in relation to the proposed layout

6.4.3 Impact assessment

The identified impacts have been individually assessed in this Section, with respect to the proposed layout and the sensitivity of the habitats observed. Note no important aquatic taxa were observed during this assessment, however it does not preclude terrestrial species that associates with riverine / depression habitat. For the purposes of this assessment the three alignments are assessed individually as follows:

Table 6-5: The following direct impacts were assessed, which are aligned with those contained in the Biodiversity Assessment Protocol and assessed against the proposed layout and potential activities

Biodiversity Assessment Protocol Impacts found applicable to this project	Impacts assessed in this report below
Faunal and vegetation communities inhabiting the site	Impact 1, 2, 3, 5 and 6
Fragmentation (physical loss of ecological connectivity and or CBA corridors)	Impact 1 and 2
Changes in numbers and density of species	Impact 1, 2 and 4
Water quality changes (increase in sediment, organic loads, chemicals or eutrophication	Impact 7
Hydrological regime or Hydroperiod changes (Quantity changes such as diversion)	Impact 8
Streamflow regulation	Impact 8
Erosion control	Impact 8
Cumulative Impacts	Impact 9 & 10

As highlighted above the following impacts on the aquatic environment have been identified

Construction and to a degree the Operational and Decommissioning Phases were relevant

- Impact 1: Direct loss of vegetation and or important habitat (terrestrial & aquatic – as these are linked in this environment) (Construction & Decommissioning)
- Impact 2: Direct loss of any faunal species (Construction & Operational)
- Impact 3: Direct loss of any species of special concern (Fauna & Floral) (Construction)
- Impact 4: Increase risk of alien plant invasion (Project lifespan)
- Impact 5: Damage or loss of alluvial riverine systems and wetlands systems and disturbance of the waterbodies in the construction phase (Construction & Decommissioning)
- Impact 6: Potential impact on localised surface water quality (Construction & Decommissioning)

Operational phase only

- Impact 7: Impact on aquatic systems through the possible increase in surface water runoff on form and function - Increase in sedimentation and erosion.

Construction and operational phase only

- Impact 8: Cumulative impacts on the terrestrial resources of the area
- Impact 9: Cumulative impacts on the aquatic resources of the area
- Impact 10: No-go option

Kokerboom 1, 2 and 3 transmission line and switching stations

Table 6-6: Impact 1, Direct of loss of vegetation and or important habitats

Project phase	**Construction**			
Impact	**Disturbance or destruction of aquatic species of special concern**			
Description of impact	During construction the proposed activities could result in the disturbance or destruction of the surrounding habitat, both terrestrial and aquatic. However as the very sensitive habitats will be avoided or spanned (Aquatic), impacts will occur within the vegetation units found throughout the greater region. The only residual impacts are related to the limited sources of topsoil disturbance, which then relates to long-term revegetation of areas such as the laydowns required.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	Develop and implement a Rehabilitation and Monitoring plan. This plan can be developed for the EMPr post Environmental Authorisation once the final tower positions, laydowns and access roads have been determined coupled to a final walk down.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	With the above mitigation in mind the derived impact significance above is agreed with.			
Cumulative impacts	The cumulative impact assessment considers the combined impact of the surrounding wind farms on the natural environment. Although the current state of the surrounding landscape is largely natural the cumulative impact would be Negligible. This is also coupled to the fact that the grid network for the 3 Kokerboom Wind Farms have been linked, and there won't be new transmission lines for each project to Helios MTS.			

Table 6-7: Impact 2, Direct of loss of faunal species

Project phase	**Construction and Decommissioning**			
Impact	**Disturbance or destruction of faunal species through noise and physical disturbance**			
Description of impact	During construction the proposed activities could result in the disturbance or destruction of the surrounding habitat. However as the very sensitive habitats will be avoided or spanned (aquatic), impacts will occur within the vegetation units found throughout the greater region. This coupled to the fact that the observed species, with the exception of the slower moving tortoises are highly mobile and will disperse to other available habitat within the region.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	Develop a Plant and Animal Search and Rescue Plan for implementation prior to any construction activities with the requisite permits in place as supplied by DENC. This plan can be developed for the EMPr post Environmental Authorisation once the final tower positions, laydowns and access roads have been determined coupled to a final walk down.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 2 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	With the above mitigation in mind the derived impact significance above is agreed with. It is advised that the Search and Rescue Plan is updated after a pre-construction walkdown, where the actual layout can be assessed once it has been pegged by a land surveyor.			
Cumulative impacts	The cumulative impact assessment considers the combined impact of the surrounding wind farms on the natural environment. Although the current state of the surrounding landscape is largely natural the cumulative impact would be Negligible.			

Table 6-8: Impact 3, Direct of loss of any species of special concern (Fauna & Flora)

Project phase	**Construction and Decommissioning**			
Impact	**Disturbance or destruction of faunal and floral species listed or protected**			
Description of impact	During construction the proposed activities could result in the disturbance or destruction of the surrounding habitat. Several animals and plants observed are protected under Provincial legislation.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	Develop a Plant and Animal Search and Rescue Plan for implementation prior to any construction activities with the requisite permits in place as supplied by DENC. This plan can be developed for the EMPr post Environmental Authorisation once the final tower positions, laydowns and access roads have been determined coupled to a final walk down.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 2 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	With the above mitigation in mind the derived impact significance above is agreed with. It is advised that the Search and Rescue Plan is updated after a pre-construction walkdown, where the actual layout can be assessed once it has been pegged by a land surveyor.			
Cumulative impacts	The cumulative impact assessment considers the combined impact of the surrounding wind farms on the natural environment. Although the current state of the surrounding landscape is largely natural the cumulative impact would be Negligible.			

Table 6-9: Impact 4, Increased risk of alien plant invasion

Project phase	**Construction, Operational and Decommissioning**			
Impact	**Increased in the numbers and types of alien plant species**			
Description of impact	Currently a small number (2) of alien species was found within the site, and with disturbance coupled to the fact that plant / machinery brought to site may contain soil/debris from other sites with seed, the potential for an increased spread of alien plants is possible			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	Develop alien management plan, for implementation during the construction phase, coupled to a detailed walkdown of the proposed layout. The management should then continue into all future phases of the project			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	With the above mitigation in mind the derived impact significance above is agreed with. It is advised that the Alien Management Plan is updated after a pre-construction walkdown, where the actual layout can be assessed once it has been pegged by a land surveyor.			
Cumulative impacts	The cumulative impact assessment considers the combined impact of the surrounding wind farms on the natural environment. Although the current state of the surrounding landscape is largely natural the cumulative impact would be Negligible.			

Table 6-10: Impact 5, Damage or loss of alluvial riverine systems and wetlands systems and disturbance of the waterbodies in the construction phase

Project phase	**Construction**			
Impact	**Damage or loss of alluvial systems, wetlands and water courses through the placement of new crossings or infrastructure.**			
Description of impact	Construction could result in the loss of alluvial riverine systems and wetland systems that are still functional and provide an ecosystem services within the site especially where new access roads are required. Loss can also include a functional loss, through change in vegetation type via alien encroachment for example. However aquatic systems rated with a High sensitivity have been avoided.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• A pre-construction walkthrough with an aquatic specialists is recommended and they can assist with the development of the stormwater management plan and Rehabilitation and Monitoring plan, coupled to micro-siting of the final layout where crossings occur. • All alien plant re-growth, which is currently low within the greater region must be monitored and should it occur, these plants must be eradicated within the project footprints and especially in areas near the proposed crossings. Prosopis (alien invasive tree) is prevalent in areas to the south of the site, thus care in transporting any material, while ensuring that such materials is free of alien seed, coupled with pre and post alien clearing must be stipulated in the EMPr. • Where roads and crossings are upgraded, the following applies: • All pipe culverts must be removed and replaced with suitable sized box culverts, where road levels are raised. • River levels, regardless of the current state of the river / water course will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a pre-construction walkdown. • Where large cut and fill areas are required these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation. • Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Short term	impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	With the above in mind the derived impact significance above is found acceptable.			
Cumulative impacts	The cumulative impact assessment considers the combined impact of the surrounding wind farms on the natural environment. Although the current state of the surrounding landscape is largely natural the cumulative impact would be Negligible			

Table 6-11: Impact 6, Potential impact on localised surface water quality (construction materials and fuel storage facilities) during the construction and decommissioning phases

Project phase	**Construction and Decommissioning**			
Impact	**Potential impacts on localised water quality, although unlikely due to the ephemeral nature of the systems, but would occur during when rainfall does occur**			
Description of impact	During construction earthworks will expose and mobilise earth materials, and a number of materials as well as chemicals will be imported and used on site and may end up in the surface water, including soaps, oils, grease and fuels, human wastes, cementitious wastes, paints and solvents, etc. Any spills during transport or while works are conducted in proximity to a watercourse has the potential to affect the surrounding biota. Leaks or spills from storage facilities also pose a risk and due consideration to the safe design and management of the fuel storage facility must be given.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• Any dust suppression must be kept to a minimum, to prevent the formation of pools, or runoff that may then contain pollutants. • All liquid chemicals including fuels and oil, including the BESS must be stored in secondary containment (bunds or containers or berms) that can contain a leak or spill. Such facilities must be inspected routinely and must have the suitable PPE and spill kits needed to contain likely worst-case scenario leak or spill in that facility, safely. • Washing and cleaning of equipment must be done in designated wash bays, where rinse water is contained in evaporation/sedimentation ponds (to capture oils, grease cement and sediment). • Mechanical plant and bowsers must not be refuelled or serviced within 100m of a river channel. • All construction camps, lay down areas, wash bays, batching plants or areas and any stores should be more than 50 m from any demarcated water courses. • Littering and contamination associated with construction activity must be avoided through effective construction camp management; • No stockpiling should take place within or near a water course; and • All stockpiles must be protected and located in flat areas where run-off will be minimised and sediment recoverable.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	Spills do occur, and these should be minimised through immediate clean up using spill kits, however with the above in mind the derived impact significance is found acceptable.			
Cumulative impacts	The cumulative impact assessment considers the combined impact of the surrounding wind farms on the natural environment. Although the current state of the surrounding landscape is largely natural the cumulative impact would be Negligible, coupled to the fact that the aquatic systems are largely ephemeral.			

Table 6-12: Impact 7, Impact on alluvial riverine systems and wetland systems through the possible increase in surface water runoff on form and function during the operational phase

Project phase	**Operation**			
Impact	**Impact on aquatic systems through possible increase in surface water runoff within the wind farm site.**			
Description of impact	Increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the riverine / wetland systems, which are currently ephemeral, i.e. riverine systems become tree rather than shrub dominated, with a loss in instream plant biodiversity through shading, which then results in habitat changes / loss.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. This stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses or similar) of exposed soil and the re-vegetation of any disturbed watercourses.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Long term	Impact will last between 10 and 15 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability		#N/A		#N/A
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	With effective stormwater management all the potential impacts can be minimised			
Cumulative impacts	The cumulative impact assessment considers the combined impact of the surrounding wind farms on the natural environment. Although the current state of the surrounding landscape is largely natural the cumulative impact would be Negligible.			

Table 6-13: Impact 8, Cumulative impacts on terrestrial resources

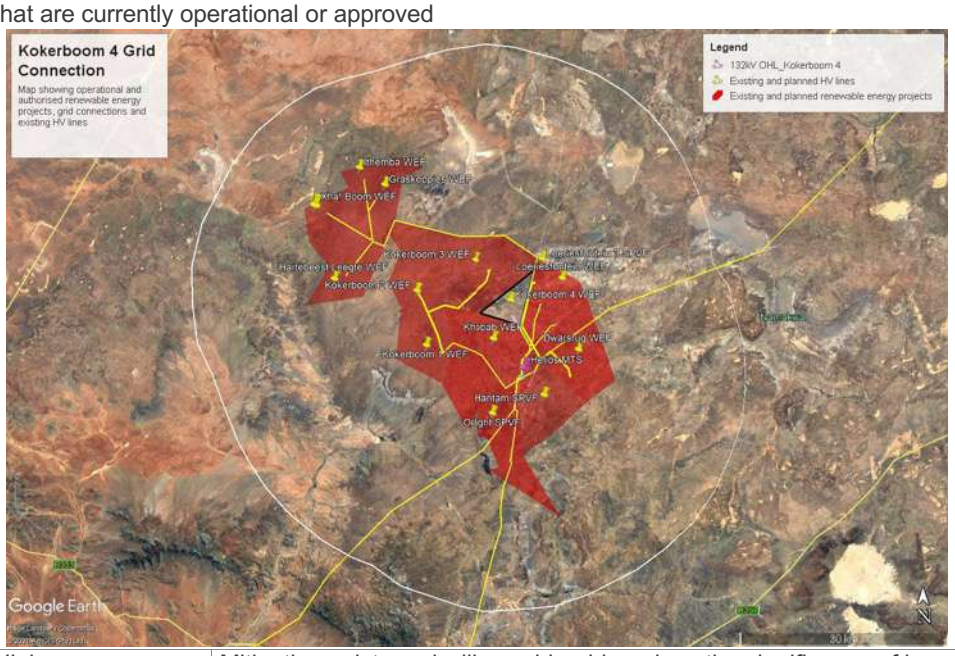
Project phase	**All phase combined**			
Impact	Cumulative Impact of the proposed grid connection on any terrestrial resources			
Description of impact	The cumulative assessment considers other grid connections located within 30 km of the project site that are currently operational or approved 			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	Refer to all mitigations measures already provided under individual impacts. The only additional mitigation measures may include: The project should share roads and infrastructure with neighbouring projects where possible to reduce the overall footprint and reduce stormwater and erosion and sedimentation related impacts			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	The projects are spread over larger areas, thus the potential cumulative impact of the projects together are likely to be Minor (-) without the proposed mitigations measures. With all cumulative mitigations (dealt with under foregoing impacts) together with the additional mitigations measures proposed here the impact could be reduced to negligible			
Cumulative impacts	N/A			

Table 6-14: Impact 9, Cumulative impacts on aquatic resources

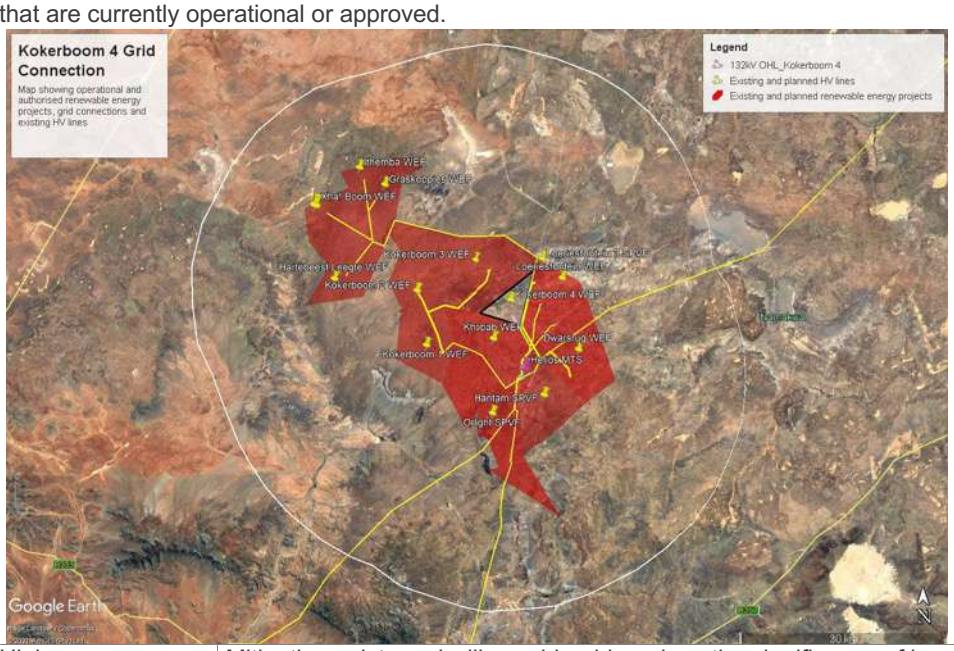
Project phase	**All phase combined**			
Impact	Cumulative Impact of the proposed grid connection on any aquatic resources			
Description of impact	The cumulative assessment considers other grid connections located within 30 km of the project site that are currently operational or approved. 			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	Refer to all mitigations measures already provided under individual impacts. The only additional mitigation measures may include: The project should share roads and infrastructure with neighbouring projects where possible to reduce the overall footprint and reduce stormwater and erosion and sedimentation related impacts			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Short term	impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	The projects are spread over larger areas, thus the potential cumulative impact of the projects together are likely to be Minor (-) without the proposed mitigations measures. With all cumulative mitigations (dealt with under foregoing impacts) together with the additional mitigations measures proposed here the impact can be reduced to negligible.			
Cumulative impacts	N/A			

Table 6-15: Impact 10, The No-go Alternative

Project phase	**NO GO alternative**		
Impact	**Combined impact on should the project not go ahead (i.e. the No Go Alternative).**		
Description of impact	Should the project not proceed, then current *status quo* with regard the terrestrial and aquatic environment would remain unchanged. Overall, the site is in a largely natural state and would remain so for an indeterminate amount of time as the natural environment already limits the extent of increased agricultural production.		
Mitigatability	Not applicable	Not applicable	
Potential mitigation	Not applicable		
Assessment	**Without mitigation**		**With mitigation**
Nature	Negative		NA
Duration	Long term	Impact will last between 10 and 15 years	
Extent	Limited	Limited to the site and its immediate surroundings	
Intensity	Negligible	Natural and/ or social functions and/ or processes are negligibly altered	
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	
Confidence	High	Substantive supportive data exists to verify the assessment	
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	
Significance	**Negligible - negative**		
Comment on significance	The impact on natural resources are likely remain in line with the status quo and the finding of negligible is deemed correct		
Cumulative impacts	The cumulative effect if all projects do not proceed would be negligible.		

6.4.4 Conclusion and Recommendations

Several Very High Sensitivity Habitats were observed and mapped, and these were then considered No-Go for any new infrastructure, while the remaining areas were rated as having a Low sensitivity, thus these areas could be considered for development. The proposed grid alignment and associated switching stations and substation upgrade areas, are well outside of the Very High sensitivity areas, inclusive of the 60m buffer for wetlands (depressions).

The Kokerboom 3 line does cross an alluvial watercourse, although the system was only rated as having a Medium sensitivity, it is still important that as much of the potential footprint is not located within this system. This should be assessed once tower positions can be determined together with a walkdown to position these in order to minimise the overall impact on this system

Based on then findings of this study and the impact assessment, the specialist finds no reason to withhold an authorisation of any of the proposed activities, assuming that key mitigations measures are implemented. This is based on the consideration that the Very High and High sensitivity areas have been avoided, inclusive of any buffers provided in this report.

6.5 Avifauna

In 2017, Avifauna Specialist, Chris van Rooyen, completed the study, *"Bird Impact Assessment Report for proposed 132kV Grid Connection"* for Proposed 132 KV Transmission Line Corridor from proposed Kokerboom WEFs to existing Helios Substation, near Loeriesfontein, Northern Cape.

The new proposed Kokerboom grid infrastructure layouts were provided to Avifauna Specialist, Chris van Rooyen in June 2021 to assess the potential new impacts.

A summary of the of the findings on birds and impact assessment are provided below. The assessment report is attached as Annexure D3.

6.5.1 Baseline Description

The study area is situated in an ecological transitional zone between the Nama Karoo and Succulent Karoo biomes (Harrison *et al*. 1997). The ecotonal nature of the study area is apparent from the presence of typical avifauna of both Succulent and Nama Karoo at the study area e.g. Karoo Eremomela *Eremomela gregalis* (Succulent Karoo) and Red Lark *Calendulauda burra* (Nama Karoo)(Figure 6-21). The study area is located on a vast flat plain with a mixture of gravel and sandy areas Figure 6-20. The vegetation consists of Bushmanland Basin Shrubland. Bushmanland Basin Shrubland consists of dwarf shrubland dominated by a mixture of low, sturdy and spiny (and sometimes also succulent) shrubs, 'white' grasses and in years of high rainfall also abundant annual flowering plants (Mucina & Rutherford 2006). A number of ephemeral drainage lines flow though the study area, but they only hold water for brief periods after rainfall events.

It is estimated that a total of 97 bird species could potentially occur in the broader area. Of these, 25 species are classified as priority species, and 17 has a medium to high likelihood of occurring regularly in the study area (Table 6-16). The study area is not located within an Important Bird Area (IBA). The closest IBA, Bitterputs Conservation Area SA036, is located approximately 60km north-east of the study area. The study area does not form part of a formally protected area. The closest protected area is the Knersvlakte Nature Reserve which is located approximately 90km away from the closest proposed transmission line corridor. The proposed developments are not expected to have any impact on the avifauna in this nature reserve due to the distance from the development.

Surface water is of specific importance to avifauna in this semi-arid environment. The study area contains a few ephemeral drainage lines, but these are generally dry for most of the year. The drainage lines hold water for a while after good rains, when it is attractive to various bird species, including large raptors, to drink and bath. It also serves as an attraction to waterbirds when it contains water, although it must be noted that the study site is generally dry for most of the year. Pools of standing water form in the drainage lines after good rains, which can last for several weeks, depending on the level of precipitation. The study area also contains boreholes with water reservoirs, where surface water becomes available in the form of water troughs, which is an important source of permanent surface water. These water troughs are a big attractant for birds, as they often are the only source of permanent surface water in the area.

The following avifaunal-relevant anthropogenic habitat modifications were recorded within the study area:

- **Water points:** The land use in the broader area is mostly small stock farming. The entire area is divided into grazing camps, with associated boreholes and drinking troughs. In this arid environment, open water is a big draw card for bird which use the open water troughs to bath and drink (Figure 6-22).
- **Transmission lines:** The broader area is bisected by several power lines. The Aries – Helios 1 400kV and Helios – Juno 400kV transmission lines traverse the study area. The transmission towers are used

by raptors for perching and roosting, and also for breeding. A Martial Eagle nest is present on the Helios – Juno 400kV transmission line approximately 2km from the Helios MTS.

Figure 6-20: An example of the gravel plains in the study area (left) and of sandy plains in the study area (right).

Figure 6-21: Red Lark, Calendulauda burra. (Source: www.avianleisure.com)

Figure 6-22: A borehole and water trough in the study area (left) and an ephemeral drainage line in the study area, filled with water after a rain event (right).

Table 6-16: Priority species occurring in the broader area. The likelihood of regular occurrence in the study area is also indicated.

Species	Taxonomic name	Full protocol reporting rate	Ad hoc reporting rate	Priority species	Red Data status: International	Red Data status: Regional	Raptor	Waterbird	Terrestrial	Corvid (crow)	Possibility of regular occurrence	Recorded during surveys	Karoo	Ephemeral drainage lines	Water points	Transmission lines	Displacement: Disturbance	Displacement: Habitat loss substations	Electrocution	Collisions
African Black Duck	*Anas sparsa*	1.61	0.00	x				x			L			x						x
Black-chested Snake Eagle	*Circaetus pectoralis*	6.45	1.64	x			x				M	x	x	x	x	x		x	x	
Black-headed Heron	*Ardea melanocephala*	1.61	1.64	x				x			L			x	x			x		
Blacksmith Lapwing	*Vanellus armatus*	4.84	0.00	x				x			L			x	x					
Black-winged Stilt	*Himantopus himantopus*	4.84	1.64	x				x			L			x						
Booted Eagle	*Hieraaetus pennatus*	1.61	0.00	x			x				L		x	x	x	x		x	x	
Burchell's Courser	*Cursorius rufus*	6.45	0.00	x	LC	VU			x		M	x	x				x	x		
Cape Crow	*Corvus capensis*	32.26	11.48	x						x	H	x	x			x			x	
Cape Teal	*Anas capensis*	1.61	0.00	x				x			L			x						x
Common Buzzard	*Buteo buteo*	1.61	0.00	x			x				L	x	x	x	x	x		x	x	
Egyptian Goose	*Alopochen aegyptiaca*	3.23	0.00	x				x			M	x		x	x				x	x
Greater Kestrel	*Falco rupicoloides*	77.42	11.48	x			x				H	x	x			x		x	x	
Jackal Buzzard	*Buteo rufofuscus*	4.84	4.92	x			x				M	x	x	x	x	x		x	x	
Karoo Korhaan	*Eupodotis vigorsii*	79.03	27.87	x	LC	NT			x		H	x	x				x	x		x
Kori Bustard	*Ardeotis kori*	1.61	0.00	x	NT	NT			x		L		x		x		x	x		x
Lanner Falcon	*Falco biarmicus*	11.29	0.00	x	LC	VU	x				M		x	x	x	x		x	x	
Ludwig's Bustard	*Neotis ludwigii*	40.32	6.56	x	EN	EN			x		H	x	x				x	x		x
Martial Eagle	*Polemaetus bellicosus*	25.81	18.03	x	EN	EN	x				H	x	x	x	x	x	x	x	x	
Northern Black Korhaan	*Afrotis afraoides*	17.74	0.00	x					x		M		x				x	x		x
Pale Chanting Goshawk	*Melierax canorus*	72.58	29.51	x			x				H	x	x	x	x	x		x	x	
Pied Crow	*Corvus albus*	88.71	32.79	x						x	H	x	x			x			x	
Rock Kestrel	*Falco rupicolus*	14.52	16.39	x			x				M		x			x		x	x	
Secretarybird	*Sagittarius serpentarius*	0.00	0.00								M	x	x	x	x			x		x
South African Shelduck	*Tadorna cana*	14.52	0.00	x				x			M			x						x
Spotted Eagle-Owl	*Bubo africanus*	16.13	0.00	x			x				M	x	x				x		x	

- EN = Endangered, VU = Vulnerable, NT = Near threatened, LC = least concern, L= Low, M = Medium, H = High

6.5.2 Site Sensitivity

The study area and immediate environment is classified as **High** sensitivity for avifauna according to the Terrestrial Animal Species Protocol[21] (Figure 6-23). The development site contains confirmed habitat for species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020, namely listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable. The occurrence of SCC was confirmed during the surveys i.e. Ludwig's Bustard (Globally and Regionally Endangered), Martial Eagle (Globally and Regionally Endangered) and Red Lark (Globally and Regionally Vulnerable) were recorded in the study area. Based on these criteria, the study area classification of **High** sensitivity for avifauna is confirmed.

The following environmental sensitivities were identified from an avifaunal perspective for the proposed transmission line grid connections (See Figure 6-24 for the avifaunal Highly sensitive areas which have been identified.):

- **High sensitivity (Mitigation required): Surface water.**

Included in this category are areas within 200m of water troughs, and all major drainage lines. Surface water in this arid habitat is crucially important for priority avifauna, including several Red Data species such as Martial Eagle, Lanner Falcon and Secretarybird. Drainage lines when flowing also attract waterbirds on occasion, as do the large pools that remain in the channel after the flow has stopped. Transmission line that are routed near these sources of surface water pose a collision risk to birds using the water for drinking and bathing, and drainage lines, when flowing, are natural flight paths for birds. Transmission line may be routed through High sensitivity buffers, but mitigation will be required in the form of Bird Flight Diverters.

- **High sensitivity (Mitigation required): Breeding Red Data species nests.**

Transmission lines are an important breeding substrate for raptors in the Karoo, due to the lack of large trees (Jenkins *et al.* 2013). The Aries – Helios 1 400kV and Helios – Juno 400kV transmission lines traverse the study area. The transmission towers are used by raptors for perching and roosting, and also for breeding. A Martial Eagle nest is present on the Helios – Juno 400kV transmission line approximately 2km from the Helios MTS. The nest has been intermittently active over the past five years. The territory is currently occupied by a pair of eagles. Construction activities within 1km of the nest during the breeding season (May – November) should be avoided. Normally a larger buffer would be required (i.e. at least 2.5km), but in this instance, the birds are already habituated to the movement of heavy vehicles due to the Granaatboskolk district road running within 500m of the nest.

[21] It should be noted that there is no Avian theme for transmission lines in the screening tool.

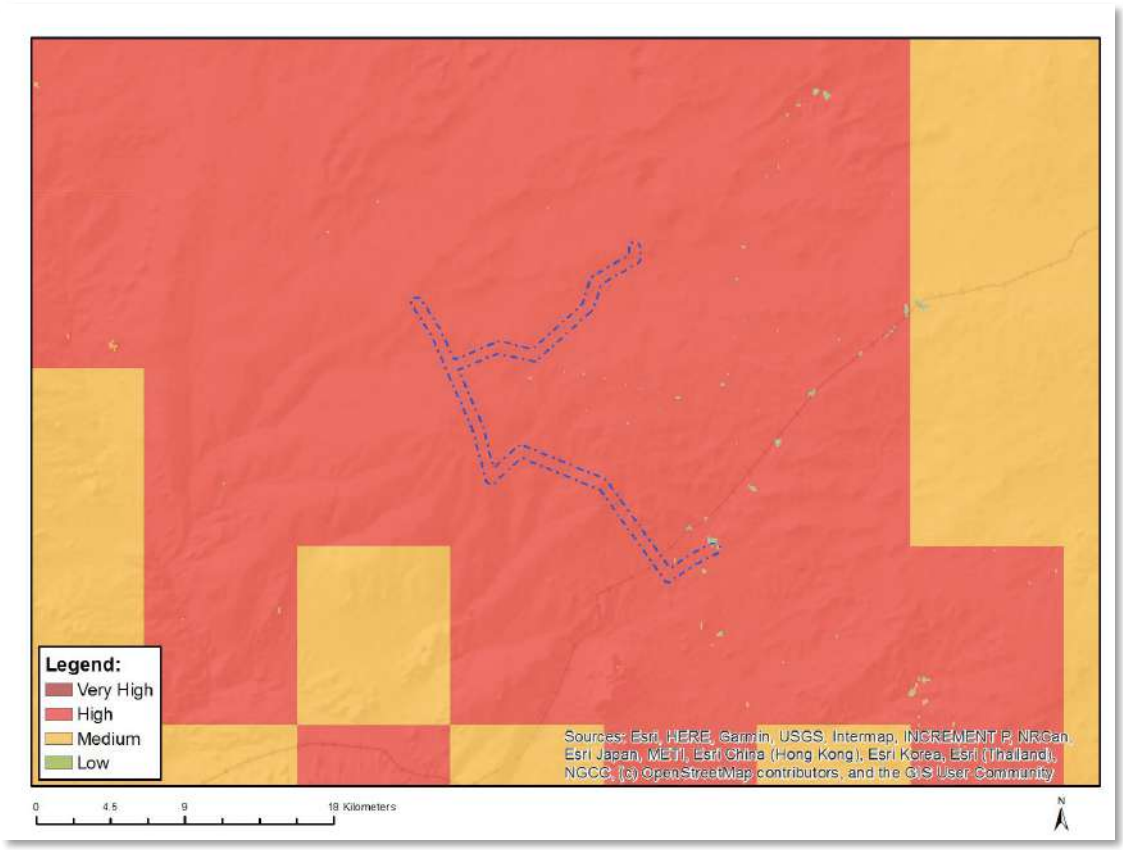


Figure 6-23: The National Web-Based Environmental Screening Tool map of the study area, indicating sensitivities for the Terrestrial Animal Species theme. The high sensitivity classification is linked to the occurrence of Ludwig's Bustard *Neotis ludwigii* and Red Lark *Calendulauda burra*.

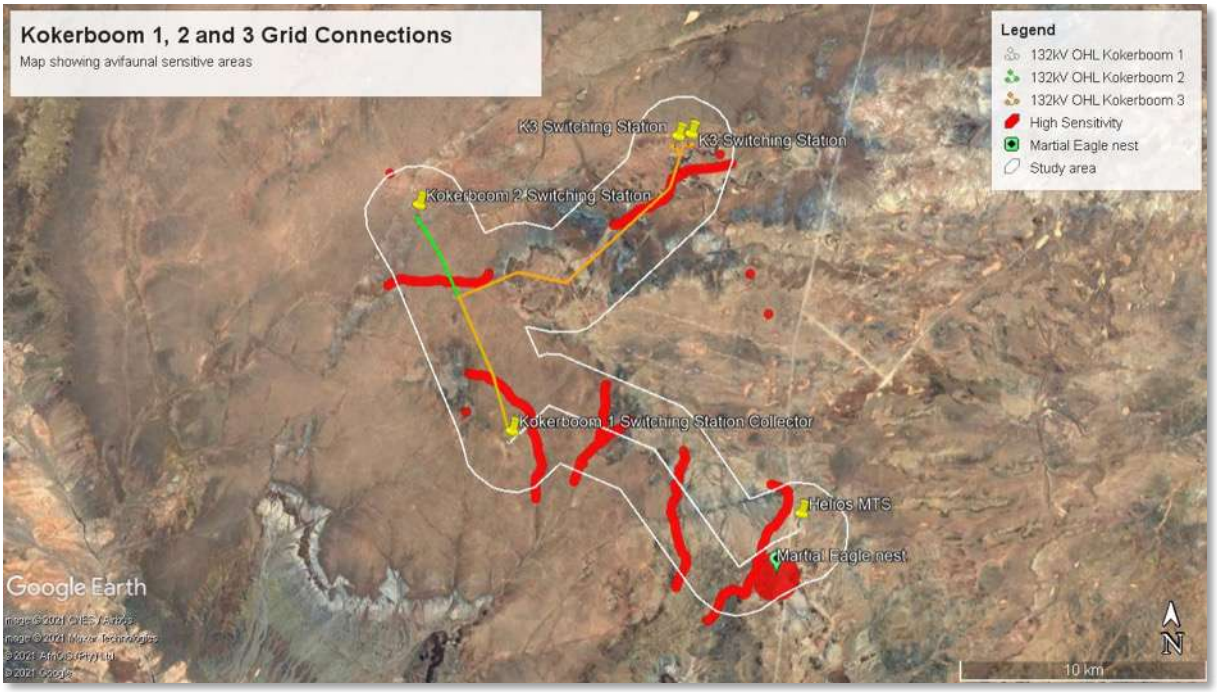


Figure 6-24: Avifaunal High sensitivity areas in the study area.

6.5.3 Impact assessment

Construction Phase Impacts

Apart from direct habitat destruction, the above-mentioned activities also impact on birds through disturbance; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests (Table 6-17). A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, although in practice that can admittedly be very challenging to implement. Ground nesting priority species are most likely to be affected by displacement due to disturbance.

It has already been mentioned that a Martial Eagle nest is present on the Helios – Juno 400kV transmission line approximately 2km from the Helios MTS, and 1.1km from the proposed Kokerboom 1 grid connection. The construction of the 132kV grid has the potential to be a source of disturbance which could lead to temporary displacement of the eagles.

Table 6-17: Displacement of priority bird species due to disturbance associated with construction of the grid and switching station

Project phase	**Construction**			
Impact	**Displacement of priority species**			
Description of impact	**Displacement of priority species due to disturbance associated with construction of the grid and switching station**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**•Construction activity should be restricted to the immediate footprint of the infrastructure. •Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. •Measures to control noise and dust should be applied according to current best practice in the industry. •Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum. •Construction activities within 1km of the Martial Eagle nest on the Helios – Juno 400kV transmission line should be avoided during the breeding season (May to November).**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	The risk of displacement will be significantly reduced if the proposed mitigation is implemented.			
Cumulative impacts	Low			

Operational Phase Impacts

During the construction of power lines, service roads (jeep tracks) and switching stations, habitat destruction/transformation inevitably takes place. The construction activities will constitute the following:

- Site clearance and preparation;
- Construction of the infrastructure (i.e. the on-site switching station, OHL and service road);
- Transportation of personnel, construction material and equipment to the site, and personnel away from the site;
- Removal of vegetation for the proposed switching stations and stockpiling of topsoil and cleared vegetation;
- Excavations for infrastructure;

These activities could impact on birds breeding, foraging and roosting in or in close proximity of the proposed onsite switching stations through transformation of habitat, which could result in temporary or permanent displacement. Unfortunately, very little mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the natural habitat within the construction footprint of the switching station yard is unavoidable (Table 6-18). Fortunately, due to the nature of the vegetation, and judged by the existing power lines, very little if any vegetation clearing will be required in the power line servitudes.

Table 6-18: Displacement of priority bird species due to habitat transformation associated with operation of the OHL and switching station.

Project phase	**Operation**			
Impact	**Displacement**			
Description of impact	**Displacement of priority species due to habitat transformation associated with the operation of the OHL and onsite switching station.**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**•Vegetation clearance should be limited to what is absolutely necessary. •The mitigation measures proposed by the vegetation specialist must be strictly enforced.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Long term	Impact will last between 10 and 15 years	Long term	Impact will last between 10 and 15 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	The risk of displacement of priority species, which is already low, will be further reduced after mitigation			

Collisions are the biggest threat posed by transmission lines to birds in southern Africa (Van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (Van Rooyen 2004, Anderson 2001) (Table 6-19).

Table 6-19: Mortality of priority species die to collision with the 132kV OHL

Project phase	**Operation**			
Impact	**Mortality of priority species**			
Description of impact	**Mortality of priority species due to collisions with the 132kV OHL**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**•The avifaunal specialist must conduct a walk-through prior to implementation to demarcate sections of powerline that need to be marked with Eskom approved bird flight diverters. The bird flight diverters should be installed on the full span length on the earthwire (according to Eskom guidelines - five metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors are strung.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	Immediate	Impact will self-remedy immediately
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	Although the marking of power lines has been proven to reduce collision mortality for most birds, there will be an ongoing residual risk of collisions with the OHL, due to the fact that no effective mitigation for bustard collisions is currently available.			
Cumulative impacts	Medium			

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (Van Rooyen 2004). The electrocution risk is largely determined by the pole/tower design. In the case of the proposed power line, no electrocution risk is envisaged because the proposed design of the 132kV line, namely the steel monopole and self-supporting lattice structures, should not pose an electrocution threat to any of the priority species which are likely to occur in the study area. Electrocutions within the proposed switching station yard are possible but should not affect the more sensitive Red Data bird species, as these species are unlikely to use the infrastructure within the switching station yard for perching or roosting (Table 6-20). Species that are more vulnerable to this impact are corvids, owls and certain species of waterbirds.

Table 6-20: Electrocution of priority species by the onsite switching station

Project phase	**Operation**			
Impact	**Mortality**			
Description of impact	**Electrocution of priority species in the onsite switching station**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**•The hardware within the proposed switching station yard is too complex to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded once operational, site specific mitigation (insulation) be applied reactively. This is an acceptable approach because Red Data priority species is unlikely to frequent the switching station and be electrocuted.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	On-going	Impact will last between 15 and 20 years	On-going	Impact will last between 15 and 20 years
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	The residual risk of electrocution will be low once mitigation is implemented.			
Cumulative impacts	Low			

Decommissioning Phase Impacts

Decommissioning activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests (Table 6-20).

Table 6-21: Displacement of priority bird species due to disturbance associated with decommissioning of the grid and switching station

Project phase	**Decommissioning**			
Impact	**Displacement**			
Description of impact	**Displacement of priority species due to disturbance associated with decommissioning of the grid and onsite substation**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**•Decommissioning activity should be restricted to the immediate footprint of the infrastructure as far as possible. •Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. •Measures to control noise and dust should be applied according to current best practice in the industry. •Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum. •The existing transmission lines must be inspected for active raptor nests prior to the commencement of the decommissioning activities. Should any active nests be present, decommissioning activities during the breeding season should be avoided if possible.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year
Extent	Very limited	Limited to specific isolated parts of the site	Very limited	Limited to specific isolated parts of the site
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	High	Natural and/ or social functions and/ or processes are notably altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	The risk of displacement will be significantly reduced if the proposed mitigation is implemented.			
Cumulative impacts	Low			

Cumulative impacts

The following cumulative impacts are envisaged for the Kokerboom 1, 2 and 3 grid connections:

- Displacement of priority species due to disturbance associated with the construction activities of the 132kV OHL and switching stations.
- Displacement of priority species due to habitat destruction associated with the construction activities of the 132kV OHL and switching stations.
- Mortality of priority species due to electrocutions in the switching stations.
- Mortality of priority species due to collisions with the 132kV OHL.
- Displacement of priority species due to disturbance associated with the decommissioning activities.

The most significant impact of the proposed grid connections and all the other grid connections associated with the existing and authorised renewable energy facilities within the 30km radius around the current project, is the potential for priority species mortality through collisions (Figure 6-25). The impacts of electrocution and displacement associated with the proposed grid connections are relatively minor compared to the envisaged collision impacts. This is especially relevant for large terrestrial species, particularly Ludwig's Bustard, which is highly susceptible to power line collisions. The proposed Kokerboom 1, 2 and 3 132kV grid connections will add a total of approximately 43km to the existing and planned HV network:

- Kokerboom 1: approximately 16km
- Kokerboom 2: Approximately 10km
- Kokerboom 3: Approximately 19km

The existing and authorised HV network in the 30km area equates to approximately 217km of HV transmission line. When viewed per project, the cumulative impact of each project will be **low,** with Kokerboom 1, 2 and 3 representing an approximate 7%, 5% and 8% increase respectively in the in the authorised and existing HV network. However, the combined Kokerboom 1, 2 and 3 grid connections come to approximately 43km, which constitute an approximate 20% increase in the authorised and existing HV network. The overall cumulative impact of the proposed grid connections, when viewed with the impacts of existing HV lines on avifauna, and the potential impacts of the grid connections of the authorised renewable energy facilities (taking into account the mitigation measures proposed for those grid connections by the avifaunal specialists), is assessed to be of **medium** significance. It could be reduced to some extent with mitigation but will remain at a **medium** level as far as power line collisions are concerned.

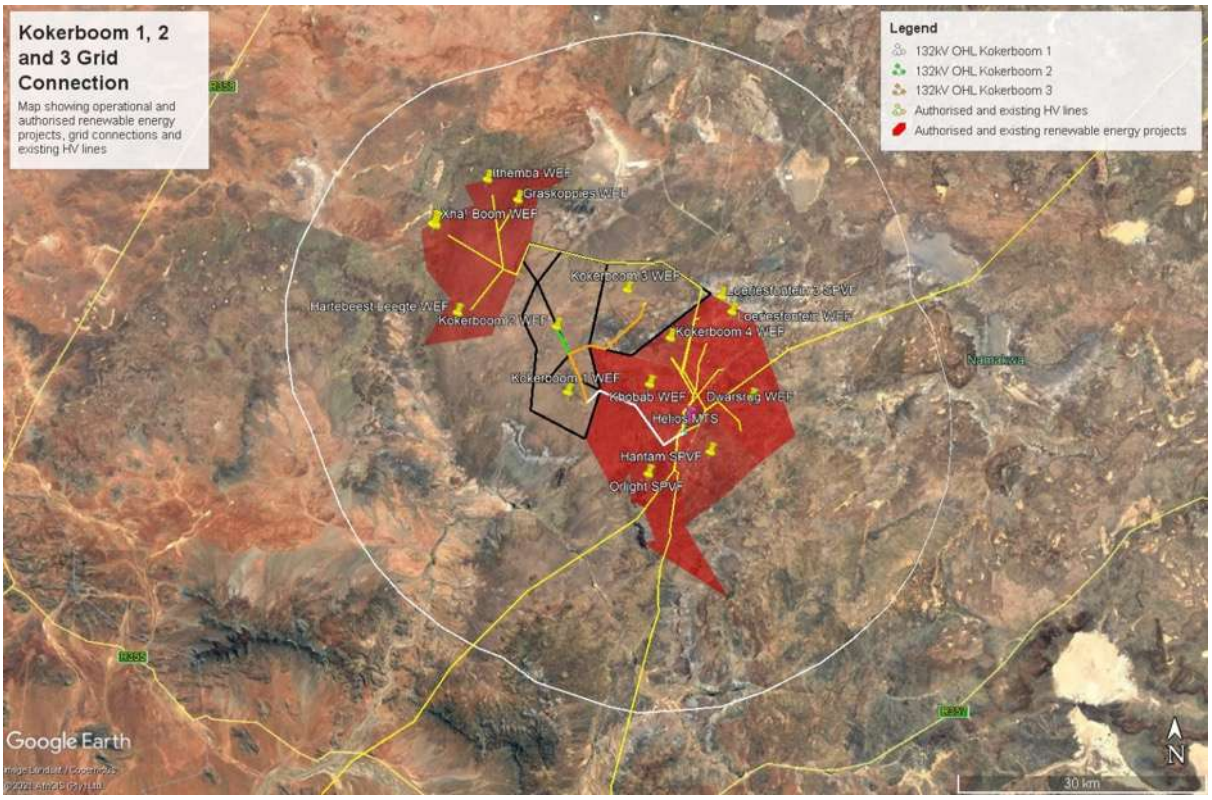


Figure 6-25: Map showing location of land parcels with operational and authorised renewable energy projects and grid connections within a 30km radius around the study area.

No-go alternative

The no-go alternative will result in no additional impacts on avifauna and will result in the ecological *status quo* being maintained, which will be to the advantage of the avifauna. However, no fatal flaws were identified during the investigations.

6.5.4 Conclusion and Recommendations

The expected impacts of the Kokerboom 1, 2 and 3, 132kV grid connections were rated to be of Minor to Moderate significance and negative status pre-mitigation. However, with appropriate mitigation, the post-mitigation significance of the identified impacts of each grid connection should be reduced to Negligible to Minor negative (see Table 7 above). It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the Impact Tables (Section 9 of the report) and the EMPr (Appendix D) are strictly implemented.

6.6 Archaeology and Heritage

The proposed Kokerboom grid infrastructure layouts were provided to Archaeologist and Heritage specialist, Jayson Orton in June 2021 to assess the potential impacts.

A summary of the of the findings on archaeology and heritage including an impact assessment is provided below. The assessment report is attached as Annexure D4.

6.6.1 Baseline Description

Beaumont *et al.* (1995:240) have stated that "Thousands of square kilometres of Bushmanland are covered by a low density lithic scatter". Many impact assessments have found this to be true, although it can be stated that the scatter tends to be more noticeable in northern Bushmanland than in the south. The artefacts include material dating to the Early (ESA), Middle (MSA) and Late (LSA) Stone Ages.

In the general vicinity of the present study area Van Schalkwyk (2011) found Stone Age sites to be associated with hills – they were either located on the crests or at the foot of the hills and were from both the MSA and the LSA. In contrast, Orton (2017a, 2017b, 2017c) found MSA material to be more frequent on the lowlands and generally attributable to background scatter, while LSA sites were focused on hills. Orton (2013) found a few small LSA artefact scatters associated with both hill tops and the margins of the Klein Rooiberg River to the southeast. In addition to widespread but low density MSA artefacts forming part of the background scatter, Webley and Halkett (2012) also reported small LSA sites located on the crests of low hills a short distance to the south of the present study area. These sites revealed primarily stone artefacts and ostrich eggshell, although one had pottery and a bead on it. They found another site, located close to a stream bed, which had a number of grooved grindstones on it.

Beaumont and Morris (1985 in Morris 2013) found dense LSA sites around pans to the west of Brandvlei (well to the east of the present study area). The finds included scatters of stone artefacts, pottery and ostrich eggshell, the latter perhaps having originated from water containers. A later survey by Morris (1996) to the north of the present study area yielded further similar sites on dunes associated with pans; he also recorded ostrich eggshell beads and pottery there.

Also to the east, Rudner and Rudner (1968) recorded engravings on dolerite outcrops as well as occupation sites dating to the LSA. These sites included stone artefacts, pottery, ostrich eggshell beads and stone features that may have been the remnants of hut circles and/or kraals.

Fourie (2011), who found nothing during his survey, reports the oral testimony of a Loeriesfontein farmer regarding the presence of rock art and engravings in the area and also that a cache of ostrich eggshell flasks had been found on his farm. Such caches have been reported from various parts of western South Africa (Henderson 2002; Jerardino *et al.* 2009; Morris 1994; Morris & Von Bezing 1996; Parkington 2006) and date to the LSA. Similar flasks are on display in the Fred Turner Museum in Loeriesfontein along with several bored stones and soapstone pipes from farms in the general region.

Other surveys have yielded low density scatters of stone artefacts of varying age (Fourie 2017b, 2017c, 2017f; Kaplan 2008; Morris 2007, 2013), while some, despite large areas being surveyed, found nothing at all (Fourie 2011, 2017a, 2017d, 2017e; Van der Walt 2012, 2013).

The only historical archaeological material reported came from the farm Kleine Rooiberg, a short distance south of the present study area (see Figure 2). It consisted of ceramic, glass and metal fragments thought to date to the early 20th century (Webley & Halkett 2012).

6.6.2 Site Sensitivity

A large number of archaeological sites have been recorded in the larger study area for the Kokerboom 1 to 3 WEFs through which the proposed transmission line route runs. Most have been described in the reports for the WEF projects and therefore only those falling within the 300 m wide corridor are reported here along with two small sites (waypoints 1954 & 1955) that fall just outside the corridor but have not been reported elsewhere (Table 6-22). All the recorded sites except that at waypoint 173 lie within the Kokerboom 1 section of the corridor. Rare background scatter artefacts were occasionally seen. These are Pleistocene-aged materials, likely all from the MSA, and are of no concern due to their poor context.

Table 6-22: List of archaeological heritage sites recorded in the transmission line corridors. The list is organised such that the records are in order starting from the southeast.

Waypoint	Co-ordinate	Description	Significance	Grade
1951	S30 30 38.6 E19 32 26.5	An isolated broken lower grindstone that has extensive pitting on its surface indicating use as an anvil as well.	Very low	GPC
527	30 29 37.3 1931 07.2	A round piled stone circle about 1.5 m in diameter. The stones are piled highest towards the north and those along the southern edge might just be natural in which case the structure would be C-shaped. There was one tortoise bone and three ostrich eggshell fragments immediately outside it.	Low **Record**[22]	GPB
398	S30 28 47.9 E19 30 21.2	Four fresh hornfels artefacts on top of a hill.	Very low	GPC
526	S30 28 16.4 E19 29 56.2	A scatter of CCS and hornfels flaked stone artefacts about 20 m in diameter on a hilltop. Mostly CCS. [Recorded as waypoint 393 in Orton 2017a, 2017b.]	Medium-Low **4 hours**	GPB
1952	S30 28 16.0 E19 29 59.6	A scatter of LSA CCS and hornfels artefacts of about 30 m diameter. This is a waypoint in a second artefact concentration in the greater scatter on this hilltop.	Medium-Low **6 hours**	GPB
1953	S30 28 02.0 E1929 28.8	A small discrete LSA hornfels scatter of 3 m diameter on top of a hill.	Low	GPC
1954	S30 28 04.4 E19 29 07.5	Very ephemeral LSA CCS scatter on a hilltop. [Just outside corridor but included as not reported earlier.]	Very low	GPC
1955	S30 28 04.5 E19 29 01.5	A small discrete LSA hornfels scatter of 5 m diameter on top of a hill. [Just outside corridor but included as not reported earlier.]	Low	GPC
173	S30 26 06.9 E19 25 31.2	Small scatter of historical ceramic fragments on an isolated hill.	Very low	GPC

Interestingly, most of the sites are associated with the area of hills in the central part of the Kokerboom 1 portion of the study area. One of these is a small circular piled stone enclosure. It is higher on the northern side. It has many bushes in and around it which made it difficult to record. It is likely that the site functioned as a small screen behind which people hid for hunting purposes (Figure 6-26).

[22] The red text indicates the mitigation that would be required if the site is to be disturbed during construction (hours indicates the hours of sampling/ recording time needed on site)

Figure 6-26: Small circular piled stone feature built on a dolerite outcrop at Waypoint 527. This view faces towards the north and the walling can be seen behind the central bush.

The most significant site was a very large scatter of LSA stone artefacts (Figures 14) over the top of the highest hill in the area (Figure 15). There appear to be two concentrations of artefacts each about 20 m to 30 m in diameter. Whether these represent a single larger occupation is not known, but it is most likely that the site is a palimpsest formed through multiple short term occupations of this hilltop over a period of time. One historical site was found within the transmission line corridors. This was a small scatter of ceramic fragments located atop a small isolated hill (Figure 16). Historical ceramics have been seen in several location in the wider Kokerboom WEF study area. It is also generally not uncommon to find a broken ceramic item (often only with a few pieces present). In the present instance, however, the scatter was very small but yet two or more vessels were represented.

No graves were seen in the study area and, due to the generally rocky substrate, the chance of finding graves is very limited. No historical materials aside from the archaeology noted above were seen in the study area.

Historical aspects and the Built environment

Van Schalkwyk (2011) reported an early 20th century farmstead constructed of stone and brick with corrugated iron roof. It is unlikely that many earlier farmsteads would be present because this harsh landscape was only permanently settled in relatively recent times. This is borne out by the fact that the two farms under study were only surveyed in 1898. Prior to this, Van Schalkwyk (2011) notes that Dutch-speaking trek boers would have used the area on a seasonal basis. It was only after the 1870s introduction of wind pumps that water was more readily available and the area became more amenable to farming (Webley & Halkett 2012).

Van Schalkwyk (2011) found an unusual house on the farm portion to the east of the study area that was built of clay and bricks and then cladded with corrugated iron sheeting. He thought it to date to approximately the 1920s. Another corrugated iron house nearby was visited by Orton (2013) who described a well-maintained stone livestock enclosure (‘kraal’), a recent but traditionally-styled cooking shelter (‘kookskerm’) and another outbuilding. Van Schalkwyk (2011: fig. 8) also illustrates (but does not

describe) another farmhouse from the region – it is far grander than that noted above and looks to be from the early to mid-20th century. Loeriesfontein, the nearest town to the site, was first established in 1894 by Frederik Turner who built a shop, the first building in Loeriesfontein. Once the shop was established, the town slowly grew around it. Van Schalkwyk (2011) and Orton (2013) both described a small graveyard with two graves near the 1920s house mentioned above; one was dated to 1913. Van Schalkwyk (2011) also illustrated (but did not describe) an isolated grave.

Figure 6-27: A few crypto-crystalline silica and hornfels artefacts from the large hilltop scatter at waypoints 526 & 1952.

Figure 6-28: View across the hilltop where the large LSA stone artefact scatter was found. It is one of the most prominent hills in the area.

Figure 6-29: Ceramic fragments from the hilltop scatter at waypoint 173.

Cultural landscapes and scenic routes

The site has a very weakly developed cultural landscape since the majority of anthropogenic interventions relate to farm tracks and fences. The landscape is largely a natural one (although it does still have cultural

significance for its aesthetic value), but has now been compromised by two neighbouring wind farm developments, the Helios Substation and associated power lines, and the Sishen-Saldanha railway line which create a new 'cultural' layer on the landscape. The adjacent gravel road is not considered a scenic route.

6.6.3 Impact assessment

The only aspects of heritage that require formal assessment are archaeology and the cultural landscape. Palaeontological impacts are considered in a separate specialist study. Note the two pylon types are no different to one another in terms of heritage impacts. The assessments below thus apply equally to both.

Impacts to archaeological resources

Direct impacts to archaeological resources would occur during the construction phase only. Because of the relatively low local cultural significance of the archaeological materials found, the extent of impacts is local. Total destruction would result in a potentially high intensity but, because of the corridor approach, the probability has only been rated as likely. The overall impact calculates to moderate negative (Table 3). Impacts to archaeological sites are generally very easy to mitigate because the sites can be excavated, sampled and recorded as required. As such, the significance rating post-mitigation becomes minor negative, although a rating of negligible perhaps better reflects the real situation (Table 6-23). There are no fatal flaws.

Table 6-23: Assessment of construction phase archaeological impacts.

Project phase	**Construction**			
Impact	**Destruction of archaeological resources**			
Description of impact	**Destruction of and damage to archaeological materials during earthmoving activities**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	- Pre-construction survey of any hilltops or potentially sensitive - Archaeological excavations, sampling and recording of sites.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Permanent	Impact may be permanent, or in excess of 20 years
Extent	Local	Extending across the site and to nearby settlements	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Negligible	Natural and/ or social functions and/ or processes are negligibly altered
Probability	Likely	The impact may occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	High	The resource is irreparably damaged and is not represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	The significance rating is driven mostly by the fact that impacts to archaeology are permanent. The post-mitigation impact would probably be negligible.			
Cumulative impacts	Cumulative impacts are expected to be of low significance.			

Impacts to the cultural landscape

Impacts to the cultural landscape would occur during the construction and operation phase due to the introduction of incompatible structures and construction machinery to the rural landscape. Construction would not last for long (short term), however, and the structures would not be visible from a very long way off (moderate intensity). Because of this the significance calculates to minor negative (Table 6-24). The construction equipment would likely have the greatest impact. For this reason, once the transmission line and switching station are established, the intensity drops. However, the duration increases to permanent and this is the main reason for the calculated operation phase impacts being moderate negative (Table 6-25). Given the other electrical infrastructure already present in the landscape a rating of minor negative is probably more appropriate. There are no fatal flaws in terms of impacts to the cultural landscape.

Table 6-24: Assessment of construction phase impacts to the cultural landscape.

Project phase	**Construction**			
Impact	**Intrusion into the cultural landscape of incompatible structures**			
Description of impact	**Alteration of the landscape through its transformation from a rural to an industrial nature and visual disturbance from construction vehicles.**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	**- None feasible**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	Impact will last between 1 and 5 years	Short term	Impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environment will be able to recover from the impact	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	The minor significance is largely due to the short term of construction impacts and the fact that other similar developments already exist in the area.			
Cumulative impacts	Cumulative impacts are expected to be of low significance.			

Table 6-25: Assessment of operation phase impacts to the cultural landscape.

Project phase	**Operation**			
Impact	**Intrusion into the cultural landscape of incompatible structures**			
Description of impact	**Alteration of the landscape through its transformation from a rural to an industrial nature.**			
Mitigatability	Low	Mitigation does not exist; or mitigation will slightly reduce the significance of impacts		
Potential mitigation	None feasible			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Permanent	Impact may be permanent, or in excess of 20 years	Permanent	Impact may be permanent, or in excess of 20 years
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environment will be able to recover from the impact	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Moderate - negative**	
Comment on significance	The main driver of significance is the long duration. An impact of minor negative is probably more accurate.			
Cumulative impacts	Cumulative impacts are expected to be of low significance.			

Existing impacts to heritage resources

There are currently no obvious threats to archaeological heritage resources on the site aside from the natural degradation, weathering and erosion that will affect archaeological materials. Trampling from grazing animals and/or farm/other vehicles could also occur. These impacts would be of negligible negative significance. The cultural landscape is already heavily compromised through the addition of a new electrical layer. The site is quite remote and does not have a high degree of aesthetic significance which means the existing impacts to the cultural landscape are likely to be of minor negative significance.

The No-Go alternative

The No-Go alternative would involve not constructing the proposed project. The effect would be that the associated Kokerboom 1, Kokerboom 2 and Kokerboom 3 WEFs, if authorised and constructed, would not be able to feed power into the national grid. While the impacts to heritage resources for the No-Go option would effectively be negligible to minor negative as per the existing impacts above, the loss of power to the grid would have socio-economic impacts for South Africa.

Cumulative impacts

Electrical projects considered in this cumulative impact assessment are listed in Appendix 2. However, non-electrical projects also affect heritage resources.

Cumulative impacts to archaeological resources are very difficult to assess accurately since it is clear from the desktop study that (1) archaeological surveys are variable in quality and/or (2) archaeological resources are extremely variably distributed on the landscape. Professional experience suggests that

sites of high significance are rare and usually occur in areas avoided by developments for environmental reasons. Cumulative impacts to archaeology are thus likely to be low, especially since the survey reported here found no significant archaeology.

The cultural landscape has already been compromised by the various other electrical facilities (substations, WEFs and the Transnet Railway Line) which have effectively established this area for power generation. The addition of this new transmission line will thus not have a significant cumulative impact because its contribution to the impacts will be very small. Construction of the project will result in a cumulative benefit to South Africa through the improvement of its electricity supply.

Levels of acceptable change

Any impact to an archaeological or palaeontological resource or a grave is deemed unacceptable until such time as the resource has been inspected and studied further if necessary. Impacts to the landscape are difficult to quantify but in general a development that visually dominates the landscape from many vantage points is undesirable. Although the transmission lines and switching stations have tall components, they would be seen against the various other existing facilities in the area and would thus not add new dominating features. In this context the proposed developments are acceptable.

Evaluation of impacts relative to sustainable social and economic benefits

Section 38(3)(d) of the NHRA requires an evaluation of the impacts on heritage resources relative to the sustainable social and economic benefits to be derived from the development. The proposed development will assist with the provision of electricity for use in South Africa. This is deemed an important function because of the historical and ongoing problems associated with South Africa's electricity supply. The construction phase for the projects will also provide an increase in jobs for the local population. None of the heritage impacts (which are of generally low significance after mitigation) is considered to be more important than these social and economic benefits.

6.6.4 Conclusion and Recommendations

There are no highly significant heritage concerns for this project. Some archaeological sites will require sampling and recording, but this is easily effected and does not influence the approval of the project. Although only the preferred alignment within the 300 m wide corridors was assessed on the ground, the possibility still exists of avoiding some or all of the sites because micro-siting can still occur. As such, no highly significant impacts are expected and there are no fatal flaws. There are no areas requiring avoidance, but obviously best practice suggests that those sites that can be avoided should be, if feasible. The single heritage indicator proposed for the project will be easily met (Table 6).

6.7 Palaeontology

The proposed Kokerboom grid infrastructure layouts were provided to Palaeontological specialist, John Almond in June 2021 to assess the potential impacts.

A summary of the of the findings on palaeontology including an impact assessment is provided below. The assessment report is attached as Annexure D5.

6.7.1 Baseline Description

Geological Context

The Kokerboom 1-4 Wind Farm grid connection project area is characterised by gently-undulating terrain with low hills, few rocky *kranzes* (ridges or scarps), shallow, usually dry water courses and extensive gravelly *vlaktes* (plains). The landscape is mantled in low karroid *bossieveld* with few, small trees along water courses and in rocky areas. In general levels of bedrock exposure are very low indeed due to the pervasive cover by superficial sediments (alluvium, colluvium, surface gravels, pedocretes *etc*); it is mainly limited to sporadic small dolerite *koppies*, stream beds, low scarps, erosion gullies as well as the margins of pans and dams. Several borrow pits, mainly situated along the Loeriesfontein – Pofadder dust road, provide important additional windows into the subsurface geology.

The Loeriesfontein region lies towards the north-western edge of the Main Karoo Basin of South Africa (Johnson *et al.* 2006). The geology of the combined grid connection project area is shown on 1: 250 000 geology sheet 3018 Loeriesfontein (Macey *et al.* 2011) and has been described and illustrated by Almond (2017a) (See black rectangle in Figure 6-30). The sedimentary bedrock successions represented within the grid connection project area are predominantly basinal mudrocks assigned to the Early to Middle Permian **Ecca Group** (**Karoo Supergroup**). They become broadly younger towards the east, although this pattern is largely obscured by much later, extensive dolerite intrusions. The three Ecca Group subunits represented in the study area include (1) dark mudrocks and fine-grained sandstones of the **Prince Albert Formation**; (2) white-weathering carbonaceous mudrocks of the **Whitehill Formation** followed by grey-green mudrocks and wackes (impure sandstones) of the **Tierberg Formation** . Early Jurassic sills of the **Karoo Dolerite Suite** (Jd) intrude the Ecca Group country rocks over large areas, especially towards the north and west. In addition, several **breccia pipes** associated with Karoo dolerite intrusion occur within the area, but are unmapped. Swarms of such intrusive pipes are well known from the Karoo region north of Loeriesfontein where they are especially abundant in the Prince Albert Formation outcrop area but also pierce through the overlying Whitehill rocks (*cf.* Macey *et al.* 2011, Almond 2014c). A range of **Late Caenozoic superficial sediments** - mostly unconsolidated and probably of Quaternary to Recent age – represented within the project area include alluvial and pan deposits, pedocretes (*e.g.* calcrete), surface gravels (including doleritic rubble) and various sandy to gravelly soils.

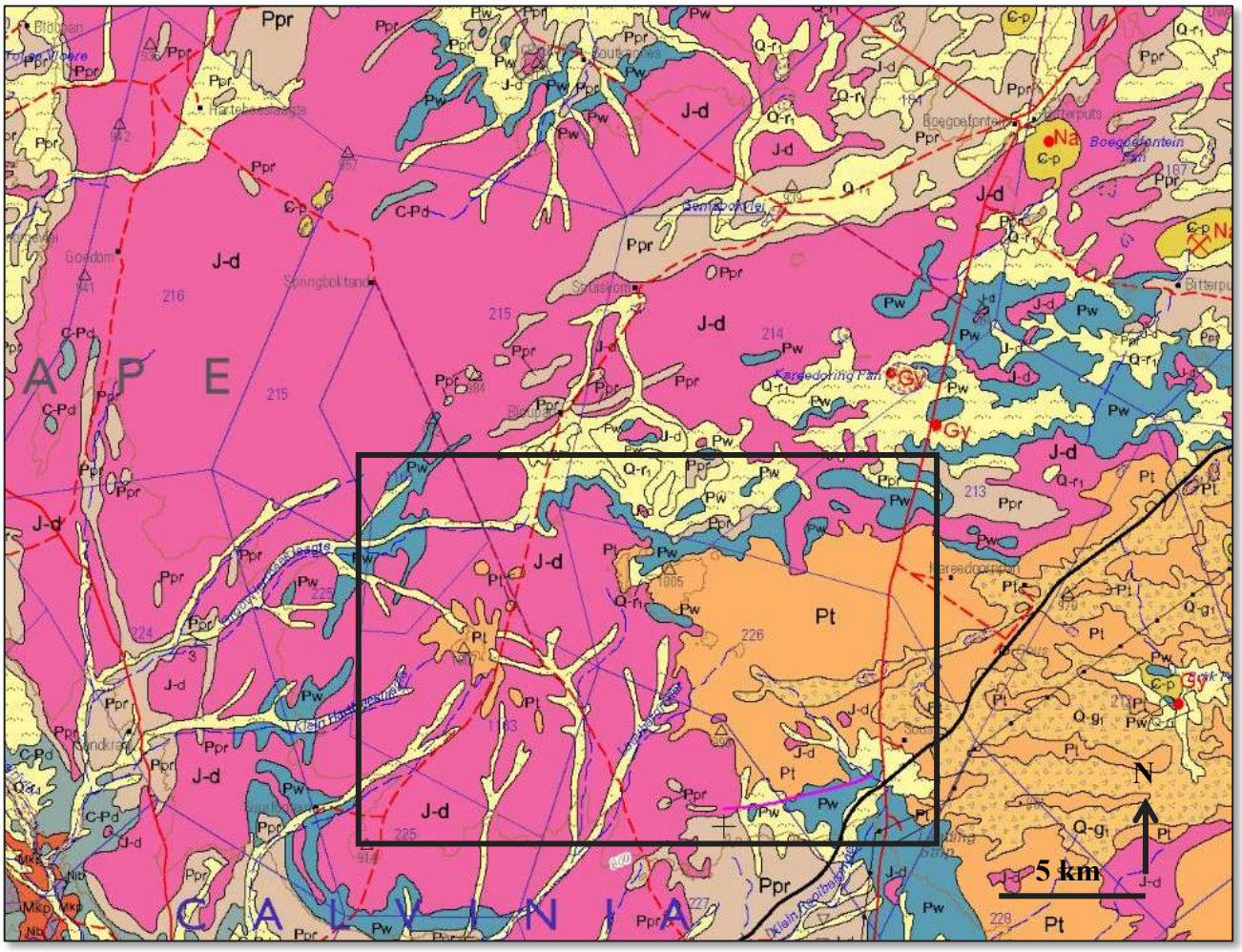


Figure 6-30: Extract from 1: 250 000 geology sheet 3018 Loeriesfontein (Council for Geoscience, Pretoria) showing the main rock units underlying the combined project area for the Kokerboom 1-4 Wind Farm grid connection developments (black rectangle), situated c. 60 km north of Loeriesfontein, Northern Cape.

The main rock units represented within the grid connection project area are:

1. **KAROO SUPERGROUP (ECCA GROUP)**
   Prince Albert Formation (Ppr, buff)
   Whitehill Formation (Pw, blue)
   Tierberg Formation (Pt, orange)
2. **KAROO DOLERITE SUITE**
   Dolerite sills and dykes (J-d, pink)
3. **LATE CAENOZOIC SUPERFICIAL SEDIMENTS**
   Stream and river alluvium (pale yellow with flying bird symbol), sandy soils (Q-r1, pale yellow), dolerite rubble (Q-g1, pale orange with triangle symbols), unmapped scree deposits, various surface gravels, pan sediments (red dotted areas; Gy = gypsum deposits).

Palaeontological Heritage Context

Palaeontological heritage that has been recorded within the sedimentary rock units represented within the combined Kokerboom 1-4 Wind Farm grid connection project area has been previously outlined, with extensive references, by Almond (2017a; see also Almond 2014c, 2020, Almond & Pether 2008).

On the basis of desktop studies (e.g. Almond & Pether 2008) as well as several previous palaeontological surveys within the broader study region by the author (See References, especially Almond 2014c, 2017a, 2020) and by other palaeontologists such as Pether (2012), Millsteed (2014), Groenewald (2014) and Butler (2016), the following conclusions have been drawn:

- The Ecca Group rocks (Prince Albert, Whitehill and Tierberg Formations) are generally very poorly-exposed and deeply-weathered near-surface. They have also been locally baked (thermally metamorphosed) by dolerite intrusions and occasionally secondarily mineralised. The only fossils recorded here within these rocks comprise low-diversity trace fossil assemblages that occur widely within the Loeriesfontein region and therefore not of unique scientific importance. No scientifically important vertebrate or plant remains were recorded here during the field assessment.
- The Karoo dolerites that crop out over large portions of the Kokerboom 1-4 Wind Farm grid connection project area are also poorly-exposed, deeply-weathered for the most part and, in addition, do not contain fossils.
- Several unmapped, small-scale occurrences of Karoo and / or post-Karoo breccia pipes and igneous intrusions occur within the broader WEF project area. Some of the associated sandy sediments contain simple invertebrate trace fossils of uncertain age and stratigraphic position (N.B. possibly within deformed Prince Albert Formation country rocks). Similar traces have previously been recorded from similar settings elsewhere within the Loeriesfontein region; they are not considered to be of great scientific significance.
- None of the wide range of Late Caenozoic superficial deposits examined during fieldwork (e.g. alluvium, colluvium, surface gravels, calcretes, stream and pan sediments, sandy soils) appears to be highly fossiliferous. Important mammalian remains are known from pan and river sediments elsewhere in Bushmanland, but they are rare and their occurrence is highly unpredictable.

6.7.2 Site Sensitivity

The combined Kokerboom 1-4 Wind Farm grid connection project area is underlain by several formations of potentially fossiliferous Late Palaeozoic sediments of the Ecca Group (Karoo Supergroup) that are extensively intruded by unfossiliferous igneous rocks of the Early Jurassic Karoo Dolerite Suite. The Ecca Group rocks (Prince Albert, Whitehill and Tierberg Formations) here are very poorly-exposed and deeply-weathered near-surface. They have also been locally baked (thermally metamorphosed) by nearby dolerite intrusions and occasionally secondarily mineralised. The only fossils recorded within these rocks comprise low-diversity trace fossil assemblages that occur widely within the Loeriesfontein region and are therefore not of unique scientific interest. No fossil vertebrate or plant remains were recorded within these rocks during the field assessments. The Karoo dolerites that crop out over large portions of the combined grid connection project area do not contain fossils. None of the wide range of Late Caenozoic superficial deposits examined during fieldwork appear to be highly fossiliferous. Important mammalian remains are known from pan and river sediments elsewhere in Bushmanland, but they are rare and their occurrence is unpredictable.

Palaeontological fieldwork as well as desktop studies indicate that, due to (1) high levels of bedrock weathering and (2) thermal metamorphosis by dolerite intrusion in the region, as well as (3) low levels of sedimentary bedrock exposure, the palaeosensitivity of the entire Kokerboom 1-4 Wind Farm grid connection project area in practice low to very low. The relevant DFFE screening tool sensitivity mapping, which shows sensitivity levels ranging from Low to Very High within the combined grid connection project footprint, is therefore contested here. The area includes sectors of zero as well as Low to Very High inferred palaeosensitivity. Based on fieldwork and desktop studies, this sensitivity mapping is contested here. Due to high levels of bedrock weathering in the region, the revised sensitivity of the entire project area is assessed as Low to Very Low (Map supplied by Zutari, Figure 6-31).

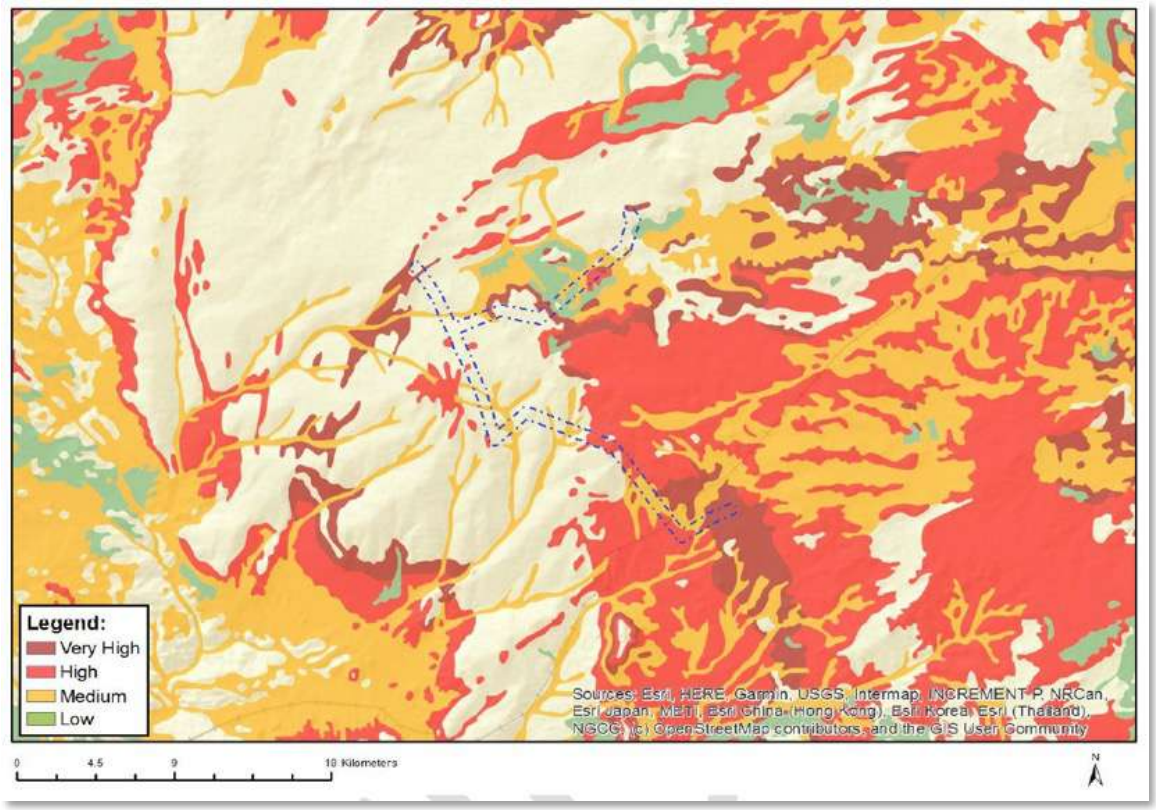


Figure 6-31: Palaeontological heritage site sensitivity map for the combined Kokerboom 1-3 Wind Farm grid connection project area (blue dotted polygon) based on the DFFE screening tool.

6.7.3 Impact assessment

The construction phase of the Kokerbom 1-4 Wind Farm grid connection infrastructure is likely to have a very low to low (negative) impact significance in terms of local palaeontological heritage resources based on (1) the low palaeosensitivity and small area of the project footprints and (2) the small scale of anticipated excavations into fresh bedrock.

No high-sensitivity or no-go areas have been identified within the combined project area of the proposed WEF grid connections. The proposed grid connection developments have no fatal flaws in terms of palaeontological heritage. Further significant impacts are not anticipated in the operational and de-commissioning phases.

Table 6-26: Damage and/ or destruction to palaeontological heritage resources

Project phase	Construction			
Impact	Damage and/ or destruction to palaeontological heritage resources			
Description of impact	It is possible that the construction phase of the proposed switching stations and pylons for the overhead transmission line may lead to the damage or destruction of buried palaeontological resources. However, the palaeontologist identified that the area in which the proposed grid connection infrastructure is located is underlain by several formations of potentially fossiliferous sediments of the Ecca Group (Karoo Supergroup) that are extensively intruded by unfossilerous igneous rocks of the Karoo Dolerite Suite. It is generally considered that while finds might occur on site, their sensitivity is low and the important mammalian remains known in pan and river sediments are rare and their occurrence is unpredictable. Furthermore, it is known that there are high levels of bedrock weathering and thermal metamorphism in the study area.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	The Environmental Control Officer (ECO) / Environmental Site Officer (ESO) responsible for the grid connection developments should be made aware of the potential occurrence of scientifically-important fossil remains within the development footprint. During the construction phase all major clearance operations (e.g. for new or widened access roads, pylon footings, laydown areas) and deeper (> 1 m) excavations should be monitored for fossil remains on an on-going basis by the ECO and on-site Environmental Officer (ESO). Should substantial fossil remains - such as vertebrate bones and teeth, or petrified logs of fossil wood - be encountered at surface or exposed during construction, the ECO or ESO should safeguard these, preferably in situ. They should then alert the South African Heritage Resources Agency, SAHRA, as soon as possible (Contact details: Dr Ragna Redelstorff, Heritage Officer Archaeology, Palaeontology & Meteorites Unit, SAHRA. 111 Harrington Street, Cape Town, 8001. Tel: +27 (0)21 202 8651. Fax: +27 (0)21 202 4509. E-mail:rredelstorff@sahra.org.za). This is to ensure that appropriate action (i.e. recording, sampling or collection of fossils, recording of relevant geological data) can be taken by a professional palaeontologist at the proponent's expense. The palaeontologist concerned with any mitigation work will need a valid fossil collection permit from SAHRA and any material collected would have to be curated in an approved depository (e.g. museum or university collection). All palaeontological specialist work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere as far as possible to the minimum standards for Phase 2 palaeontological studies developed by SAHRA (2013).			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Long term	Impact will last between 10 and 15 years	Long term	Impact will last between 10 and 15 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Low	The affected environment will not be able to recover from the impact - permanently modified	Low	The affected environment will not be able to recover from the impact - permanently modified
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	High	The resource is irreparably damaged and is not represented elsewhere
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	Likely, very low to low (negative) impact significance without mitigtion.			
Cumulative impacts	None.			

Cumulative impacts

Tabulated data and satellite maps indicating proposed or authorised renewable energy facilities in the vicinity (c. 40 km radius) of the combined Kokerboom 1-4 Wind Farm grid connection project area north of Loeriesfontein are presented in Table 3-5 (Data provided by Zutari). Cumulative impacts posed by the proposed new grid connection infrastructure in the context of these developments has been assessed on the basis of the available PIA reports (cf Almond 2011a, 2011b, 2014c, 2017a, 2020, Pether 2012, Groenewald 2014, Millsteed 2014, Butler 2016). Given (1) the low palaeontological sensitivity of the broader Bushmanland region north of Loeriesfontein, (2) the low impact significance determined for the various renewable energy projects in the region (including the Kokerboom 1-4 Wind Farms themselves) and (3) the small footprints of the proposed grid connections, which do not entail involve large-scale bedrock excavations, it is concluded that the cumulative impact on palaeontological heritage resources of all the proposed grid connection infrastructure is LOW. The anticipated cumulative impacts therefore fall within acceptable limits.

6.7.4 Conclusion and Recommendations

The proposed electrical infrastructure developments are not fatally flawed in palaeontological heritage terms. Anticipated cumulative impacts are of LOW significance and therefore fall within acceptable limits.

6.8 Visual Landscape

In 2017, Visual Impact Assessment (VIA) Practitioner, Stephen Stead, completed the study, *"Basic Assessment Specialist Report: Visual Impact"* for the Proposed 132 KV Transmission Line Corridor from proposed Kokerboom WEF to existing Helios Substation, near Loeriesfontein, Northern Cape. The new proposed Kokerboom grid infrastructure layouts were provided to VIA Practitioner, Stephen Stead in June 2021 to assess the potential new impacts. The specialist confirmed that the previous Visual Impact Significant ratings of Low would remain considering the deviation from previously assessed alternatives are low, from a visual perspective. It is the recommendation of the Visual Specialist, that the development should be authorised as Visual Impact Significance will be Low and there are no significant visual resources in the transmission line Zone of Visual Influence.

A summary of the VIA is provided below. The assessment report and confirmation letter of the latest layout is attached as Annexure D7.

6.8.1 Baseline Description

The landscape in which the grid connection infrastructure is proposed, is predominantly flat with some topographic variation (Figure 6-36) and key features being large wind turbines (Figure 6-32 and Figure 6-34). The area is largely natural with man-made modifications associated with farming practices (small features in the landscape and do not detract from sense of place) and large industrial activity in the area such as the operational Khobab and Loeriesfontein WEFs, as well as the existing Eskom Helios MTS and associated existing 400kV transmission lines (Figure 6-33 and Figure 6-37). Furthermore, numerous other numerous other renewable energy projects and associated infrastructure, i.e., transmission lines and switching stations are proposed for the surrounding area. The Sishen-Saldanha railway line also traverses the landscape near to the proposed project site (Figure 6-35). There are very few sensitive receptors in the vicinity of the development, however road users on the Nuwepos Road (Figure 6-37) would be exposed to view of the transmission line as it crosses the road before connecting to Helios. Due to the presence of the existing Helios substation, the numerous transmission lines and the railway line infrastructures, the landscape around this section of the road is degraded to some degree and the visual absorption capacity for vertical line element is increased.

The current landuse of the proposed properties is agricultural, with low intensity sheep farming carried out in this arid environment. The Bioregion is Nama-Karoo with the main vegetation type being Bushmanland Basin Shrubland (Figure 6-38). Due to the low stock carrying capacity of the Bushmanland vegetation, the farms are large in size.

Figure 6-32: View of the Khobab windfarm from the proposed Kokerboom 3 transmission line route towards the southeast (Lat: -30.372684°, Long 19.507141°)

Figure 6-33: View of the Helios MTS from the Nuwepos/Granaatboskolk road towards the north (Lat: -30.507482°, Long 19.556249°)

Figure 6-34: View of the Khobab windfarm from the proposed Kokerboom 1 Swtiching station towards the northeast (Lat: -30.372684°, Long 19.507141°)

Figure 6-35: View of the Sishen-Saldanha railway line approximately where the proposed Kokerboom 1 transmission line will cross, looking towards the southwest (Lat: -30.513662° 19.534606°)

Figure 6-36: The slightly undulating terrain associated with numerous smaller drainage channels (general site photo).

Figure 6-37: Nuwepos/Granaatboskolk Road westbound view towards the proposed transmission line routing with the Eskom lines in the middle ground.

Figure 6-38: The existing farm roads and Bushmanland Basin Shrublands (general site photo).

6.8.2 Site Sensitivity

The scenic quality, due to minimal undulation of the site and the surrounding terrain, landform is rated low. The visual impact of the proposed switching stations is likely to be negligible as they are located within the boundaries of the farm portions some distance away from the Nuwepos Road. Model of the anticipated viewshed of the proposed transmission line corridors with a 25m height offset, indicated that the visual impact would be limited to with ≈8km of the infrastructure. The visual extent would therefore be considered local. Due to the remoteness of the locality, the Amount of Use was rated Low and Public Interest is also rated Low. No tourist activities making use of the scenic resources were apparent and the Adjacent Users' sensitivity to landscape change is thus rated Low. The area is not formally protected as a conservancy or nature reserve and hence is rated Low as a Special Area. The overall Receptor Sensitivity to landscape change is rated Low.

The SIA (Annexure D7) found the surrounding area of the proposed site to be sparsely populated. Most of the farms in the area are unoccupied, and there are no sensitive receptors located within proximity of any of the proposed transmission line buffers. Furthermore, none of the local landowners that were interviewed indicated that they were concerned about the potential visual impacts associated with the proposed power lines. From a social point of view, the visual impact of the proposed power lines on the areas overall sense of place and character is therefore likely to be limited, specifically within the context of the development of the area as a renewable energy node.

6.8.3 Impact assessment

A VIA significant rating of low (minor) has been assigned to the proposed development based on the following reasons (Table 6-27):

- 1. The majority of the routing is well set back from the public road and located outside the Foreground / Mid Ground 6km buffer distance where landscape changes are more clearly noticeable.
- 2. The area is very remote and has no tourism or associated sensitivity receptors who would object to the change in sense of place.
- 3. The area is well established as a wind farming area with the existing two wind farms (Loeriesfontein and Khohab) increasing the visual absorption capacity of the locality.

Table 6-27: Visual obstruction of landscape to sensitive receptors

Project phase	**Construction, Operation and Decommissioning**			
Impact	**Visual obstruction of landscape to sensitive receptors**			
Description of impact	• The visual impacts associated with the proposed development include the use and movement of large vehicles and a crane to raise the power line structures. Small maintenance access routes would be created along the proposed transmission line route which could result in soil erosion if not adequately managed. Due to the small footprint of the monopole and small track, windblown dust is likely to be limited. • The impacts are likely to be similar in each of the project phases, although the frequency of vehicles and use of crane is likely to be more significant in the construction phase. • Very limited mitigation is available to screen a 25m high structure and therefore the only mitigation available refers to the management of erosion. The impact will not change with mitigation for any of the three transmission line corridors.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• Soil erosion measures need to be adequately implemented and routinely monitored by the ECO during construction and by the owner of the infrastructure during operation. This should occur monthly during construction, bi-annual during operation, and bi-annual for a year following decommissioning. • Should the infrastructure be decommissioned, all structures should be removed and recycled where possible. • The rubble should be managed according to the NEM:WA and deposited at a registered landfill if it cannot be recycled or reused. • All compacted areas should be ripped and then rehabilitated according to a rehabilitation specialist.			
Assessment	**Without mitigation**		• **With mitigation**	
Nature	Negative		Negative	
Duration	Long term	Impact will last between 10 and 15 years	Long term	Impact will last between 10 and 15 years
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	None			
Cumulative impacts	They are caused mainly by multiple power lines being routed adjacent to each other, or converging on a specific area, resulting in a massing effect and subsequent landscape degradation. However, in the context of the existing transmission line infrastructure in and around Helios, the proposed grid connection is expected to make a minimal contribution to the cumulative impact.			

Cumulative impacts

The main issue relating to cumulative impacts is landscape cluttering when multiple power lines are viewed from a single location. For proposed development the potential for negative cumulative impacts is rated Low. This is due to the remoteness of the locality for most of the routing and the higher visual absorption capacity of the area where the power lines will be viewed from the road. Should the proposed grid connection infrastructure not be constructed, the proposed Kokerboom WEFs would not be able to be constructed either. This would therefore reduce the potential impact on the visual landscape and sense of place. However, the proposed Kokerboom WEFs and grid connection infrastructure are not unique within the landscape, and the visual impact would likely occur from other renewable energy developments.

6.8.4 Conclusion and Recommendations

It is the recommendation of this Visual Statement, that the proposed development should be authorised as Visual Impact Significance will be Low and there are no significant visual resources in the transmission line Zone of Visual Influence.

6.9 Nuisance impacts

A noise assessment (specialist assessment compiled by Enviro Acoustic Research, EARES, 2020) and traffic assessment (specialist assessment by Aurecon, Mr A Schwarz, 2020) were undertaken for specific requirements to the Kokerboom WEFs and have not been included in this BAR. However, the EAP has undertaken an assessments of potential noise impacts based on the host of available information for the Kokerboom WEFs.

A summary of the of potential nuisance impacts and impact assessment are provided below.

6.9.1 Baseline Description

Several nuisance impacts may be created by the construction of the proposed grid connection infrastructure. These impacts include an increase in dust, noise, reduction in safety and an increase in traffic. The receptors to these impacts may be anyone who enters the local area in the vicinity of the proposed development.

Dust

The geology and soils are generally uniform across the site. The sandiness of the soils, together with the dry climate areas create the potential for dust on site. It is anticipated that the generation of dust will increase with construction activities, due to an increase in vehicles and site clearing/ excavation activities associated with the development.

Noise

Land use is mostly wilderness with agricultural activities. The area surrounding the proposed site consists predominantly of agricultural lands dominated by sheep farming activities. Existing land use activities are not expected to impact on the ambient sound levels. There are no major roads in the vicinity of the proposed development, with the local community using the existing gravel roads to access their properties. There may be some increased traffic on the Granaatboskolk Road relating to operation of the Loeriesfontein and Khobab WEFs as well as the future construction of other renewable projects in the area. The Sishen-Saldanha railway line crosses towards the east of the proposed grid connection.

Traffic

The traffic volumes associated with proposed development will have three distinct patterns, particularly for the construction, operation and de-commissioning stages of the project. The primary road of concern is the Nuwepos/Granaatboskolk Road that branches from the R357 approximately 1km outside of Loeriesfontein. The R357 is the main road into Loeriesfontein and there is currently not a lot of detailed traffic information regarding the roads in and around the site.

The area surrounding the proposed grid connection infrastructure consists predominantly of large farms used for low intensity livestock grazing. Consequently, there is very little traffic in the area. Since May 2015, the traffic would have been greater than the years before, given the construction phase of the Khobab and Loeriesfontein WEFs. During the construction phase of the proposed grid connection infrastructure, there will be an increase in regular traffic to and from the site. The increased traffic will be noticeable locally.

6.9.2 Site Sensitivity

Given the low intensity farming practices and limited traffic in the area, there is very little, if any, noise generated by humans. Whilst little noise would be generated by the grid connection infrastructure during

the operational phase, an increase in noise would be created by the construction related activities. During the construction phase, noise will be generated from the construction activities. However, these are also anticipated to only be at a site-specific scale. The proposed development will be too far from the Khobab, and Loeriesfontein WEFs for cumulative noise impacts to be of any concern.

6.9.3 Impact assessment

Noise

The increase in noise pollution from the operation of heavy machinery, as well as increased traffic during the construction phase of the proposed development would include.

Construction impacts:

- Various construction activities taking place simultaneously during the day will increase ambient sound levels due to air-borne noise.
- Various construction activities taking place simultaneously at night will increase ambient sound levels due to air-borne noise. Such an increased noise will be highly audible, potentially disturbing during the very quiet night-time periods.
- Construction of roads during the day may increase ambient sound levels temporary.
- Various construction vehicles passing close to potential noise-sensitive receptors at may increase ambient sound levels and create disturbing noises.

No significant noises impacts are associated with the operation of transmission lines and/or switching stations.

Traffic

The trips associated with the construction phase are primarily the transport of machinery, materials and people to the site. The primary impact of heavy vehicle and abnormal vehicle transportation is the increased rate of road degradation. This will be at its highest intensity during the construction phase of the project. It is expected that the roads in and around Loeriesfontein and the site can accommodate the increased loading, however the degradation will be sped up; consequently, affecting any plans for routine maintenance. Abnormal vehicles also present an increased risk to other road users and specific safety protocols must be followed. Warnings and safety instructions should be communicated to the general public in all towns. The operational phase impact of traffic associated with the transmission lines will be negligible.

Table 6-28: Increase of dust

Project phase	**Construction and Decommissioning**			
Impact	**Increase of dust**			
Description of impact	Dust, as a result of clearing vegetation for the construction of the grid connection infrastructure is likely to occur. Construction vehicles are likely to make use of the existing farm roads to transport equipment and material to the construction site. Earthworks would also be undertaken. These activities would exacerbate dust especially in the dry winter months.			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis or use of other suitable dust-suppression agents, and ensuring that vehicles used to transport sand and dust-generating building materials are fitted with tarpaulins or covers. The Contractor should liaise with the affected farmers regarding timing and location of construction activities so they can make alternative arrangements for their sheep.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	Likely negligible with mitigation measures undertaken.			
Cumulative impacts	The cumulative dust impact may be more significant if cumulative projects in the area are constructed simultaneously without undertaken mitigation measures in their individual capacity.			

Table 6-29: Increase of noise

Project phase	**Construction and decommissioning**			
Impact	**Increase of noise**			
Description of impact	Construction related activities, such as heavy vehicle traffic, people, and excavations etc. can lead to an increase in noise to an area. A noise specialist undertook a noise impact assessment for the proposed Kokerboom Wind Farms and identified that there were very few receptors in the area which was verified by an EAP on site.			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	Construction related activities should be undertaken in terms of the relevant best practice standards.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Almost certain / Highly probable	It is most likely that the impact will occur
Confidence	Medium	Determination is based on common sense and general knowledge	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance	Likely negligible with mitigation measures undertaken.			
Cumulative impacts	None.			

Table 6-30: Generation of litter, general and recyclable waste

Project phase	**Construction and decommissioning**			
Impact	**Generation of litter, general and recyclable waste**			
Description of impact	During the construction period, and to a limited extent, the operational period, the increase in people to the area is likely to increase the chance of litter to the area. Carried by wind, the litter can easily move to surrounding areas. However, this can be controlled through appropriate management. General waste generated during the construction period may cause environmental degradation and should therefore be managed responsibly.			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	The Contractor should ensure that workers are informed that no waste can be thrown out of the windows while being transported to and from the site. Workers who throw waste out of windows should be fined. The Contractor should be required to collect waste along the access road reserve on a weekly basis. Waste generated during the construction phase should be transported to the local landfill site or re-used/ recycled where possible.			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Brief	Impact will not last longer than 1 year	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Local	Extending across the site and to nearby settlements
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environmental will be able to recover from the impact	High	The affected environmental will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Negligible - negative**		**Negligible - negative**	
Comment on significance	None.			
Cumulative impacts	Local municipalities may struggle to handle large volumes of waste from several proposed projects and therefore developers must aim to reuse, reduce or recycle waste. Or if possible transport waste back to origin where manufacturer can better deal with specific waste items.			

Cumulative impacts

The cumulative effect of traffic (both regular back and forth to site, as well as the transport of abnormal loads) will only have a noticeable impact if the construction timelines as well as components, manufacturing centre, importation ports, etc. of all cumulative projects are exactly aligned which is deemed improbable.

Dust generation would slightly increase when cumulative construction projects are undertaken simultaneously. If the projects undertake responsibility for dust control on a site specific basis the cumulative impact should not be any greater (or less).

Cumulative noise pollution from construction activates may slightly increase when cumulative construction projects are undertaken simultaneously. However, given the few noise sensitive receptors in the area the cumulative impact should not be any greater (or less).

Waste generation, i.e. litter, general and recyclable waste during the construction and decommissioning phases need to be dealt with by contractors. Construction phase waste generation will likely be stringently controlled by the contractors, ECO and ESO. However, decommissioning phase waste generation is an unknown and it's likely that several of the large scale projects will be decommissioned or refurbished at the same time considering that several projects would likely be decommissioned at the same time given an equal project lifetime (20 years) in terms of the REIPPPP. This will have to be dealt with in terms of the legislative requirements at the time of decommissioning and it's envisaged that many of the components associated with the transmission line projects may be reused or recycled.

6.9.4 Conclusion and Recommendations

The development of the proposed infrastructure will only increase noises during construction, the developer however should:

- Investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from a location where construction or operational activities are taking place. A complaints register must be kept on site;
- The developer should minimize night-time construction traffic if the access road is closer than 150 m from the Struiskom dwelling (if occupied at time of construction), alternatively, the access road must be relocated further than 150 m from this NSD (night-time traffic passing this dwelling). (If Struiskom is not occupied at the time of construction, then such limitation will not apply).

In general, no obvious problems were identified associated with the transport of freight along the proposed routes to the site, nor for the accesses required for the construction and maintenance of the proposed transmission lines and switching station infrastructure. There are no obvious issues with the construction traffic related to the proposed transmission line and switching station infrastructure, as there are several other transmission line and switching station infrastructure built in the area already. Granaatsboskolk Road was previously upgraded as part of all the construction activity in the area (construction of the existing WEFs, upgrades to Helios etc.).

6.10 Electromagnetic Interference (EMI) & Radio Frequency Interference (RFI)

The proposed Kokerboom grid infrastructure layouts were provided to Callie Fouché, of Interference Testing and Consultancy Services, in June 2021 to assess potential electromagnetic interference path loss and associated risk to the Square Kilometre Array (SKA).

A summary of the of the findings on the risk to the SKA radio telescope project is provided below. The assessment report is attached as Annexure D8.

6.10.1 Baseline Description

The Karoo area is host to the Department of Science and Technology's SKA radio telescope project. Due to the sensitivity of the telescope receivers, there is a risk that unintentional emissions from electrical and electronic systems will desensitise the SKA receivers resulting in interference to celestial observations and/or data loss. Such interference is typically referred to as 'Electromagnetic Interference (EMI).

Schedule D (Regulations restricting interference due to electrical activities within the Karoo central Astronomy advantage area 1) of the REGULATIONS ON THE PROTECTION OF THE KAROO CENTRAL ASTRONOMY ADVANTAGE AREAS IN TERMS OF THE ASTRONOMY GEOGRAPHIC ADVANTAGE ACT, 2007 published on 15 December 2017 applies to the Kokerboom 1-4 Windfarm project and grid connection infrastructure in the follow way:

i. No person may construct, install, operate or use any electrical infrastructure and electrical equipment within the Karoo Central Astronomy Advantage Area 1 unless it complies with these Schedule D Regulations and the management authority has issued a permit in relation thereto; or, it has been exempted from the possession of a permit as provided for in sub-regulations 3(3), 3(4) and 3(5)

ii. All electrical infrastructure and any electrical equipment used in connection therewith or on its own

    (a) shall not cause radio frequency interference due to electromagnetic emissions within the SKA Infrastructure Territory;
    (b) shall not cause radio frequency interference, due to any wireless communications used within an infrastructure installation, at the SKA Virtual Centre or saturation level interference within the SKA Infrastructure Territory; and
    (c) shall be separated from the nearest SKA Infrastructure Territory and from the SKA Virtual Centre by the required separation distances that are determined in accordance with regulation 6 of these Schedule D Regulations in order to comply with sub-regulations 3(2)(a) and 3(2)(b)

iii. Existing electrical equipment and infrastructure is exempted from the requirement to acquire and possess a permit unless it is found that radio frequency interference is caused.

iv. New electrical equipment and infrastructure, with an electrical power rating of greater than 100 kVA and within a distance of 30 km from the nearest SKA Infrastructure Territory, or within a distance of 50 km for electricity generation by means of wind turbines, require a permit in terms of regulation 4 of these Schedule D Regulations. At greater distances, these facilities are exempted from the requirement to acquire and possess a permit unless it is found that radio frequency interference is caused.

v. New electrical equipment and infrastructure with an electrical power rating of equal to or less than 100 kVA, is exempted from the requirement to acquire and possess a permit unless it is found that radio frequency interference is caused.

vi. In the event that radio frequency interference is caused within the nearest SKA Infrastructure Territory or at the SKA Virtual Centre by electrical equipment and infrastructure exempted in terms of sub-regulations 3(3), 3(4) and 3(5), the situation shall be attended to as follows:

(a) the interference caused shall be investigated by the management authority to determine the source and level of interference;
(b) the radio frequency interference must be removed in order to ensure compliance with sub-regulations 3(2)(a) and 3(2)(b); and
(c) to facilitate ongoing compliance, the management authority shall determine the required permit conditions that must be complied with and issue the permit under which the electrical equipment and infrastructure may continue to operate without causing radio frequency interference.

Figure 6-39: Locality map showing nearest two SKA locations in relation to the Kokerboom WEFs and associated grid connection infrastructure

Figure 6-40: Area map showing Kokerboom locations relative to SKA

6.10.2 Site Sensitivity

Based on the study supported by Eskom under the research programme: EMC and EMI (N.R100017.R.01.009 [6] with inputs from SKA, the grid connection infrastructure interference is not viewed as problematic given the separation distance of >90km and assurance that no arcing or sparking occurs due to voltage gradients or substandard installation practices (Table 6-31).

Table 6-31: Permit requirements

Item	Description	Distance to SKA infrastructure	Existing Eqp Par 3(3)	<50km Par 3(4)	>100kVA Par 3(4)	Form 5 requirement
1	Kokerboom 1 grid connection	107.5km	No	No	Yes	No
2	Kokerboom 2 grid connection	111.22km	No	No	Yes	No
3	Kokerboom 3 grid connection	96.94km	No	No	Yes	No

6.10.3 Impact assessment

Due to the >90km separation distance no mitigation is required for grid connection infrastructure.

6.10.4 Cumulative Impact

The standard incoherent signal addition of 10x Log N where N is the number of projects <30km is currently not accounted for as not all projects in the area of interest will be constructed. A worst case theoretical value of 11.5dB will be applicable if all 14 projects currently listed within the 30km buffer materialise.

6.10.5 Conclusion and Recommendations

Grid connection infrastructure interference is not viewed as problematic given the separation distance of >90km and no mitigation would be required.

7 ENVIRONMENTAL IMPACT STATEMENT

The potential impacts associated with the proposed grid connection infrastructure for the three Kokerboom WEFs are summarised in Table 7-1, Table 7-2 and Table 7-3. With mitigation measures in place as set out in chapter 6, and detailed in the generic EMPr (Annexure G), post mitigation impacts are anticipated to be very low to moderate negative significance, and low up to moderately positive. A cumulative impact map (Figure 7-1 to Figure 7-4) showing the main sensitivities associated with the proposed development site is provided at the end of this chapter.

Anticipated impacts to terrestrial ecology of the site will be largely associated with disturbance, loss and transformation of intact vegetation and faunal habitat to hard infrastructure. The majority of the potential impacts are expected to occur during the construction phase, while operational impacts also include risk of soil erosion and invasion of alien plant species. Significance of impacts on terrestrial ecology with mitigation measures in place was rated between negligible and minor negative significance.

The main negative impact on avifauna includes electrocution of bids and birds colliding with power lines. Other impacts include electrical faults caused by bird's excreta when roosting or breeding on the power lines, and displacement through disturbance and habitat destruction. Loss of habitat and disturbance would occur during the construction and decommissioning phases, while the other anticipated impacts are anticipated to occur during the operational phase. Significance of impacts on avifauna with mitigation measures in place was rated between minor and moderate negative significance.

In terms of aquatic ecology considerations, the proposed grid connection infrastructure is located near the boundary of two quaternary catchments. These catchments are characterised by small/narrow perennial watercourses and drainage lines. Potential impacts of the proposed grid connection infrastructure on aquatic resources/ecosystems, include loss of riparian systems and disturbance to alluvial watercourses, increase in sedimentation and erosion, pollution of localised surface water quality with general and hazardous waste, and loss of wetlands. These impacts are anticipated during the construction and decommissioning phases. While increase in sedimentation and erosion could also potentially occur during the operational phase. Significance of impacts on aquatic ecology with mitigation measures in place was rated minor negative significance.

Heritage resources include archaeological, paleontological and cultural heritage material. Stone artefacts were found to be rare in the landscape with very few artefacts attributable to background scatter being seen. The sites recorded were largely in limited to specific clusters. During the palaeontological field assessment none of the wide range of Late Caenozoic superficial deposits appeared to be fossiliferous. While the cultural landscape of the site is very weakly developed since most anthropogenic interventions relate to farm tracks and fences.

Anticipated impacts on heritage resources are anticipated to occur during the construction phase and the significance of impacts with mitigation measures in place was rated as minor negative. While impacts to the built environment and alteration to the cultural landscape are anticipated to be of moderate negative significance pre- and post-mitigation and would occur during the operational phase.

It is anticipated that direct impacts on the socio-economic environment will be of largely of local extent. During the construction and decommissioning phase potential impacts include, harm to social networks with the presence of external construction workers and social networks associated with the influx of job seekers, risk to safety of farmers and farm workers, livestock and damage to farm infrastructure, and increased risk of grass fire. Significance of impacts with mitigation measures in place was rated minor negative. Positive impacts identified during the construction and decommissioning phases includes the creation of employment and business opportunities and has been rated as having a significance rating of medium positive. The findings of the SIA indicate that the impact related to the structures impeding on

grazing land. Therefore the impact on landowners affected by the transmission line routes, during the operation phase, is anticipated to be of minor negative significance. Positive impacts during the operational phase includes support of development of renewable energy and has been rated as having a significance rating of moderate positive.

Several nuisance impacts will be created by the construction of the proposed grid connection infrastructure. These impacts include an increase in dust, noise, reduction in safety and an increase in traffic. The receptors to these impacts may be anyone who enters the local area in the vicinity of the proposed development. Therefore significance of impacts on sensitive receptors with mitigation measures in place was rated between minor negative significance.

The components of the project that can impact on soils, agricultural resources and productivity include occupation of the site by the footprint of the facility, and construction activities that disturb the soil profile and vegetation. The agricultural impacts of an overhead power line in this kind of an environment are considered negligible by the agricultural specialist. The social specialist considered the agricultural impact from the perspective of the landowners whose livelihoods rely on the availability of grazing land and has rated the significance of the impact with mitigation measures in place as minor negative significance.

There are very few sensitive receptors in the vicinity of the development, however road users on the Granaatboskolk Road would be exposed to views of the proposed transmission line as it crosses the road before connecting to Helios. Due to the presence of the existing Helios substation, the numerous transmission lines and the railway line infrastructures, the landscape around this section of the road is degraded to some degree and the visual absorption capacity for vertical line element is increased. The visual impact of the proposed switching stations is likely to be negligible as they are located within the boundaries of the farm portions some distance away from the Granaatboskolk Road. The visual impact of the proposed transmission line is anticipated to have an impact significance rating of between minor negative significance. Three transmission line routes were assessed and three routes were found to be acceptable by all specialists. Further details are provided in the sections below.

Table 7-1: Summary of the potential construction phase impacts

Aspect	Impacts	Phase	Significance pre mitigation	Significance post mitigation
Agriculture	Loss of agricultural potential (land)	Construction	Negligible - negative	Negligible - negative
Agriculture	Loss of grazing resources (social)	Construction	Negligible - negative	Negligible - negative
Agriculture	No-go	No-go	Neutral	
Ecology (Aquatic)	Disturbance or destruction of aquatic species of special concern	Construction	Minor - negative	Negligible - negative
Ecology (Terrestrial)	Direct of loss of faunal species	Construction	Minor - negative	Negligible - negative
Ecology (Terrestrial)	Direct of loss of any species of special concern (Fauna & Flora)	Construction	Minor - negative	Negligible - negative
Ecology (Terrestrial)	Increased risk of alien plant invasion	Construction	Minor - negative	Negligible - negative
Ecology (Aquatic)	Damage or loss of alluvial riverine systems and wetlands systems and disturbance of the waterbodies in the construction phase	Construction	Minor - negative	Negligible - negative
Ecology (Aquatic)	Potential impact on localised surface water quality (construction materials and fuel storage facilities) during the construction and decommissioning phases	Construction	Minor - negative	Negligible - negative
Ecology (Terrestrial)	Cumulative impacts on terrestrial resources	Construction	Minor - negative	Negligible - negative
Ecology (Aquatic)	Cumulative impacts on aquatic resources	Construction	Minor - negative	Negligible - negative
Ecology (Terrestrial and Aquatic)	No-go	No-go	Negligible - negative	
Avifauna	Displacement of priority bird species due to disturbance associated with construction of the grid and switching station	Construction	Minor - negative	Negligible - negative
Avifauna	Cumulative impacts	Construction	Moderate - negative	Moderate - negative
Avifauna	No-go	No-go	Neutral	
Archaeology	Assessment of construction phase archaeological impacts.	Construction	Moderate - negative	Minor - negative
Archaeology	Cumulative	Construction	Moderate - negative	Moderate - negative
Heritage	Intrusion into the cultural landscape of incompatible structures	Construction	Minor - negative	Minor - negative
Heritage	Cumulative	Construction	Negligible - negative	Negligible - negative
Archaeology & Heritage	No-go	No-go	Neutral	
Palaeontology	Damage and/ or destruction to palaeontological heritage resources	Construction	Negligible - negative	Negligible - negative
Palaeontology	Cumulative	Construction	Minor - negative	Minor - negative
Visual	Visual obstruction of landscape to sensitive receptors	Construction	Minor - negative	Minor - negative
Visual	Cumulative	Construction	Minor - negative	Minor - negative
Visual	No-go	No-go	Neutral	
Dust	Increase of dust	Construction	Minor - negative	Minor - negative
Noise	Increase of noise	Construction	Minor - negative	Minor - negative
Waste generation	Generation of litter, general and recyclable waste	Construction	Negligible - negative	Negligible - negative

Table 7-2: Summary of the potential operational phase impacts

Aspect	Impacts	Phase	Significance pre mitigation	Significance post mitigation
Agriculture	No-go	No-go	Neutral	
Ecology (Terrestrial)	Increased risk of alien plant invasion	Operational	Minor - negative	Negligible - negative
Ecology (Aquatic)	Impact on alluvial riverine systems and wetland systems through the possible increase in surface water runoff on form and function during the operational phase	Operational	Minor - negative	Negligible - negative
Ecology (Terrestrial)	Cumulative impacts on terrestrial resources	Operational	Minor - negative	Negligible - negative
Ecology (Aquatic)	Cumulative impacts on aquatic resources	Operational	Minor - negative	Negligible - negative
Ecology (Terrestrial and Aquatic)	No-go	No-go	Negligible - negative	
Avifauna	Displacement of priority bird species due to habitat transformation associated with operation of the OHL and switching station.	Operational	Minor - negative	Minor - negative
Avifauna	Mortality of priority species die to collision with the 132kV OHL	Operational	Moderate - negative	Minor - negative
Avifauna	Electrocution of priority species by the onsite switching station	Operational	Minor - negative	Minor - negative
Avifauna	Cumulative impacts	Operational	Moderate - negative	Moderate - negative
Avifauna	No-go	No-go	Neutral	
Archaeology	Cumulative	Operational	Moderate - negative	Moderate - negative
Heritage	Intrusion into the cultural landscape of incompatible structures	Operational	Moderate - negative	Moderate - negative
Heritage	Cumulative	Operational	Negligible - negative	Negligible - negative
Archaeology & Heritage	No-go	No-go	Neutral	
Visual	Visual obstruction of landscape to sensitive receptors	Operational	Minor - negative	Minor - negative
Visual	Cumulative	Operational	Minor - negative	Minor - negative
Visual	No-go	No-go	Neutral	
Electromagnetic Interference & Radio Frequency Interference	Electromagnetic Interference (EMI) & Radio Frequency Interference (RFI)	Operational	Neutral	neutral

Table 7-3: Summary of the potential decommissioning phase impacts

Aspect	Impacts	Phase	Significance pre mitigation	Significance post mitigation
Agriculture	Loss of grazing resources (social)	Decommissioning	Negligible - negative	Negligible - negative
Agriculture	No-go	No-go	Neutral	
Ecology (Terrestrial)	Direct of loss of faunal species	Decommissioning	Minor - negative	Negligible - negative
Ecology (Terrestrial)	Direct of loss of any species of special concern (Fauna & Flora)	Decommissioning	Minor - negative	Negligible - negative
Ecology (Terrestrial)	Increased risk of alien plant invasion	Decommissioning	Minor - negative	Negligible - negative
Ecology (Aquatic)	Potential impact on localised surface water quality (construction materials and fuel storage facilities) during the construction and decommissioning phases	Decommissioning	Minor - negative	Negligible - negative
Ecology (Terrestrial)	Cumulative impacts on terrestrial resources	Decommissioning	Minor - negative	Negligible - negative
Ecology (Aquatic)	Cumulative impacts on aquatic resources	Decommissioning	Minor - negative	Negligible - negative
Ecology (Terrestrial and Aquatic)	No-go	No-go	Negligible - negative	
Avifauna	Displacement of priority bird species due to disturbance associated with decommissioning of the grid and switching station	Decommissioning	Minor - negative	Minor - negative
Avifauna	Cumulative impacts	Decommissioning	Moderate - negative	Moderate - negative
Avifauna	No-go	No-go	Neutral	
Archaeology	Cumulative	Decommissioning	Moderate - negative	Moderate - negative
Heritage	Cumulative	Decommissioning	Negligible - negative	Negligible - negative
Archaeology & Heritage	No-go	No-go	Neutral	
Visual	Visual obstruction of landscape to sensitive receptors	Decommissioning	Minor - negative	Minor - negative
Visual	Cumulative	Decommissioning	Minor - negative	Minor - negative
Visual	No-go	No-go	Neutral	
Dust	Increase of dust	Decommissioning	Minor - negative	Minor - negative
Noise	Increase of noise	Decommissioning	Minor - negative	Minor - negative
Waste generation	Generation of litter, general and recyclable waste	Decommissioning	Negligible - negative	Negligible - negative

7.1.1 Transmission Line Route and Switching stations

The findings of this basic assessment process indicate that the proposed transmission lines and switching stations will have a moderate to negligible negative impact, with mitigation, on the receiving environment and are considered acceptable. The overall impact of the proposed transmission lines and switching stations in context of the Kokerboom WEF developments are seen as a potential positive which outweigh the potential negative impacts on the environment given the appropriate mitigation measures are followed and outcomes achieved. During the basic assessment of the grid connection infrastructure, the environmental sensitivities were mapped by the EAP and specialists. Areas of sensitivity have therefore been avoided as far as possible, and the infrastructure components have been located outside of all identified sensitive areas.

7.1.2 No-go alternative

The no-go alternative implies that the status quo of the site would be maintained. This option would prevent the authorised Kokerboom 1, 2 and 3 WEFs from exporting their energy to the national grid, and as such the WEF would never be constructed. This would mean that the positive impacts associated with the development of the Kokerboom WEFs (and grid connection infrastructure), such as job creation, foreign investment, local economic development, energy security and a decreasing reliance on fossil fuel industries would not be realised. Furthermore, as detailed in Section 2, 4 and 5 of this BAR, the opportunity to build WEFs in an environment that is expansive and holds little social, economic or biophysical value would be missed, meaning that a more sensitive environment might be disturbed for future developments.

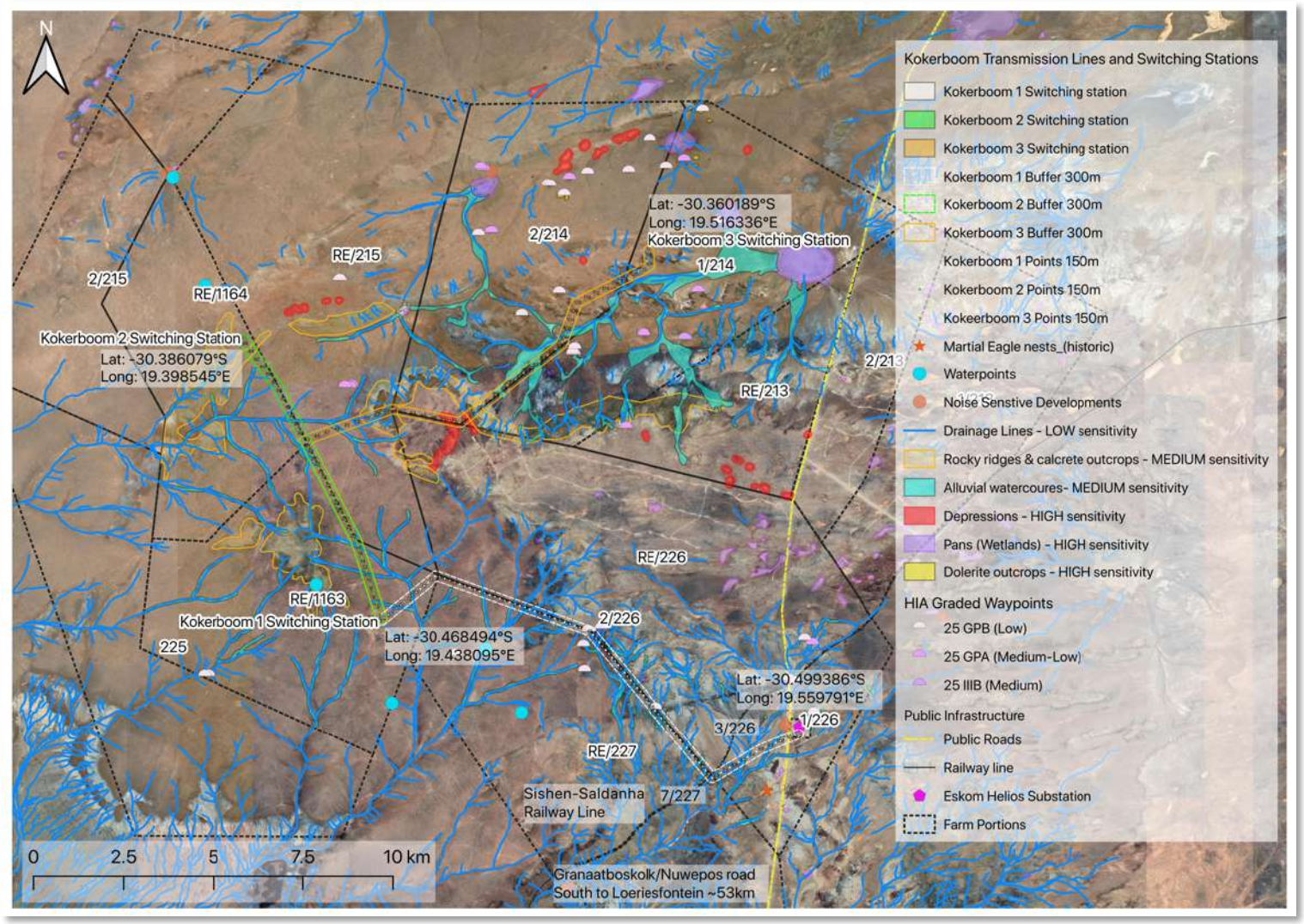


Figure 7-1: Combined sensitivity map showing Kokerboom 1, 2 and 3 transmission lines (buffers) and switching stations

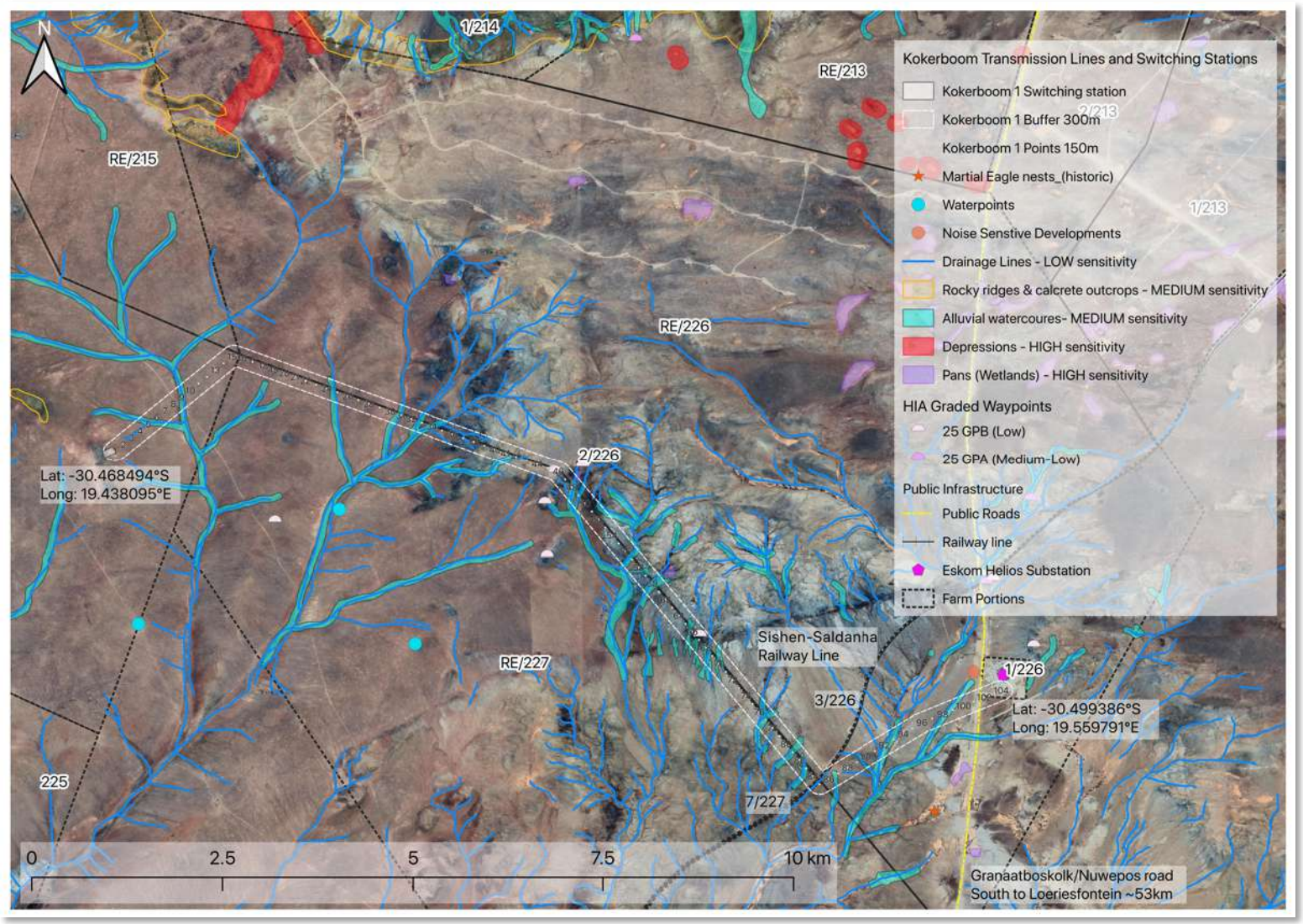


Figure 7-2: Combined sensitivity map showing Kokerboom 1 transmission line (buffer) and switching station

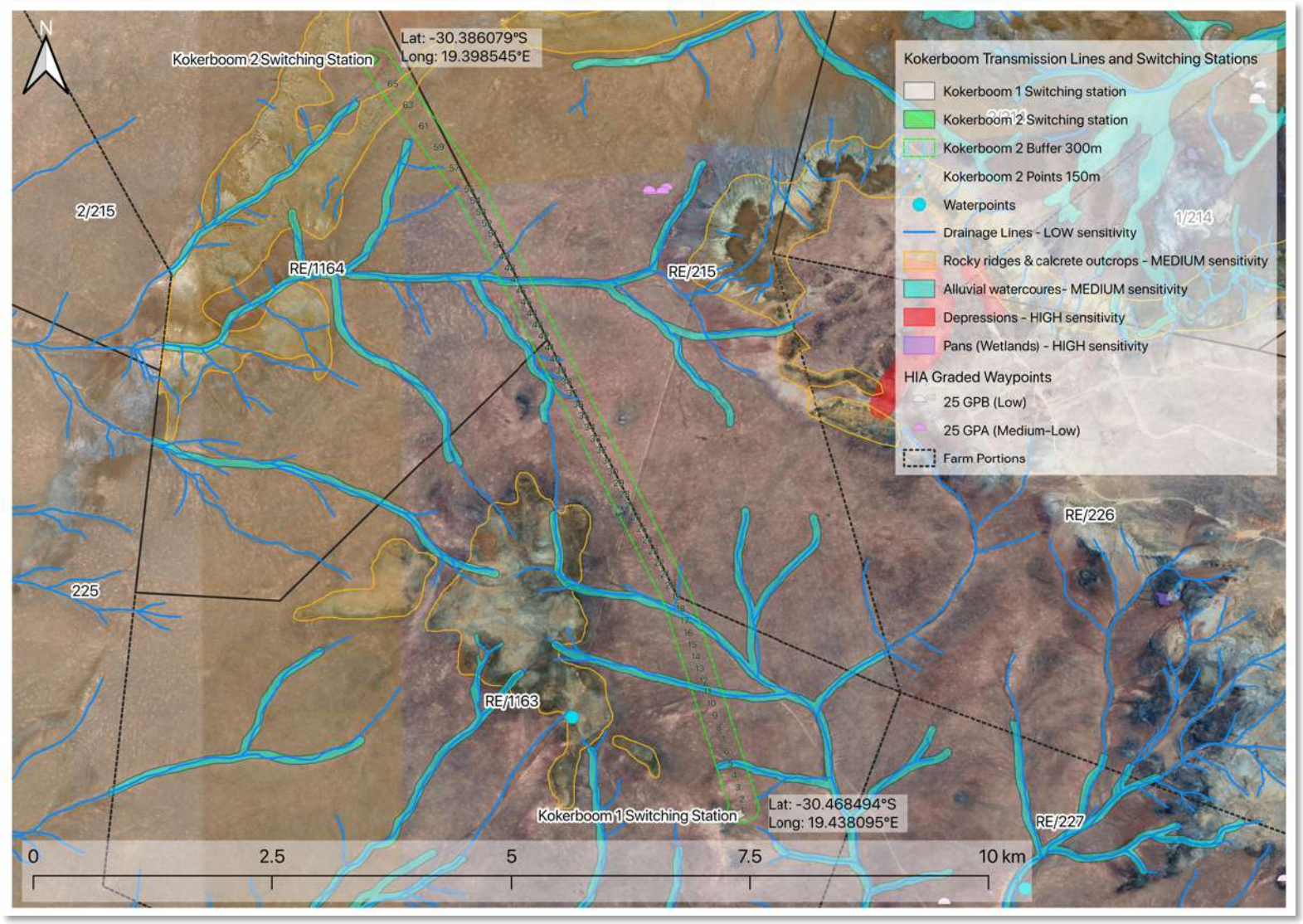


Figure 7-3: Combined sensitivity map showing Kokerboom 2 transmission line (buffer) and switching station

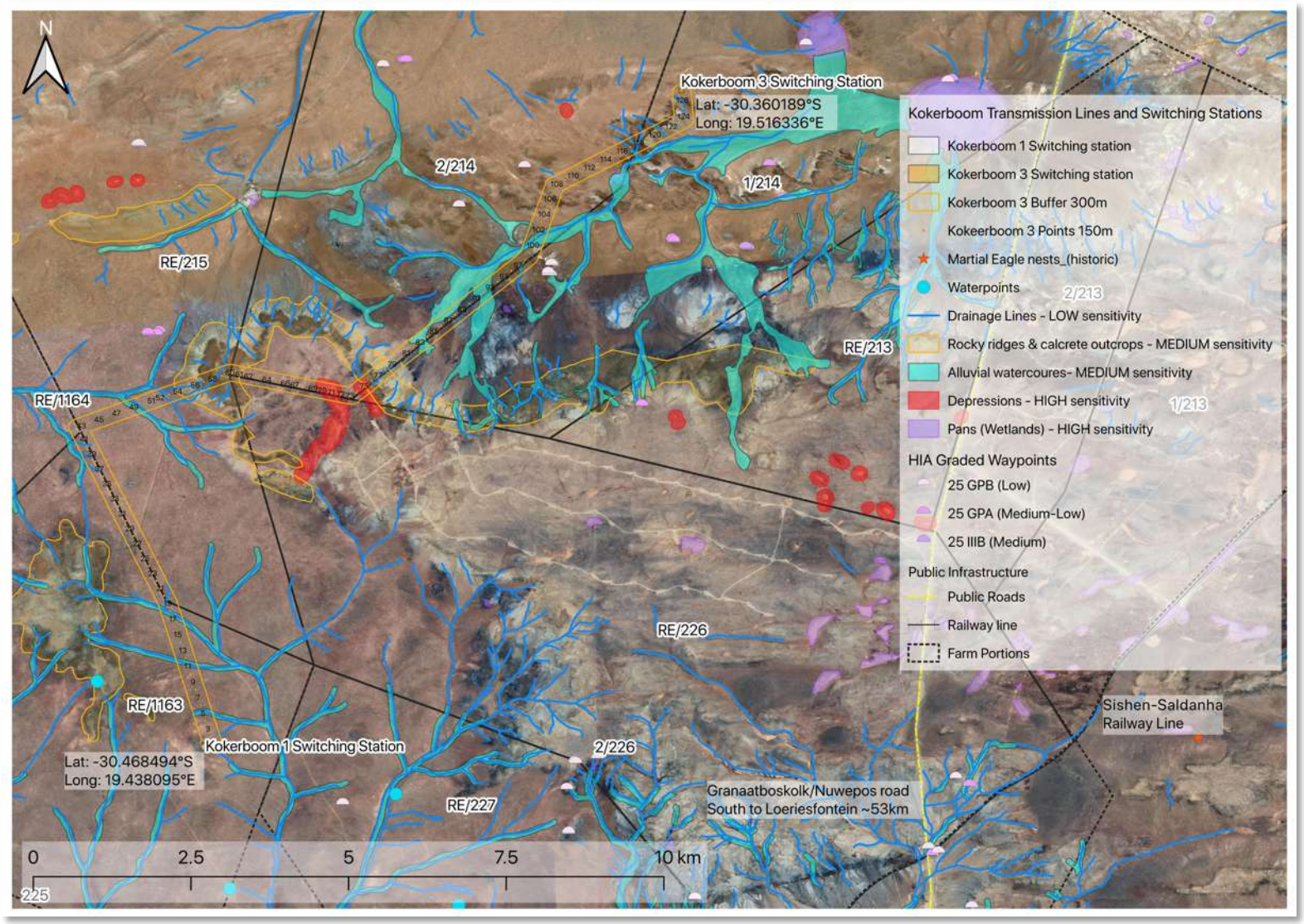


Figure 7-4: Combined sensitivity map showing Kokerboom 3 transmission line (buffer) and switching station

8 CONCLUSIONS AND WAY FORWARD

Based on the information presented within this basic assessment report and associated annexures, it is recommended that the proposed Kokerboom grid connection infrastructure consisting of three transmission lines and three associated switching stations be granted a positive Environmental Authorisation.

This BAR will be updated where necessary following the 30-day public comment period. All comments received on the BAR will be collated, responded to, and included in the updated Public Participation Report (Annexure C). Where necessary the BAR will be updated to address the received comments. The final BAR will be submitted to the DFFE for review and decision-making (for 107 days) whereby an Environmental Authorisation would be granted or refused. All registered I&APs will be notified of the outcome.

As per the requirements of NEMA, this BA has reviewed the array of potential environmental impacts associated with the proposed activities on the Kokerboom 1, 2 and 3 transmission line and switching station sites. Table 8-1, Table 8-2 and Table 8-3 below provides a summary of the description of the proposed project (Chapter 4).

Table 8-1: Summary of proposed project description (Kokerboom 1 Transmission line and switching station)

Component	Description
Overhead Powerline (OHL)	132kV single- or double-circuit Extending from the Kokerboom 1 switching station (collector substation) to the Eskom Helios MTS. OHL will be located within a servitude of up to 32m wide to be positioned within a 300m wide corridor (a 300m wide corridor assessed as part of this BA to allow micro-siting).
OHL Pylons	Up to 45m in height (most structures will be up to 32m tall, only increasing to up to 45m when crossing the railway line, existing overhead transmission line and public roads, i.e. Granaatsboskolk Road (AP2972) - depending on the minimum clearance specified by the road, OHL and rail authorities) Monopole (Self-supporting or stayed) and/or lattice may be used. Disturbance footprint per pylon of up to 10m by 10m (100m^2)
OHL footprint	Length ≈16km Construction road / service track (jeep track) width ≈4m (or less) OHL footprint ~6,4ha (16km x 4m), (consideration must be given that part of this road will use existing farm roads and/or WEF roads) Approximate number of pylons (based on average 150m average between pylons) ≈108 Pylon's disturbance footprint ~1,08ha (108 x 100m^2)
Kokerboom 1 Switching Station	Kokerboom 1 Switching Station (collector station) adjacent to authorised Kokerboom 1 WEF facility substation.
Switching station coordinates	Lat: -30.468494°(approx. centre point) Long: 19.438095°
Switching station footprint	Footprint of up to 1,5ha (100m wide and 150m long)
Laydown Areas	Temporary laydown area of ≈5000m^2 will be required at the switching station.
Site Access	The existing approved access roads to the Kokerboom 1 WEF substations will be used to access the proposed switching station locations. Roads to be developed as part of the Kokerboom WEFs will be utilized to access the OHL as far as possible, however a service track (jeep track) will be required along the OHL route for construction and maintenance purposes.

Table 8-2: Summary of proposed project description (Kokerboom 2 Transmission line and switching station)

Component	Description
Overhead Powerline	132kV single- or double-circuit Extending from the Kokerboom 2 switching station to the Kokerboom 1 switching station (collector station). OHL will be located within a servitude of up to 32m wide to be positioned within a 300m wide corridor (a 300m wide corridor assessed as part of this BA to allow micro-siting).
OHL Pylons	Structures will be up to 32m tall (may increase to 45 depending minimum clearance specified by authorities) Monopole (Self-supporting or stayed) and/or lattice may be used. Disturbance footprint per pylon of up to 10m by 10m (100m^2)
OHL footprint	Length ≈10km Construction road / service track (jeep track) width ≈4m (or less) OHL footprint ~4ha (10km x 4m), (consideration must be given that part of this road will use existing farm roads and/or WEF roads) Approximate number of pylons (based on average 150m average between pylons) = ≈68 Pylons disturbance footprint ~0,68ha (68 x 100m^2)
Kokerboom 2 Switching Station	Kokerboom 2 Switching Station to be located directly adjacent to the authorised Kokerboom 2 WEF Facility substation.
Switching station coordinates	Lat: -30.386079° (approx. centre point) Long: 19.398545°
Switching station footprint	Footprint of up to 1ha (100m wide and 100m long)
Laydown Areas	Temporary laydown area of ≈5000m^2 will be required at each switching station.
Site Access	The existing approved access roads to the Kokerboom 1 and 2 WEF substations will be used to access the proposed switching station locations. Roads to be developed as part of the Kokerboom 1 and 2 WEFs will be utilised to access the OHL as far as possible, however a service track (jeep track) will be required along the OHL route for construction and maintenance purposes.

Table 8-3: Summary of proposed project description (Kokerboom 3 Transmission line and switching station)

Component	Description
Overhead Powerline	132kV single- or double-circuit Extending from the Kokerboom 3 switching station to the Kokerboom 1 switching station (collector station). OHL will be located within a servitude of up to 32m wide to be positioned within a 300m wide corridor (a 300m wide corridor assessed as part of this BA to allow micro-siting).
OHL Pylons	Structures will be up to 32m tall (may increase to 45 depending minimum clearance specified by authorities). Monopole (Self-supporting or stayed) and/or lattice may be used. Disturbance footprint per pylon of up to 10m by 10m (100m^2).
OHL footprint	Length ≈19km Construction road / service track (jeep track) width ≈4m (or less) OHL footprint ~7,6ha (19km x 4m), (consideration must be given that part of this road will use existing farm roads and/or WEF roads) Approximate number of pylons (based on average 150m average between pylons) = ≈127 Pylons disturbance footprint ~1,27ha (127 x 100m^2)
Kokerboom 3 Switching Station	Kokerboom 3 Switching Station to be located directly adjacent to the Kokerboom 3 WEF Facility substation.
Switching station coordinates	Lat: -30.360189° (approx. centre point) Long: 19.516336°
Switching station footprint	Footprint of up to 1ha (100m wide and 100m long)
Laydown Areas	Temporary laydown area of ≈5000m^2 will be required at each switching station.
Site Access	The existing approved access roads to the Kokerboom 1, 2 and 3 WEF substations will be used to access the proposed switching station locations. Roads to be developed as part of the Kokerboom 1, 2 and 3 WEFs will be utilised to access the OHL as far as possible, however a service track (jeep track) will be required along the OHL route for construction and maintenance purposes.

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10 ANNEXURES

Annexure A, Details of the EAP

Annexure B, Correspondence with DFFE

Annexure C, Public Participation

Annexure D, Specialist reports

Annexure D.1, Agriculture and Soil Assessment

Annexure D.2, Terrestrial and Aquatic Ecology Assessment

Annexure D.3, Avifauna Assessment

Annexure D.4, Archaeology and Heritage Assessment

Annexure D.5, Palaeontology Assessment

Annexure D.6, Visual Impact Assessment

Annexure D.7, Electromagnetic Assessment

Annexure D.8, CAA confirmation

Annexure E, Screening Tool Report

Annexure F, Transmission line route coordinates

Kokerboom 1 Transmission line Coordinates at 150m (WGS 84)			Kokerboom 2 Transmission line Coordinates 150m (WGS 84)			Kokerboom 3 Transmission line Coordinates 150m (WGS 84)		
No.	Long.	Lat.	No.	Long.	Lat.	No.	Long.	Lat.
1	19.43861	-30.46826	1	19.39855	-30.38607	1	19.43851	-30.46805
2	19.43975	-30.46734	2	19.39865	-30.38620	2	19.43862	-30.46688
3	19.44089	-30.46641	3	19.39948	-30.38734	3	19.43820	-30.46558
4	19.44203	-30.46549	4	19.40031	-30.38849	4	19.43779	-30.46429
5	19.44317	-30.46456	5	19.40114	-30.38963	5	19.43737	-30.46299
6	19.44431	-30.46364	6	19.40198	-30.39078	6	19.43696	-30.46169
7	19.44545	-30.46271	7	19.40281	-30.39192	7	19.43654	-30.46039
8	19.44660	-30.46179	8	19.40364	-30.39307	8	19.43613	-30.45909
9	19.44774	-30.46086	9	19.40448	-30.39421	9	19.43571	-30.45779
10	19.44888	-30.45994	10	19.40531	-30.39536	10	19.43530	-30.45649
11	19.45002	-30.45901	11	19.40614	-30.39650	11	19.43488	-30.45519
12	19.45116	-30.45809	12	19.40697	-30.39765	12	19.43447	-30.45389
13	19.45230	-30.45716	13	19.40781	-30.39879	13	19.43405	-30.45260
14	19.45344	-30.45624	14	19.40863	-30.39994	14	19.43364	-30.45130
15	19.45459	-30.45531	15	19.40925	-30.40118	15	19.43322	-30.45000
16	19.45596	-30.45551	16	19.40988	-30.40242	16	19.43281	-30.44870
17	19.45741	-30.45603	17	19.41051	-30.40366	17	19.43239	-30.44740
18	19.45885	-30.45655	18	19.41114	-30.40490	18	19.43198	-30.44610
19	19.46030	-30.45707	19	19.41177	-30.40613	19	19.43156	-30.44480
20	19.46174	-30.45759	20	19.41239	-30.40737	20	19.43095	-30.44356
21	19.46319	-30.45812	21	19.41302	-30.40861	21	19.43032	-30.44233
22	19.46463	-30.45864	22	19.41365	-30.40985	22	19.42969	-30.44110
23	19.46608	-30.45916	23	19.41428	-30.41109	23	19.42906	-30.43986
24	19.46752	-30.45968	24	19.41491	-30.41232	24	19.42843	-30.43863
25	19.46897	-30.46020	25	19.41553	-30.41356	25	19.42780	-30.43739
26	19.47041	-30.46072	26	19.41616	-30.41480	26	19.42717	-30.43616
27	19.47186	-30.46125	27	19.41679	-30.41604	27	19.42655	-30.43493
28	19.4733	-30.46177	28	19.41742	-30.41728	28	19.42592	-30.43369
29	19.47475	-30.46229	29	19.41805	-30.41851	29	19.42529	-30.43246
30	19.47619	-30.46281	30	19.41868	-30.41975	30	19.42466	-30.43122
31	19.47764	-30.46333	31	19.4193	-30.42099	31	19.42403	-30.42999
32	19.47908	-30.46386	32	19.41993	-30.42223	32	19.42340	-30.42876
33	19.48053	-30.46438	33	19.42056	-30.42346	33	19.42277	-30.42752
34	19.48198	-30.4649	34	19.42119	-30.4247	34	19.42215	-30.42629
35	19.48342	-30.46542	35	19.42182	-30.42594	35	19.42152	-30.42505
36	19.48487	-30.46594	36	19.42244	-30.42718	36	19.42089	-30.42382
37	19.48631	-30.46646	37	19.42307	-30.42842	37	19.42026	-30.42259
38	19.48776	-30.46699	38	19.4237	-30.42965	38	19.41963	-30.42135
39	19.4892	-30.46751	39	19.42433	-30.43089	39	19.41900	-30.42012
40	19.49065	-30.46803	40	19.42496	-30.43213	40	19.41838	-30.41888
41	19.49209	-30.46855	41	19.42558	-30.43337	41	19.41775	-30.41765
42	19.49354	-30.46907	42	19.42621	-30.4346	42	19.41712	-30.41642
43	19.49498	-30.4696	43	19.42684	-30.43584	43	19.41730	-30.41546
44	19.49643	-30.47012	44	19.42747	-30.43708	44	19.41875	-30.41495
45	19.49787	-30.47064	45	19.4281	-30.43832	45	19.42019	-30.41443
46	19.49932	-30.47116	46	19.42872	-30.43955	46	19.42163	-30.41391
47	19.50024	-30.47225	47	19.42935	-30.44079	47	19.42308	-30.41339
48	19.50116	-30.47334	48	19.42998	-30.44203	48	19.42452	-30.41287
49	19.50207	-30.47444	49	19.43061	-30.44327	49	19.42596	-30.41236
50	19.50299	-30.47554	50	19.43124	-30.4445	50	19.42741	-30.41184
51	19.5039	-30.47663	51	19.43169	-30.4458	51	19.42885	-30.41132
52	19.50481	-30.47773	52	19.4321	-30.4471	52	19.43029	-30.41080
53	19.50573	-30.47883	53	19.43252	-30.4484	53	19.43174	-30.41029

54	19.50664	-30.47992	54	19.43293	-30.4497	54	19.43318	-30.40977
55	19.50756	-30.48102	55	19.43335	-30.45101	55	19.43462	-30.40925
56	19.50847	-30.48212	56	19.43377	-30.45231	56	19.43607	-30.40873
57	19.50938	-30.48321	57	19.43418	-30.45361	57	19.43751	-30.40822
58	19.5103	-30.48431	58	19.4346	-30.45491	58	19.43895	-30.40770
59	19.51121	-30.48541	59	19.43501	-30.45621	59	19.44040	-30.40718
60	19.51213	-30.4865	60	19.43543	-30.45752	60	19.44184	-30.40666
61	19.51304	-30.4876	61	19.43585	-30.45882	61	19.44336	-30.40695
62	19.51396	-30.48869	62	19.43626	-30.46012	62	19.44489	-30.40725
63	19.51487	-30.48979	63	19.43668	-30.46142	63	19.44641	-30.40755
64	19.51578	-30.49089	64	19.4371	-30.46272	64	19.44794	-30.40785
65	19.5167	-30.49198	65	19.43751	-30.46403	65	19.44946	-30.40814
66	19.51761	-30.49308	66	19.43793	-30.46533	66	19.45099	-30.40844
67	19.51853	-30.49418	67	19.43834	-30.46663	67	19.45251	-30.40874
68	19.51944	-30.49527	68	19.43837	-30.46784	68	19.45404	-30.40904
69	19.52035	-30.49637				69	19.45556	-30.40933
70	19.52127	-30.49747				70	19.45708	-30.40963
71	19.52218	-30.49856				71	19.45861	-30.40993
72	19.5231	-30.49966				72	19.46013	-30.41023
73	19.52401	-30.50076				73	19.46166	-30.41052
74	19.52493	-30.50185				74	19.46288	-30.40981
75	19.52584	-30.50295				75	19.46403	-30.40891
76	19.52675	-30.50405				76	19.46519	-30.40800
77	19.52767	-30.50514				77	19.46634	-30.40709
78	19.52858	-30.50624				78	19.46750	-30.40619
79	19.5295	-30.50733				79	19.46866	-30.40528
80	19.53041	-30.50843				80	19.46981	-30.40437
81	19.53132	-30.50953				81	19.47097	-30.40347
82	19.53224	-30.51062				82	19.47213	-30.40256
83	19.53315	-30.51172				83	19.47328	-30.40165
84	19.53407	-30.51282				84	19.47444	-30.40074
85	19.53498	-30.51391				85	19.47560	-30.39984
86	19.53625	-30.51321				86	19.47675	-30.39893
87	19.53754	-30.51244				87	19.47791	-30.39802
88	19.53883	-30.51167				88	19.47907	-30.39712
89	19.54011	-30.5109				89	19.48022	-30.39621
90	19.5414	-30.51013				90	19.48138	-30.39530
91	19.54269	-30.50936				91	19.48253	-30.39439
92	19.54397	-30.50859				92	19.48369	-30.39349
93	19.54526	-30.50782				93	19.48484	-30.39258
94	19.54655	-30.50704				94	19.48600	-30.39167
95	19.54783	-30.50627				95	19.48715	-30.39076
96	19.54912	-30.5055				96	19.48831	-30.38985
97	19.55053	-30.50492				97	19.48947	-30.38895
98	19.55195	-30.50435				98	19.49062	-30.38804
99	19.55337	-30.50377				99	19.49141	-30.38693
100	19.55479	-30.5032				100	19.49188	-30.38564
101	19.5562	-30.50262				101	19.49235	-30.38436
102	19.55762	-30.50205				102	19.49282	-30.38307
103	19.55904	-30.50147				103	19.49329	-30.38178
104	19.55993	-30.50111				104	19.49376	-30.38050
						105	19.49423	-30.37921
						106	19.49470	-30.37793
						107	19.49517	-30.37664
						108	19.49584	-30.37549
						109	19.49719	-30.37481
						110	19.49854	-30.37413
						111	19.49989	-30.37345

								112	19.50124	-30.37277
								113	19.50259	-30.37209
								114	19.50394	-30.37141
								115	19.50529	-30.37073
								116	19.50664	-30.37005
								117	19.50799	-30.36937
								118	19.50934	-30.36870
								119	19.51069	-30.36802
								120	19.51204	-30.36734
								121	19.51339	-30.36666
								122	19.51474	-30.36598
								123	19.51609	-30.36530
								124	19.51680	-30.36433
								125	19.51668	-30.36298
								126	19.51656	-30.36164
								127	19.51645	-30.36042

Annexure G, Generic EMPr updated

Annexure H, Site photographs