ENVIRONMENTAL SCREENING REPORT:

PROPOSED GROMIS-NAMA-AGGENEIS 400KV IPP INTEGRATION POWER LINE, NORTHERN CAPE PROVINCE

February 2021

Prepared for:

Eskom

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DOCUMENT CONTROL

Quality and revision record

Quality approval

	Capacity	Name	Signature	Date
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Reviewer:	CEO, Director & Environmental Science Specialist (SACNASP reg. #400328/11)	Elbi (G.E.) Bredenkamp		30 April 2020

This report has been prepared in accordance with Enviroworks Quality Management System.

Revision record

Revision Number	Objective	Change	Date
1	Draft Report	N/A	30 April 2020
2	Final Draft Report	Revision based on Eskom comments	24 July 2020
3	Final Report	Recommendation from stakeholders included	19 February 2021

SUMMARY

This screening report set out to identify the Preferred Alternative corridor for the development of a new 400 kV power line for the integration of IPP's between the substation of Aggeneis, Nama and Gromis in the Northern Cape Province.

Enviroworks was supplied by three alternative corridors to assess for the proposed development.

A robust approach was taken and made use of a range of specialist impact assessments in the field of environmental, social and economic studies. The approach used by specialists were standardised as much as possible in order to combine the results into a final recommendation.

Taking into account the scope and scale of the study (large spatial scale and resource limitations), the approach was confined to taking a largely desktop based approach to assess the alternatives. Each alternative was investigated in terms of the specialist aspects. The potential impacts that the proposed development could have were identified and significance rated in terms of standard impact rating methodology. By using the impact ratings for each of the specialist impacts, these were mapped and combined to produce and overall impact rating map for each alternative. Based on the significance ratings of each alternative, Alternative 5 emerged as the Preferred Alternative corridor considering environmental, social and economic aspects.

Alterative 5 is preferred over Alternative 1 by most specialists, because it avoids the important conservation and protected area found along Alternative 1 (and where Alternative 4 coincides with it) and still follows existing infrastructure for most of its length. Most of the specialist recommended to confine the new development as close as possible to the existing line in order to cluster impacted areas, limit disturbance, avoid creating impact in new areas and to make use of existing infrastructure such as access roads. One of the sensitive areas identified in most studies were the protected and conservation areas along Alternative 1, which made Alternative 5 a more preferred alternative. As both alternatives follow the same route for most of the length and have existing disturbances, new impacts will be limited and very similar. Both Alternative 1 and 5 are considered feasible alternatives from most of the specialists' recommendations but Alternative 5 is the most preferred across all project phases.

Alternative 5 emerged as having the lowest overall mean impact significance during the construction phase. When looking at the spatial pattern of sensitive and no-go areas, it does seem that the areas of high significance within Alternative 5 can be successfully avoided by the careful planning of the route alignment and pylon placement. Alternative 4 is excluded from further consideration due to the very high proportion of the area classified as having very high impacts. The spatial arrangement of the high impact significance areas will make it difficult, if not impractical, to avoid these sensitive areas within Alternative 4.

Alternative 1 & 5 emerged as having a similar, and low mean impact significance for both the construction and operational phase. If one considers the spatial pattern of sensitive and no-go areas between Alternative 1 and

5, it is apparent that Alternative 1 has numerous sensitive areas that's crosses the entire corridor width. The length of these sections are much larger (>460m) than the required distance between pylon placement. The spatial pattern of Alternative 5's sensitive areas is more spread out. The sections crossing the corridor are narrower compared to Alternative 1, which in turn will make avoiding placement of infrastructure in these areas more practically feasible.

Going forward it must be noted that Alternative 5 has the greatest potential to restrict future mining activities and in contrast, Alternative 1 would pose the lowest impact on future mining activities. It is suggested to consult with the relevant authorities with regards to mineral deposits and mining rights and ensure the line does not cross areas of known mineral deposits and/or where existing mining rights exist. This should be explored in detail in the next phase of land negotiations. Alternative 5 would need to be discarded if subsequent investigations to this report indicate there are highly viable deposits along this routing that are likely to become operational mines. Should the power line be constructed along Alternative 1, the route should be placed as close to the National Route 14 highway as possible, remaining on the extreme edges of Goegap Nature Reserve in order to minimize impact on this sensitive protected area. Goegap Nature Reserve and the managers of adjacent protected areas should be further consulted to better gage the significance of expected impacts. In all instances the final power line route would need to avoid the No-Go areas as far as much as practically feasible to minimise negative impacts.

Within the Preferred Alternative, the report's recommendations will be used by Eskom in the next phase to negotiate 'right-of way' with landowners. Once this phase is complete, Eskom can approach the Competent Authority for application for the required environmental authorisation in the Basic Assessment (BA) Process.

The impact rating map and identified sensitive (i.e. 'no-go' areas) can be used during the BA Process as a starting point for more detailed site verifications that will typically include ground-truthing site sensitivities to ensure highly sensitive areas are avoided for the final route alignment and pylon placement.

This screening assessment identified suitable mitigation measures for each of the identified impacts and monitoring procedures were also supplied. It is recommended that these mitigation and monitoring measures be included in the project specific EMPr and implemented through-out the project lifetime.

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DETAILS OF THE EAP

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RELEVANT QUALIFICATIONS

- MSc Botany (SU): Specialising in Invasion Biology & Fynbos Restoration
- BSc Hons Plant Sciences- Ecology (UP)
- BSc Environmental Sciences (UP)
- Section 21 (c) and (i) Training: Roodeplaat (November 2017)
- SASS5 Aquatic Biomonitoring Training (November 2018)

WORK EXPERIENCE

- March 2016 - May 2017: Field assistant, Plant Ecologist at Department of Environmental Affairs (Oceans & Coasts)
- June 2017 - current: Environmental Consultant & Ecological Specialist at Enviroworks
- January 2019 – current: Office manager for Enviroworks, Cape Town

Published popular Science article:

- Mostert, E., Gaertner, M., Hall, S., Mukundamago, M., Holmes, P. 2015. *Solving the puzzle of restoring the missing fynbos*. Quest, Volume 11, Number 3.

Publication accepted for journal publication:

- Mostert, E., *et al*., Impacts of invasive alien trees on threatened lowland vegetation types in the Cape Floristic Region, South Africa, South African Journal of Botany 108 (2017) 209–222.
- Mostert E., et al, A multi-criterion approach for prioritizing areas in urban ecosystems for active restoration following invasive plant control, Environmental Management, (In production), 1-20, **DOI** 10.1007/s00267-018-1103-9

FRESHWATER ECOLOGICAL ASSESSMENTS

- Wetland delineation and DWS Section 21 (c) & (i) Water Use Risk Matrix for the proposed development of 100 erven on Erf 210 in Sutherland, Karoo Hoogland Local Municipality, Northern Cape, COGHSTA.
- Wetland delineation and DWS Section 21 (c) & (i) Water Use Risk Matrix for the proposed Zachtevlei Dam And Bulk Conveyance Infrastructure, Lady Grey, Eastern Cape, Indwe Environmental Consulting for Joe Gqabi District Municipality.
- DWS Section 21 (c) & (i) Water Use Risk Matrix for the proposed development of Erf 3976 for a mixed use development in Hartswater, Phokwane Municipality, Northern Cape, Makespace Architects.
- DWS Section 21 (c) & (i) Water Use Risk matrix for the proposed construction of a cellular telecommunications base station and associated infrastructure in Roodekrans, Gauteng, Coast to Coast Towers (Pty) Ltd.
- Wetland delineation for the proposed development of the Sarah Baartman Agricultural Hub, Eastern Cape, FemPlan.
- Wetland delineation for the proposed development of the Alfred Nzo Agricultural Hub, Eastern Cape, FemPlan.
- Wetland delineation for the proposed development of the OR Tambo Agricultural Hub, Eastern Cape, FemPlan.
- DWS Section 21 (c) & (i) Water Use Risk Matrix for the proposed expansion of a granite mine in Biesjesfontein, Springbok, Northern Cape, Greenmined.
- DWS Section 21 (c) & (i) Water Use Risk Matrix for the proposed development of new sports grounds at Waterstone College, Olifantsvlei, Gauteng, CURRO.
- Wetland delineation and DWS Section 21 (c) & (i) Water Use Risk Matrix for the 24G Application for the unlawful clearing of indigenous vegetation and construction of chicken lay houses, Molote City, North West Province, Baramakama Poultry (Pty) Ltd.
- Freshwater specialist study for the extension of a canal by 10 metres at km0.1 along Minor Road 6924, Western Cape Province, Garden Route District Municipality.
- Wetland delineation and DWS Section 21 (c) & (i) Water Use Risk Matrix for the 24G Application for the unlawful construction of a poultry farm, Belgie, Thaba 'Nchu, Free State, Country Bird Holdings.
- Freshwater Study and DWS Section 21 (c) & (i) Water Use Risk Matrix for the the periodic maintenance of TR1/2, TR1/3, TR44/1, TR88/1, MR401, MR402 and DR1834, near Uniondale, Western Cape Province, Western Cape Department of Transport and Public Works.
- DWS Section 21 (c) & (i) Water Use Risk Matrix for the rehabilitation of Divisional Road 1688 from Calitzdorp (KM 1.00) to the Calitzdorp Spa Turnoff (KM 15.64), Western Cape Province, BVi Consulting Engineers.

WATER USE LICENCE APPLICATIONS

- General Authorization for the rehabilitation of Divisional Road 1688 from Calitzdorp (KM 1.00) to the Calitzdorp Spa Turnoff (KM 15.64), Western Cape Province, BVi Consulting Engineers.
- General Authorization for the the periodic maintenance of TR1/2, TR1/3, TR44/1, TR88/1, MR401, MR402 and DR1834, near Uniondale, Western Cape Province, Western Cape Department of Transport and Public Works.
- Water Use Licence Application for chicken lay houses, Molote City, North West Province, Baramakama Poultry (Pty) Ltd.

SECTION 24G RECTIFICATION APPLICATION

- Section 24G Application for the unlawful clearing of indigenous vegetation and construction of chicken lay houses, Molote City, North West Province, Baramakama Poultry (Pty) Ltd.

ENVIRONMENTAL CONTROL OFFICER

- Environmental Control Officer for the rehabilitation of Divisional Road 1688 from Calitzdorp (KM 1.00) to the Calitzdorp Spa Turnoff (KM 15.64), Western Cape Province, BVi Consulting Engineers.
- Environmental Control Officer for the the periodic maintenance of TR1/2, TR1/3, TR44/1, TR88/1, MR401, MR402 and DR1834, near Uniondale, Western Cape Province, Western Cape Department of Transport and Public Works.

ENVIRONMENTAL REHABILITATION PLAN

- Environmental rehabilitation plan for all the areas affected by the continuous spillage of raw sewage in and around Upington, Northern Cape Province, Dawid Kruiper Local Municipality.

BASIC ASSESSMENT EXPERIENCE

- The proposed construction of a cellular telecommunications base station and associated infrastructure on Portion 76 of Farm No. 106, Robertson, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- The proposed construction of a cellular telecommunications base station and associated infrastructure on Portion 1 of Farm No. 178, Fisantekraal, City of Cape Town, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- The proposed development of a telecommunication base station and associated infrastructure on Portion 8 of the Farm Delta no. 1003, Groot Drakenstein, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- Proposed development of a free standing cellular communication base station and associated infrastructure on Portion 7 of the Farm Haane Kuil no. 335, Beaufort West, Western Cape Province, Warren Petterson Planning (Pty) Ltd.

INTEGRATED ENVIRONMENTAL AUTHORISATIONS

- Amendment of the Environmental Integrated Authorisation for the Continuous Ash Disposal at Matimba Power Station, Lephalale, Limpopo Province, Eskom Holdings SOC Ltd.

ENVIRONMENTAL MANAGEMENT PLANS

- The proposed construction of a cellular telecommunications base station and associated infrastructure on Portion 76 of Farm No. 106, Robertson, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- The proposed construction of a cellular telecommunications base station and associated infrastructure on Portion 1 of Farm No. 178, Fisantekraal, City of Cape Town, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- The proposed development of a telecommunication base station and associated infrastructure on Portion 8 of the Farm Delta no. 1003, Groot Drakenstein, Western Cape Province, Coast to Coast Towers (Pty) Ltd.
- Proposed development of a free standing cellular communication base station and associated infrastructure on Portion 7 of the Farm Haane Kuil no. 335, Beaufort West, Western Cape Province, Warren Petterson Planning (Pty) Ltd.

EXPERIENCE IN PERMITS AND LICENCING

- Flora removal permit and translocation guidelines for the periodic maintenance of National Route 2 Section 4 between Riviersonderend (km 0.0) and Swellendam (km 56.9), Western Cape Province, SANRAL.
- Flora removal permit for the re-surfacing of the Donkergat Access Road located within the Langebaan 4 Special Forces Regiment Base, Langebaan, Western Cape, Department of Public Works**.**
- Fauna and flora removal permits for the upgrading of intersections and resealing of road sections between Hotazel and Black Rock, Northern Cape, SMEC.
- Flora removal permit for the rehabilitation of Divisional Road 1688 from Calitzdorp (KM 1.00) to the Calitzdorp Spa Turnoff (KM 15.64), Western Cape Province, BVi Consulting Engineers.

ECOLOGICAL IMPACT ASSESSMENT EXPERIENCE

- Ecological Impact Assessment for the proposed development of 100 erven on Erf 210 in Sutherland, Karoo Hoogland Local Municipality, Northern Cape, COGHSTA Northern Cape.
- Ecological Impact Assessment for the periodic maintenance of National Route 2 Section 4 between Riviersonderend (km 0.0) and Swellendam (km 56.9), Western Cape Province, SANRAL.
- Flora identification study for the re-surfacing of the Donkergat Access Road located within the Langebaan 4 Special Forces Regiment Base, Langebaan, Western Cape, Department of Public Works.
- Quarterly monitoring assessment for the rehabilitation efforts on Portion 5 of Farm 830 Doornekraal, Malmesbury, Western Cape.
- Rehabilitation feedback and framework report for the rehabilitation efforts on Portion 5 of Farm 830 Doornekraal, Malmesbury, Western Cape.
- Botanical inspection and recommendations for vegetation rehabilitation at 13 Duikerweg, Melkbosstrand, Western Cape.
- Botanical inspection along R60 selected road crossing and road widening between Worcester and Ashton, Western Cape, BVi Consulting Engineers.
- Ecological Impact Assessment for the proposed development of the Mapungubwe Visitor Interpretation Centres and Overnight Facilities, Limpopo Province, SANParks.
- Ecological Impact Assessment for the proposed development of Erf 3976 for a mixed use development in Hartswater, Phokwane Municipality, Northern Cape, Makespace Architects.
- Ecological Impact Assessment for the proposed construction of a cellular telecommunications base station and associated infrastructure in Roodekrans, Gauteng, Coast to Coast Towers (Pty) Ltd.
- Ecological Impact Assessment for the proposed construction of six lay houses and two new production (hen) houses at Frans Dam Farm, No. 803 Portion 3 in Brandfort, Free State, Moreson Pluimvee Boerdery (Pty) Ltd.
- Ecological Impact Assessment for the 24G Application for the unlawful clearing of indigenous vegetation and construction of chicken lay houses, Molote City, North West Province, Baramakama Poultry (Pty) Ltd.
- Ecological Impact Assessment for the proposed construction of a composting facility on Farm No. 1136 Terugval Portion 1 in Brandfort, Free State, Moreson Pluimvee Boerdery (Pty) Ltd.
- Ecological Impact Assessment for the 24G Application for the unlawful construction of a poultry farm, Belgie, Thaba 'Nchu, Free State, Country Bird Holdings.
- Ecological Impact Assessment for the periodic maintenance of TR1/2, TR1/3, TR44/1, TR88/1, MR401, MR402 and DR1834, near Uniondale, Western Cape Province, Western Cape Department of Transport and Public Works.
- Botanical Survey for the proposed 20m monopole mast and base station on Erf 455, Simon's Town, Western Cape Province, Atlas Tower (Pty) Ltd.

ALIEN INVASIVE SPECIES MANAGEMENT EXPERIENCE

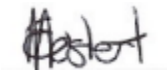
- Preparation of a plan to control and eradicate invasive species as contemplated in Section 76 of the Act, National Environmental Management: Biodiversity Act, 2004 (Act No.10 Of 2004) (NEMBA) for Theewaterskloof Local Municipality**.**
- Baseline Biodiversity Database and Alien Management Strategy Recommendations, Drakenstein, Western Cape, Drakenstein Municipality.
- Review and presentation of Lafarge Saldanha Alien Invasive Species Management Plan, Saldanha, Western Cape Province, Lafarge South Africa.
- Alien Invasive Species Training for staff and management, Saldanha, Western Cape Province, Lafarge South Africa.

DECLARATION OF INDEPENDENCE

I, Elana Mostert, ID 910523 0099 085, declare that I:

- am an Environmental Consultant at Enviroworks;
- am assigned as Environmental Assessment Practitioner by Enviroworks (Pty) Ltd. for this proposed project;
- I do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference;
- remuneration for services by the proponent in relation to this proposal is not linked to approval by decision-making authorities responsible for permitting this proposal;
- the consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project;
- have no and will not engage in conflicting interests in the undertaking of the activity;
- undertake to disclose to the client and the competent authority any material, information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations 2017; and,
- will provide the client and competent authority with access to all information at my disposal, regarding this project, whether favourable or not.

Elana Mostert



Signature

1. BACKGROUND

1.1. Introduction

Eskom proposes to develop a new power line from the Gromis substation via the Nama substation towards the Aggeneis substation in the Northern Cape Province.

In order to ensure that the Namaqualand electricity network is compliant and that there is sufficient line capacity to accommodate potential Independent Power Producers (IPPs) within the Namaqualand area, it is proposed to develop the new Gromis-Nama-Aggeneis 400 kV line and establishment of a 400/132 kV yard at the Nama substation. This Screening Assessment aims to assess possible route (hereafter referred to as corridor) alternatives for the proposed new power line. This project follows after a Strategic Environmental Assessment (SEA) was undertaken by CSIR that identified nationwide corridors for the strategic expansion of Electricity Grid Infrastructure (EGI).

1.2. Strategic Environmental Assessment - Strategic Electrical Grid Infrastructure

In 2016 a Strategic Environmental Assessment (SEA) was undertaken by the CSIR. The purpose of the SEA was to identify strategic Electricity Grid Infrastructure (EGI) Corridors to support electricity transmission up to 2040. The vision for the Strategic EGI was to expand in an environmentally responsible and efficient manner that effectively meets the country's economic and social development needs.

Objectives of the EGI SEA were:

- Identify strategic corridors to support backbone of electricity transmission up to 2040;
- Refine the corridors based on high level suitability from an environmental, economic and social perspective;
- Undertake scoping level environmental pre-assessment of the corridors;
- Facilitate streamlined environmental authorisation of EGI development inside of corridors;
- Promote integrated decision-making between authorising authorities;
- Gazette the corridors under the SIP programme (Infrastructure Development Act);
- Enable Eskom greater flexibility when negotiating servitudes; and,
- Support upfront strategic investment.

The final EGI Corridors assessed as part of the 2016 EGI SEA were gazetted for implementation on 16 February 2018 in Government Gazette No. 41445, Government Notice R. 113. One of these corridors, was the Northern Corridor – Please see Figure 1 for the Gazetted Corridors. The proposed new power line will be constructed within the SEA identified Northern Corridor.

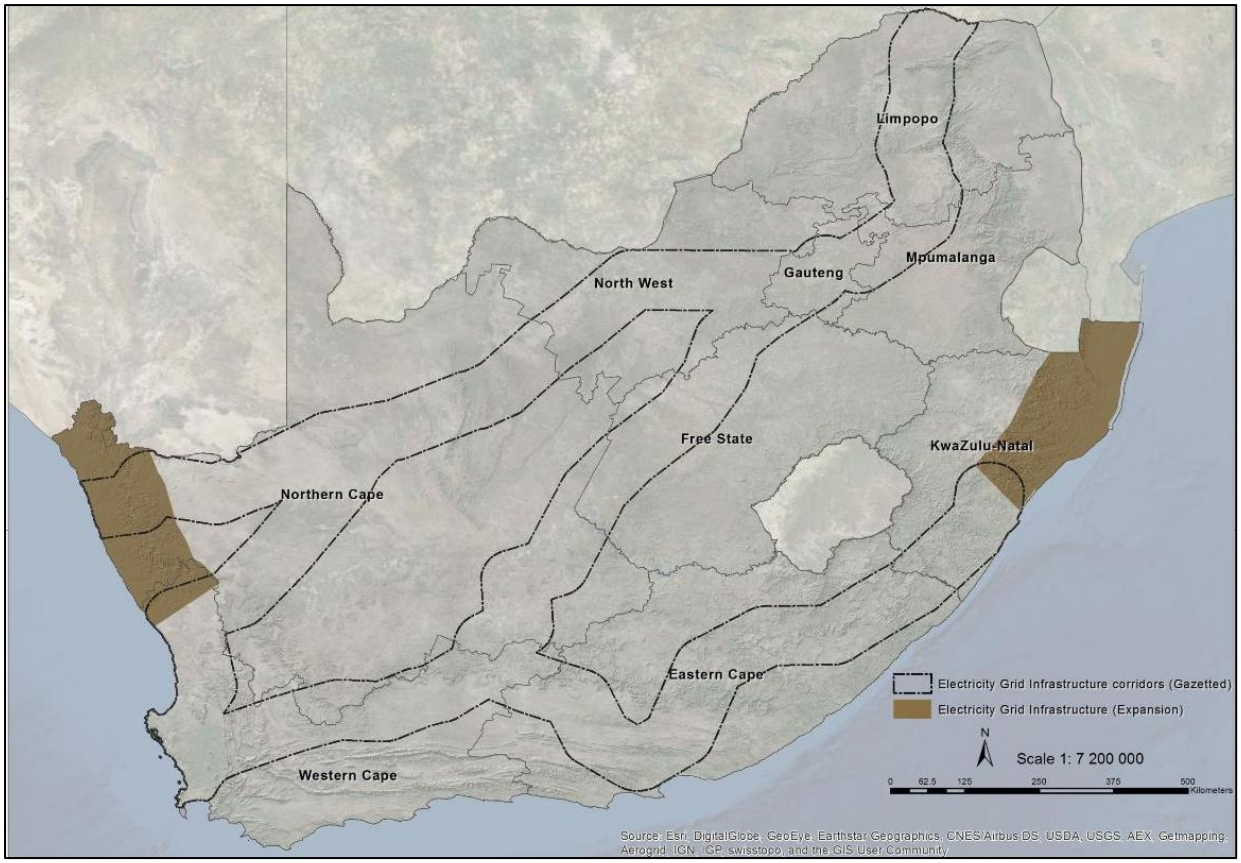


Figure 1 Final Electricity Grid Infrastructure (EGI) power corridors assessed as part of the 2016 EGI Strategic Environmental Assessment (taken from Department of Environmental Affairs, 2016)

1.3. Alternative Environmental Authorisation procedure to be followed

The above mentioned Gazette (GN R. 113 in Government Gazette No. 41445) provided an alternative procedure to be followed when applying for Environmental Authorisation (EA) for the development of large scale electricity transmission and distribution infrastructure (identified in terms of Section 24(2)(a) of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA)) when these activities fall within the identified Strategic Transmission Corridors (i.e. areas declared as geographical areas of strategic importance), such as the Northern Corridor.

Developers proposing to submit applications for Environmental Authorisations for large scale electricity transmission infrastructure within any of the five Strategic Transmission Corridors, that trigger Listed Activity 9 of Listing Notice 2 of the 2014 Environmental Impact Assessment (EIA) Regulations (as amended), or any other listed and specified activities that are necessary for the realization of such infrastructure and facilities, would need to follow a Basic Assessment (BA) Process in terms of the 2014 EIA Regulations (as amended), as opposed to a full Scoping and EIA Process, which is required for all activities listed in Listing Notice 2. Therefore, the outcome of the 2016 EGI SEA was the streamlining of the Environmental Authorisation process for EGI related development within any of the five Strategic Transmission Corridors.

A pre-requisite for the BA process to be followed is however the obtaining of a servitude prior to application for environmental authorisation. One of the objectives of this SEA process was also to enable the developers with the flexibility to consider a range of route alternatives within the pre-assessed strategic corridors to avoid land negotiation issues and to submit a pre-negotiated route to the Competent Authority.

As noted above, this has been achieved for the development of EGI within any of the five Strategic Transmission Corridors gazetted in February 2018 (GN R. 113 in Government Gazette No. 41445), for which:

(a) a pre-negotiated route must be submitted to the Department of Environmental Affairs (DEA); and,

(b) a BA procedure needs to be followed in compliance with the 2014 EIA Regulations (as amended) instead of a full Scoping and EIA process previously triggered by such activities.

This new streamlined environmental assessment process also includes a reduced decision-making timeframe for the Competent Authority (i.e. 57 days as opposed to 155 days). Several factors served as motivation for the abovementioned streamlining of the Environmental Assessment Process, including the fact that the development of linear EGI is a well-known type of development, and the DEA has previously considered and issued Environmental Authorisation for numerous applications in this regard.

1.4. Screening of Alternative Routes

Before a route can be pre-negotiated for the proposed development, and then presented to the Competent Authority for application during the BA procedure, a Preferred Alternative route must be identified.

Enviroworks (Pty) Ltd, a professional Environmental Compliance consultancy, was appointed by Eskom to conduct the Screening Assessment of a set of provided alternative route options in order to identify the Preferred Alternative from an Environmental Perspective. Several specialist studies were conducted to inform this screening report. These studies include:

- Heritage Impact Assessment
- Socio-Economic Impact Assessment
- Botanical Impact Assessment
- Freshwater Impact Assessment (surface watercourses)
- Fauna Impact Assessment
- Avifaunal Impact Assessment
- Visual Impact Assessment
- Agricultural Impact Assessment
- Desktop Geo-hydrological Impact Assessment

This screening report will be used by Eskom to negotiate Right-of-Way with land owners. After negotiations with land owners, Eskom will enter a next tender phase where the Basic Assessment (BA) Process will be followed to

obtain an authorisation from the competent authority based on the pre-negotiated route. Eskom envisage to use the same specialists to verify their work, should there be a need to do so. All studies conforms to the prescriptions in Appendix 6 of NEMA Regulations, per Government Notice (GN) Regulation 326 of 7 April 2017.

1.5. Legal Framework

This study was undertaken in terms of Regulation 15 of the EIA Regulations, 2014 (Government Notice No. R 982, In the Gazette No. 38282 of 4 December 2014), that provide for the procedure to be followed in applying for environmental authorisation for large scale electricity transmission and distribution development activities identified in terms of Section 24(2)(a) of the National Environmental Management Act, 1998.

The key pieces of legislation that enable the identification and implementation of Power Corridors include the NEMA, Infrastructure Development Act (Act 23 of 2014) and the Spatial Planning and Land Use Management Act (Act 16 of 2013) (SPLUMA). The applicability and description of these pieces of legislation are captured in the 2016 EGI SEA Report (DEA, 2016) and the reader is referred to this report for further details.

2. NEED AND DESIRABILITY

The main aim of the EGI - SEA was to ensure that the final strategic corridors were positioned to support areas where future transmission infrastructure will be best utilised. The electricity grid infrastructure including transmission lines, are required to provide grid access to electricity generators so that the energy they generate can reach users. For this reason, planning around the likely future location of these generators is a key input to Eskom's transmission network planning processes. This includes planning for generation plants of all types and sizes. It also encompasses independent power producers (IPPs) which have rapidly become key electricity producers, particularly for renewable energy producers projects and this has increased the demand for grid access and hence the need to construct more EGI. As noted in the latest Eskom Transmission Development Plan, the establishment of large-scale renewable energy generation is becoming a primary driver of network development, particularly in the Western-, Eastern- and Northern Cape Provinces (Eskom, 2018).

Eskom's ability to continue to supply the national electricity requirements is significantly hampered by several factors including aging infrastructure and a failure of coal power stations due to, amongst others, maintenance issues (Nchabeleng, 2019). The proposed power line will provide much needed infrastructure and support the inclusion of more renewable energy sources, thus reducing the country's dependency on fossil fuels (Leach, 2020).

Furthermore, based on the findings of the 2015 SEA (Department of Environmental Affairs, 2015), the development of Renewable Energy (RE) projects, which will be facilitated by connection to the grid by the new 400 kV power line, will have direct and indirect benefits and will aid to diversify the economies of local municipalities. This will be particularly important for the study area which relies heavily on mining and agricultural industries, both of which have seen a decline over the years (Leach, 2020).

3. PROJECT SCOPE AND MAIN OBJECTIVES

- Undertake the environmental screening process and produce a report which Eskom can utilize to negotiate a power line route for the construction of the project. The report will be used to determine any fatal flaws along the proposed route to be negotiated;
    - Provide ample time for a public involvement process (Public Participation Process, PPP) to notify the public of the proposed project and give the public an opportunity to raise possible issues and concerns;
    - Identify all the relevant stakeholders, Government Departments at all levels, Non-government organizations (NGO's) and the general public that needs to be involved. Where possible landowners in the affected corridors must be identified and included in the process;
    - Preparation of all the necessary documents required for the public involvement process;
    - Conduct a site visit with Eskom and all the specialists involved in the project;
    - Produce specialist reports that are be based on desktop work as well as field studies to ensure completeness and detail. Specialist studies will be used during the later BA process and as such need to be detailed and complete;
    - All information gathered during the PPP and the specialist studies to be used in compiling the final screening report that indicates the suitability of the proposed final route for construction and minimal environmental impact;
    - All documents prepared, including specialist study reports, will become the property of Eskom after completion of the screening study, for use during the later BA process to be followed once the route is negotiated.

4. DESCRIPTION OF THE ALTERNATIVES

4.1. Alternative corridors

This study's transmission corridors are situated within the Northern Corridor of the EGI SEA. The Northern Corridor originates in the Northern Cape on the coast to the south of Port Nolloth, an area characterised by mining mostly for diamonds and some agriculture. It then moves through primarily agricultural areas interspersed with mining operations and increasingly solar power generation facilities, particularly near Pofadder and Upington. It passes through the major iron ore mining areas around Sishen/Kathu before crossing into the agricultural areas of North-West province centred around Vryburg. Thereafter it reaches the wider Rustenburg area platinum belt and on to Gauteng.

Eskom initially identified and provided Enviroworks with four (4) alternative corridors to assess. After the site inspection with Eskom and in consultation with the specialist team, another alternative (Alternative 5) was identified.

During the site visit, the specialist team, in consultation with Eskom, concluded that Alternative 1, 4 and 5 were the only viable options for consideration and excluded alternative 2 and 3. The location of Alternative 1, 4 and 5 can be viewed in the maps below (Figures 2, 3 & 4).

4.2. Transmission infrastructure

The proposed development will entail the construction of a 400 kV power line, between the substations of Aggeneis, Nama and Gromis. The direct footprint of a single pylon supporting a 400 kV powerline is about 1 ha. This area is needed for the foundation excavation, assembly and raising of the pylon. The overhead power line will be supported by various types of pylons (such as self-supporting lattice towers, guyed towers and monopole structures). Pylon towers will be spaced approximately 460 m apart, with the distance varying in mountainous terrain. Where the gradient of the terrain is <15%, Cross Rope Suspension or Guyed-Vee Towers will be used (height 32 metres), and in the case where the gradient exceeds 15%, Self-Supporting Towers will be used (average height of 28 metres; however, can go as high as 43 metres depending on the topography of the study area).

The development footprint for where the substations expansion extends up to is unknown at this stage (including temporary construction camps, borrow pits, vehicle parking, stock piles, etc.). A 4m access road is needed for vehicles during construction. The access roads for accessing pylons/powerlines is usually widened to a two-track road of 8m. Servitudes of 55m is mandatory for the 400 kV line, with a maximum width of 90m at the pylon location. The servitude will require ongoing vegetation clearing to maintain an eight-metre strip wherein grass/herbaceous vegetation regrowth is cut to a height of 20 cm, and trees in most cases are removed. Considering the sparse and short vegetation growth forms in the study area, very little clearing and removal of trees will be needed.

The tower design and servitude assumption can be viewed in the table below (Table 1 & 2).

Table 1 Building Plans for the proposed Cross Rope Pylon.

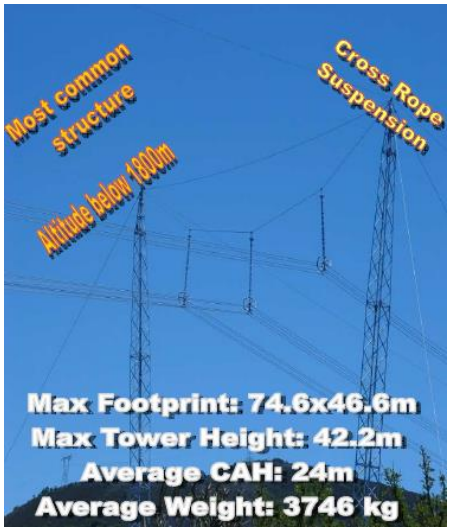
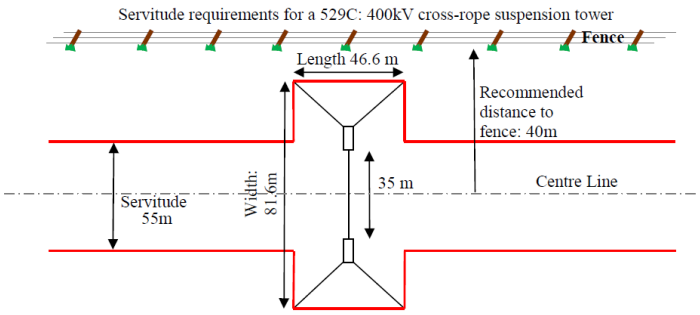
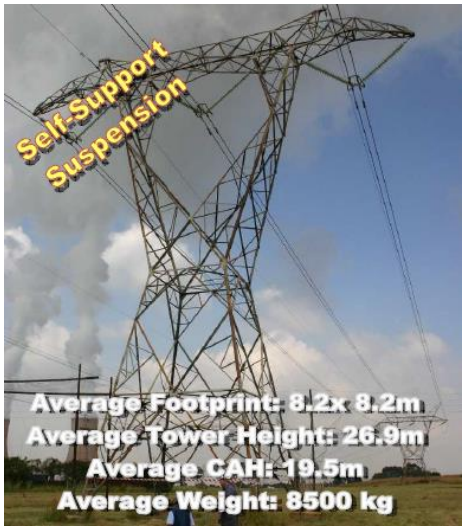
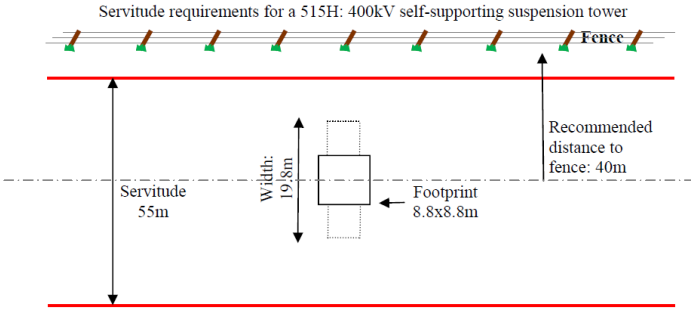
	

Table 2 Building Plans for Self Supporting Pylon.

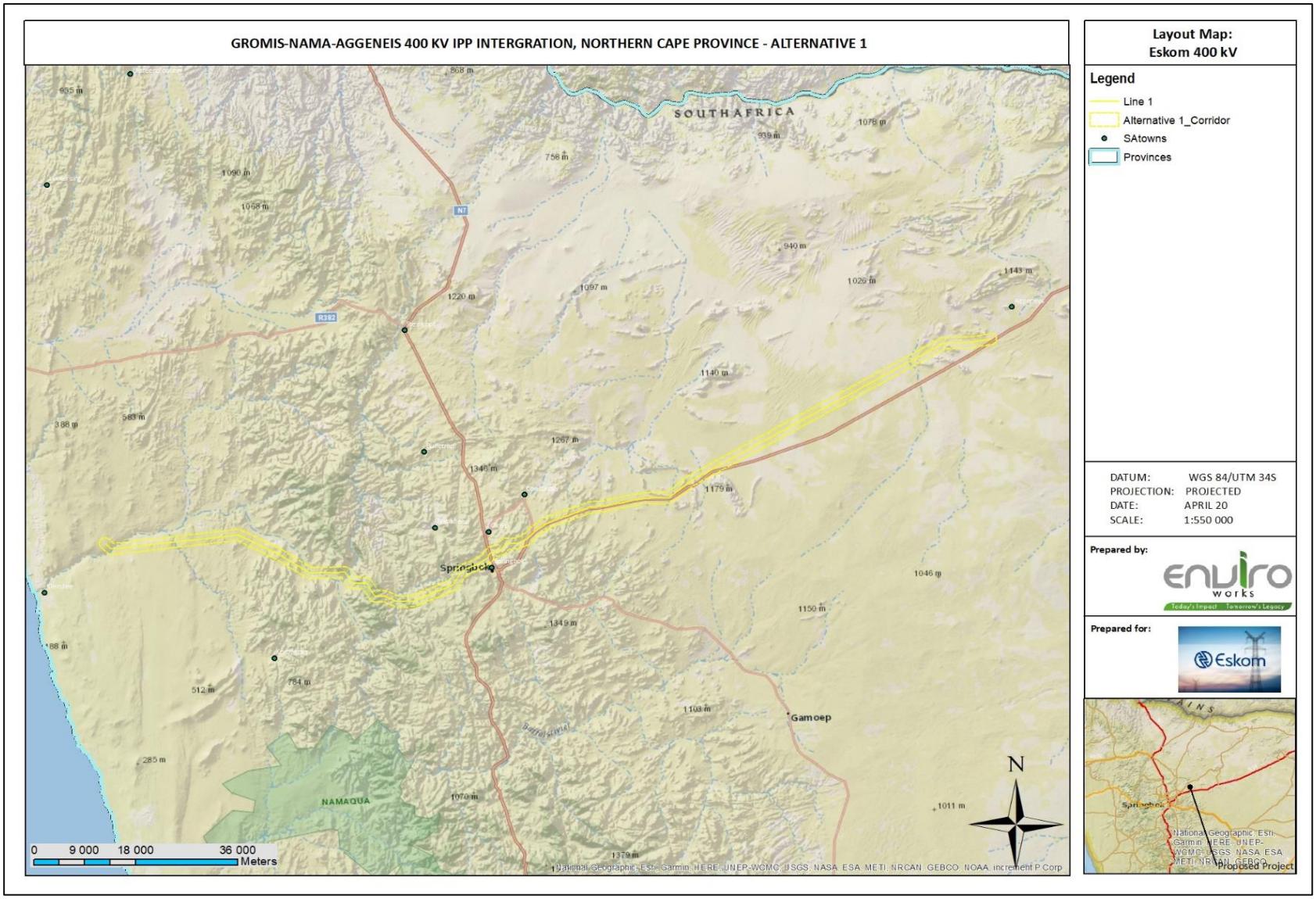


Figure 2 Locality map of Alternative 1

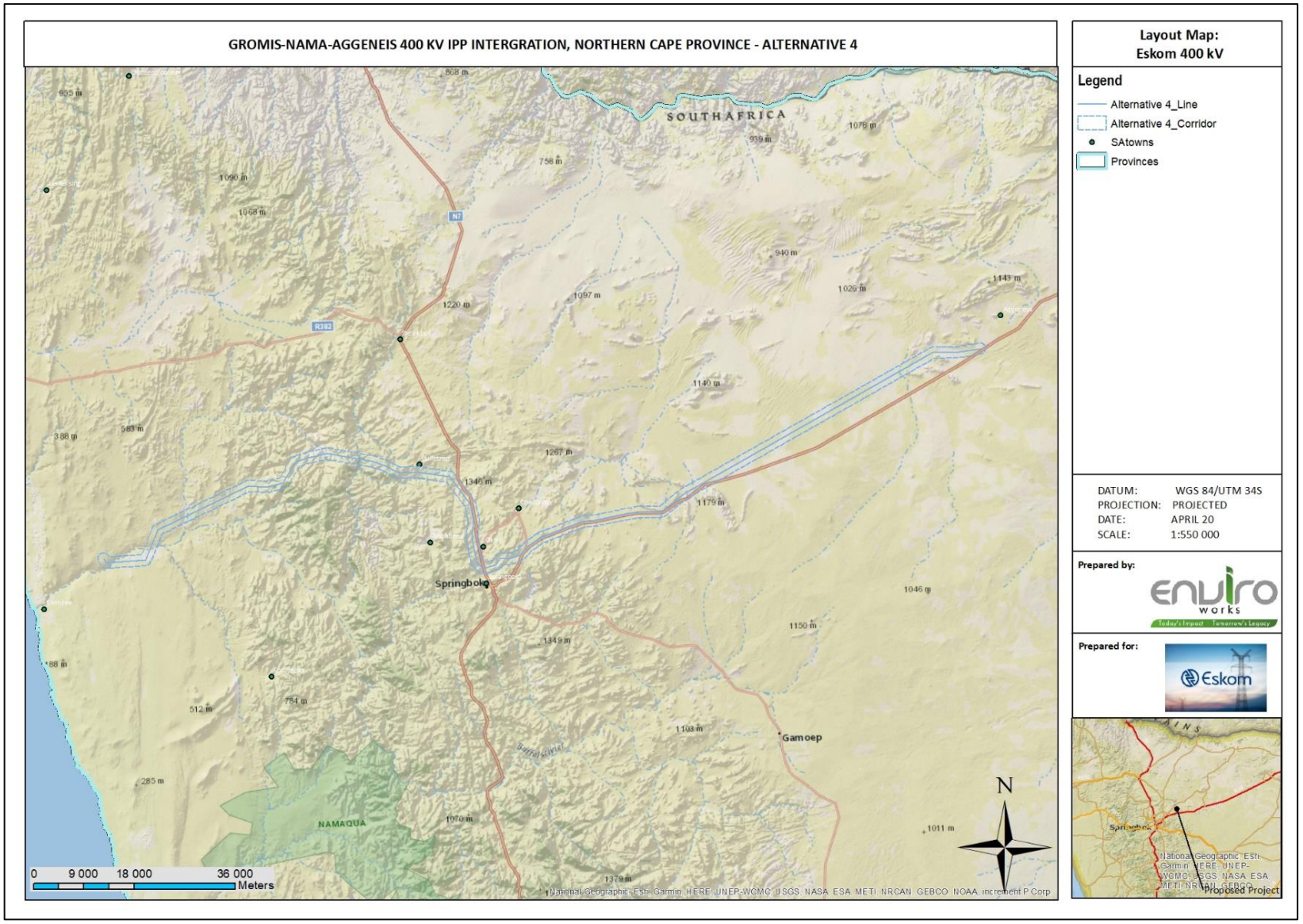


Figure 3 Locality map of Alternative 4

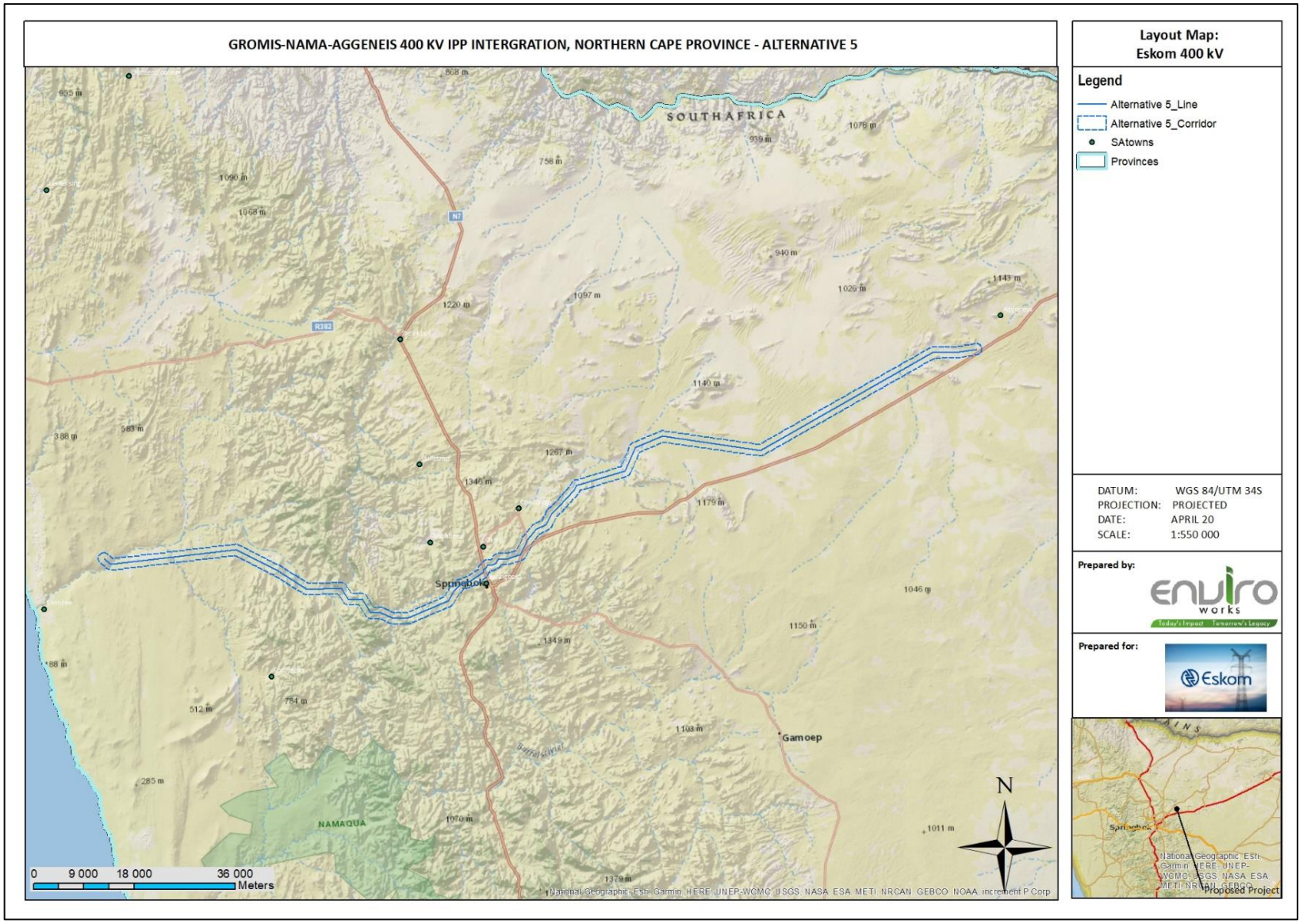


Figure 4 Locality map of Alternative 5

5. RECEIVING ENVIRONMENT OF THE WIDER CORRIDOR AREA

The proposed power line development runs from just east of Kleinzee via Springbok to just west of Aggeneys. The development spans across two local municipalities, the Nama Khoi Local Municipality (NKLM) and the Khâi Ma Local Municipality (KMLM), which are two of the six local municipalities making up the Namakwa District Municipality (NDM) in the Northern Cape Province. Most of the development falls within the Nama Khoi Municipality. The NDM is situated in the north-western corner of South Africa and is bordered by the Atlantic Ocean to the west, Namibia to the north, ZF Mgcawu and Pixley ka Seme District Municipalities to the north-east and east respectively and the Western Cape Province to the south. The district has an area of 126 836km², making it the largest district municipality in South Africa, and the town of Springbok functions as the administrative centre. The National Route 7 (N7), an important transport route, passes through the district. The main economic sectors contributing to the district are agriculture, mining, mari-culture, tourism, industry and electricity. Between 2003 and 2013, the tertiary sector had the highest contribution to the economy with an average annual contribution of 63.1%. This was followed by the primary sector contributing an annual average of 33.8% (as in Leach, 2020).

The NDM had the highest solar radiation intensity in Southern Africa, making it an ideal location for solar projects. Wind, wave and nuclear energy have also been identified as renewable energy sources which could potentially support the energy sector (Namakwa District Municipality: IDP, 2017) (as in Leach, 2020). The establishment of large-scale renewable energy (RE) generation is becoming a primary driver of electricity transmission network development, particularly in the Western, Eastern and Northern Cape Provinces (Eskom, 2018). This is understandable why the study area has been designated as a Renewable Energy Development Zone (REDZ) by government, with numerous wind and solar energy projects either in the planning, construction or operational phases currently (CES, 2019).

Developing the energy sector holds great potential benefits for the Northern Cape and would have significant knock-on effects for the local economy. In order to facilitate the development of this industry the necessary infrastructure and associated amenities need to be provided through innovative planning and projects such as which is proposed here (CES, 2019; Northern Cape Province, 2019).

Besides the growing energy sector, the area is still known for its mining activities; however, due to the high demand of power in South Africa a lot of farms are bought by Power Generating Companies as the area offers high yielding capacity for renewable energy projects. The Namaqualand region is also highly dependent on tourism especially during the flowering season with two (2) National Parks situated within close proximity of Springbok. Numerous trails and 4 x 4 routes are present within the area to further enhance tourism within the area (as in Du Plessis, 2020).

6. METHODOLOGY

6.1. Overall approach

Each specialists' approach and methodology can be viewed in the respective reports attached in **Appendix 3**, and will not be discussed further here. This section will rather give an overview of the overall approach taken by Enviroworks to produce this Screening Report.

Enviroworks firstly applied the Screening Tool to the Alternative corridors as per Regulation 16(1)(b)(v) of the Environmental Impact Assessment Regulations, 2014 (as amended) and this information was used as baseline information for the Screening Report and specialist's desktop studies.

The approach to this study was to screen the four corridor alternatives initially provided by Eskom for potential sensitive environmental, social and economic issues. During the site visit with the specialist team (14-17 October 2019) it was decided and communicated with Eskom to add another alternative, Alternative 5. It was also discussed that Alternative 2 and 3 were not feasible and should be excluded from further consideration. The final alternatives considered to be viable options, after conducting the site visit, were Alternatives 1, 4 and 5.

Specialists used the National Screening Tool results, desktop study information, applicable guideline documents and field verification to produce the respective specialist reports. The findings of all the specialists were integrated after conducting desktop studies, together with the field visit, to make an informed decision on the best practical environmental option for the recommended preferred route.

An important aspect of the specialist studies were to produce the following outcomes:

- Provide a description and identification of potential impacts of the proposed development in terms of the specialist field;
- Assess the impacts (direct, indirect and cumulative) in terms of their significance (using suitable evaluation criteria, i.e. Impact Rating Methodology below)
- Provide suitable mitigation measures. In accordance with the mitigation hierarchy, negative impacts should be avoided, minimised, rehabilitated (or reinstated) or compensated for (i.e. offsets), whereas positive impacts should be enhanced. A risk-averse and cautious approach should be adopted under conditions of uncertainty;
- Consider time boundaries, including short to long-term implications of impacts for project life-cycle (i.e. pre-construction, construction, operation and decommissioning);
- Consider spatial boundaries, including: Broad context of the proposed project (i.e. beyond the boundaries of the specific site);
- The provision of a statement of impact significance for each issue, which specifies whether or not a pre-determined threshold of significance (i.e. changes in effects to the environment, which would change a significance rating) has been exceeded, and whether or not the impact presents a potential fatal flaw

or not. This statement of significance should be provided for anticipated project impacts both before and after application of impact management actions; and,

- Appraisal of alternatives (including the No-Go option) by identifying the Best Practicable Environmental Option (BPEO) with suitable justification.

Specialists were requested to specifically consult the following list of documents, especially for background information, to identify impacts, mitigation and monitoring measures:

- Generic Environmental Management Programme (EMPr) for the development and expansion of infrastructure for the overhead transmission and distribution of electricity (RSA, 2019)
- Northern Cape Spatial development Plan (SDF) (Northern Cape Province, 2019)
- Strategic Environmental Impact Assessment for Electricity Grid Infrastructure (Department of Environmental Affairs, 2016).

The findings of the specialist studies were integrated to make an informed recommendation on the Preferred Alternative for the proposed powerline. This alternative will be subjected to land negotiation by Eskom with land owners and then submitted to the Competent Authority for authorisation during the BA process.

6.2. Impact ratings Methodology

Each specialist was tasked to identify potential impacts of the proposed project and have each impact evaluated and rated as per the methodology described below.

The tables below indicate and explain the methodology and criteria used for the evaluation of the **Environmental Risk Ratings** as well as the calculation of the final **Environmental Significance Ratings** of the identified potential ecological impacts.

Each potential environmental impact is scored for each of the **Evaluation Components** as per the Table 3 below.

Table 3 Scale utilised for the evaluation of the Environmental Risk Ratings.

Evaluation Component	Rating Scale and Description/criteria
MAGNITUDE of NEGATIVE IMPACT (at the indicated spatial scale)	**10 - Very high**: Bio-physical and/or social functions and/or processes might be *severely* altered. **8 - High**: Bio-physical and/or social functions and/or processes might be *considerably* altered. **6 - Medium**: Bio-physical and/or social functions and/or processes might be *notably* altered. **4 - Low** : Bio-physical and/or social functions and/or processes might be *slightly* altered. **2 - Very Low**: Bio-physical and/or social functions and/or processes might be *negligibly* altered. **0 - Zero**: Bio-physical and/or social functions and/or processes will remain *unaltered.*
MAGNITUDE of POSITIVE IMPACT (at the indicated spatial scale)	**10 - Very high (positive)**: Bio-physical and/or social functions and/or processes might be *substantially* enhanced. **8 - High (positive)**: Bio-physical and/or social functions and/or processes might be *considerably* enhanced. **6 - Medium (positive)**: Bio-physical and/or social functions and/or processes might be *notably* enhanced.

Evaluation Component	Rating Scale and Description/criteria
	4 - Low (positive): Bio-physical and/or social functions and/or processes might be *slightly* enhanced. **2 - Very Low (positive)**: Bio-physical and/or social functions and/or processes might be *negligibly* enhanced. **0 - Zero (positive)**: Bio-physical and/or social functions and/or processes will remain *unaltered.*
DURATION	**5 - Permanent** **4 - Long term**: Impact ceases after operational phase/life of the activity > 60 years. **3 - Medium term**: Impact might occur during the operational phase/life of the activity – 60 years. **2 - Short term**: Impact might occur during the construction phase - < 3 years. **1 - Immediate**
EXTENT (or spatial scale/influence of impact)	**5 - International**: Beyond National boundaries. **4 - National**: Beyond Provincial boundaries and within National boundaries. **3 - Regional**: Beyond 5 km of the proposed development and within Provincial boundaries. **2 - Local**: Within 5 km of the proposed development. **1 - Site-specific**: On site or within 100 m of the site boundary. **0 -** None
IRREPLACEABLE loss of resources	**5 – Definite** loss of irreplaceable resources. **4 – High** potential for loss of irreplaceable resources. **3 – Moderate** potential for loss of irreplaceable resources. **2 – Low** potential for loss of irreplaceable resources. **1 – Very low** potential for loss of irreplaceable resources. **0 - None**
REVERSIBILITY of impact	**5 –** Impact **cannot** be reversed. **4 – Low** potential that impact might be reversed. **3 – Moderate** potential that impact might be reversed. **2 – High** potential that impact might be reversed. **1 –** Impact **will be** reversible. **0 –** No impact.
PROBABILITY (of occurrence)	**5 - Definite**: >95% chance of the potential impact occurring. **4 - High probability**: 75% - 95% chance of the potential impact occurring. **3 - Medium probability**: 25% - 75% chance of the potential impact occurring **2 - Low probability**: 5% - 25% chance of the potential impact occurring. **1 - Improbable**: <5% chance of the potential impact occurring.
CUMULATIVE impacts	**High**: The activity is one of several similar past, present or future activities in the same geographical area, and might contribute to a very significant combined impact on the natural, cultural, and/or socio-economic resources of local, regional or national concern. **Medium**: The activity is one of a few similar past, present or future activities in the same geographical area, and might have a combined impact of moderate significance on the natural, cultural, and/or socio-economic resources of local, regional or national concern. **Low**: The activity is localised and might have a negligible cumulative impact. **None**: No cumulative impact on the environment.

Once the **Environmental Risk Ratings** have been evaluated for each potential ecological impact, the **Significance Score** of each potential ecological impact is calculated by using the following formula:

- **SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.**

The maximum **Significance Score** value is 150.

The **Significance Score** was then used to rate the **Environmental Significance** of each potential ecological impact as per Table 4 below. The **Environmental Significance** rating process is completed for all identified potential ecological impacts both before and after implementation of the recommended mitigation measures.

Table 4 Scale used for the evaluation of the Environmental Significance Ratings.

Significance Score	Environmental Significance	Description/criteria
125 – 150	Very high (VH)	An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.
100 – 124	High (H)	An impact of high significance which could influence a decision about whether or not to proceed with the proposed project, regardless of available mitigation options.
75 – 99	Medium-high (MH)	If left unmanaged, an impact of medium-high significance could influence a decision about whether or not to proceed with a proposed project. Mitigation options should be relooked.
40 – 74	Medium (M)	If left unmanaged, an impact of moderate significance could influence a decision about whether or not to proceed with a proposed project.
<40	Low (L)	An impact of low is likely to contribute to positive decisions about whether or not to proceed with the project. It will have little real effect and is unlikely to have an influence on project design or alternative motivation.
+	Positive impact (+)	A positive impact is likely to result in a positive consequence/effect, and is likely to contribute to positive decisions about whether or not to proceed with the project.

6.3. Spatial representation of impact ratings

Each impact and their corresponding impact ratings were translated into spatial maps. More detail on the approach to mapping the specialist's impact rating can be viewed in the attached **Appendix 2**. (In short, the study area (i.e. alternatives) were divided into homogenous areas for each impact. Each homogenous area was then rated according to the impact rating methodology as above. That rating was then mapped and is represented in **Appendix 5**. The resulting impact rating maps were combined by averaging the impact ratings per specialist field and then again averaged to produce an overall map indicating the average impact rating across each alternative. This approach has a duel advantage in that the overall preferred corridor can be selected (i.e. having the lowest average impact rating) and it can be used to identify highly sensitive and 'no-go' areas, that should be avoided where possible (i.e. avoid pylon placement and line alignment in areas of high impact rating values).

6.4. Public Participation Process

Although not required, the Public Participation Process (PPP) conducted for this report was conducted as per the Environmental Impact Assessment Regulations, 2014, of the National Environmental Management Act (NEMA) (Act 107 of 1998), with the view of using the PPP as a form of Pre- Application PPP in the next phase, namely the Basic Assessment Process (Leach, 2020). The complete PPP methodology, comments and responses and register of Interested and Affected Parts (IAPs) can be viewed in the PPP Report attached in **Appendix 4**.

7. ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

The majority of this report depends on the specialist reports, which in turn depends on desktop studies, data that is currently freely available and a brief site visit to determine potential impacts and their significance during the proposed project activities.

The processes of investigation which have led to the production of this report, harbours several assumptions, which include the following:

- All information provided by the applicant to the environmental specialist was correct and valid at the time that it was provided;
- The proposed project footprint as provided is correct and will not be significantly deviated from;
- Strategic level investigations undertaken by the applicant prior to the commencement of the screening process, determined that the development site represents a potentially suitable and technically acceptable location;
- The public will receive a fair and reoccurring opportunity to participate and comment during the next BA process phase, through the provision of adequate public participation timeframes stipulated in the Regulations;
- The need and desirability of the project is based on strategic national, provincial and local plans and policies which reflect the interests of both statutory and public viewpoints;
- The screening process is a project-level framework and the specialists are limited to assessing the anticipated environmental impacts associated with the construction and operational phases of the proposed project;
- Strategic level decision making is conducted through cooperative governance principles with the consideration of sustainable and responsible development principles underpinning all decision making.
- Given that the impact assessment process involves prediction, uncertainty forms an integral part of the process. Two types of uncertainty are associated with the impact assessment BA Process, namely process-related and prediction-related.
    - Uncertainty of prediction is critical at the data collection phase as final certainty will only be obtained upon implementation of the proposed development. Adequate research, experience and expertise may minimise this uncertainty;
    - Uncertainty of values depicts the approach assumed during the impact assessment process, while final certainty will be determined at the time of decision making. Enhanced communication and widespread/comprehensive coordination can lower uncertainty;
- Uncertainty of related decision relates to the interpretation and decision making aspect of the screening- and BA Process, which shall be appeased once monitoring of the project phases is undertaken;
- The BA Process will commence in the next phase and does not form a part of the scope of works indicated for this phase of the project;

- The significance/importance of widespread/comprehensive consultation towards minimising the risk/possibility of omitting significant impacts is further stressed. The use of quantitative impact significance rating formulas (as utilised in this approach) can further standardise the interpretation of results and limit the occurrence and scale of uncertainty;
- The initial study was undertaken as a desktop assessment and as such, the information gathered must be considered with caution, as inaccuracies and data capturing errors are often present within these databases. A. Site visit was conducted thereafter to ground-truth the desktop assessment to some extent;
- Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur;
- Each specialist study has their own set of assumptions, uncertainties and limitations associated with their respective impact assessments. These are unavoidably incorporated into the overall screening report. The reader is directed to the respective studies in **Appendix 3** for more detail on the individual studies' assumptions, uncertainties and limitation.

Gaps in knowledge can be attributed to:

Enviroworks is an independent environmental consulting firm and as such, all processes and attributes of the specialist investigations are addressed in a fair and unbiased/objective manner. It is believed that through the running of a transparent and participatory process, risks associated with assumptions, uncertainties and gaps in knowledge can be and have been acceptably reduced.

8. RESULTS

This section gives a brief overview of the results and findings from the specialist's impact assessment studies. The complete and detailed results from the specialist investigations can viewed in the reports, attached as appendices in **Appendix 3**.

8.1. Socio-Economic Assessment

8.1.1. Social Assessment

While the option of not constructing the power line will avoid several negative impacts it will result in a high opportunity cost. Without the necessary grid infrastructure to distribute electricity, the development of future IPP projects will be greatly restricted. Economic benefits associated with the development of IPP projects would be forfeited. Landowners would not receive the extra income in the form of compensation, an income source which would particularly benefit farmers struggling due to the drought. With a gradually declining mining industry and climate change threatening the viability of agriculture in the Northern Cape, alternative economic contributors will become increasingly important. Not exploiting the comparative advantages held by the Northern Cape, in terms of wind and solar, will result in high opportunity costs at both a local and national scale. Furthermore, the opportunity for combating climate change by capitalising on renewable energy sources would not be realised. Specifically, in terms of each of the alternatives the following was found:

Alternative 1

From a practical perspective Alternative 1 is the more feasible option, providing the shortest distance between substations and roughly following the existing power line with its existing access roads. However, the western section of Alternative 1 passes by numerous sensitive receptors, including several guest resorts and farmhouses. Construction and decommissioning phase impacts are expected to be higher along this stretch. Following the existing power line also creates the risk of cumulating visual impacts. Due to the number of sensitive receptors along the western section of Alternative 1 is not recommend.

The eastern section of Alternative 1, spanning between Nama and Aggeneis substations, passes through the Goegap Nature Reserve and other conservation areas. As a provincial nature reserve, Goegap is valuable for conservation and tourism. This section of Alternative 1 is not recommend as negative visual impacts, affecting 'sense of place' would be significantly high. The section of Alternative 1 further east of the protected areas is feasible. This section passes through sparsely populated areas of low importance to tourism. If the other specialist studies propose the eastern section of Alternative 1 as a feasible option the power line would need to follow the N14 highway closely, remaining on the extreme edges of Goegap Nature Reserve.

Alternative 4

Due to the remoteness of route Alternative 4 the potential for negative social impacts during construction will be significantly lower compared to that of the western section of Alternative 1. Alternative 4 avoids Spektakel Pass and the numerous guesthouses and farmsteads along it.

Alternative 4 presents significant practical challenges as the mountainous topography would complicate the construction process and make the power line difficult to access once operational. The Nama Khoi Local Municipality (NKLM) noted that the existing power line is already challenging to access, affecting the turnaround time of repairs. Cost is another factor, as Alternative 4 spans a longer distance, approximately fifteen kilometres (15km) more than Alternative 1. This carries significant financial implications as each kilometre of power line costs the Proponent several million Rand, money could potentially be better spent on social upliftment projects.

Alternative 5

The section between Nama substation and Aggeneis substation that Alternative 5 traverses, consists predominantly of farmland and is generally of low tourism importance. Alternative 5 presents a feasible option as it avoids the Goegap Nature Reserve. A section of Alternative 5 passes by the Appolis Guest House and several farmsteads. This section of the power line would need to be routed around these sensitive areas to avoid them. As Alternative 5 moves east it runs parallel with the existing line through an area of low sensitivity.

Overall, developing a 400 kV power line from Gromis- via Nama- to Aggeneis substation and expanding Nama substation will result in several positive spin-offs through facilitating IPP projects in the area, supporting the national electricity grid and energy development goals. National and municipal planning documents are in support of the proposed development so long as the power line does not adversely impact the local tourism industry.

While the power line will facilitate several positive economic impacts, it would pass through a scenic landscape with a rich cultural heritage, an important tourism industry and a large marginal population. These factors make the area particularly susceptibility to potential negative impacts, especially any impacts that will affect the ‘sense of place’.

Assessing these potential impacts found that negative impacts were typically expected to be higher near farmsteads/residential areas and important tourism or historic attractions. Positive impacts are expected to be less dependent on distance from social features.

Visual intrusion will be one of the main negative impacts as it will impact the ‘sense of place’ throughout the operational life of the power line. This is expected to increase the closer the power line is situated to residential areas, farmsteads and tourism related facilities. Poor location of the power line would threaten the viability of existing tourism related features such as guest resorts and nature reserves. Such impacts can be mitigated by avoiding ‘No-Go’ areas, ensuring the power line is not placed near sensitive receptors.

Although declining, mining activities remain a key economic contributor to Namakwaland and the possible sterilisation of minerals needs to be prevented. While the public participation process of the Screening

Assessment endeavoured to consult all relevant mining companies, the consultation was limited relative to the number of mining rights held within the area. A more in-depth consultation process should be pursued upon assessing the finalised route, during the Basic Assessment phase. As mentioned, the sterilisation of minerals has been addressed in more detail in the Economic Impact Assessment.

Given that construction related impacts will be temporary and can be mitigated or avoided, selecting the route with the lowest operational phase impacts is preferable.

The findings indicate that if mitigation measures are implemented, negative impacts can be lowered to acceptable levels. Thus, implementation of mitigation measures will ensure that the proposed development of a 400 kV power line from Gromis substation via Nama substation to Aggeneis substation will have social benefits that outweigh the negative impacts. It is recommended that between Gromis- and Nama substation the power line should be constructed along Alternative 4. From Nama- to Aggeneis substation the power line should follow Alternative 5. It should be noted that if mitigation measures are not adhered to then the proposed power line could have high negative impacts on the area's tourism industry, farmers and local communities.

8.1.2. Economic impacts

This specialist economic assessment was mainly a desktop study that relied on existing primary data sources pertinent to the project and its study area (published policies, plans and frameworks for example developed by various tiers of government). This primary data was supplemented by secondary information sources such as existing literature on the study area and economy, specifically the economic sectors discussed in this report and subject to assessment. In addition to this desktop review of existing information, additional data on local property markets, tourism and agricultural activities was sourced from key local informants such as estate agents, tourism business owners and farmers. An attempt at ascertaining whether any existing, or proposed, mining operations could potentially straddle the corridor alternatives under assessment has also been made.

The following anticipated economic impacts have been identified and assessed:

- Job creation and skills development;
- Direct and indirect economic impacts (including the subsequent enabling and development of IPP projects that the proposed powerline will facilitate);
- Mining (existing right holders/operations and exploration license holders);
- Economic impacts on agriculture;
- Economic impacts on tourism attractions or operations;
- Property value and land use impacts; and
- Resettlement and economic displacement impacts.

These impact categories were assessed for all corridor alternatives under review. The key findings of this economic study are:

- Alternative 1 (the westerly section between Gromis- and Nama substations) is the least preferred from a potential tourism impact perspective. The same section is also the only alternative that stands to impact on agricultural activity in the construction phase, and could potentially impose a minimal level of impact in the operational phase of the powerline. Similarly, although physical resettlement is not a necessary requirement for the project and can be easily avoided in its entirety, this alterative holds the most potential to impact on residential or suburban areas and result in potential economic displacement (loss of income, temporary or permanent disturbances to their properties etc.) for landholders in this corridor.
- Alternative 5 also passes in close proximity to several residences and farmsteads as it turns northwards (to the east of Concordia) and is likely to result in construction phase disturbances to these residents and their agricultural activities. It will also be very visually imposing for these residents due to its proximity.
- Should the above considerations be borne in mind when selecting the preferred route alignment for further assessment it is unlikely that the powerline would lead to notable declines in property value. One of the potential cumulative impacts of the powerline from a property value perspective is that as more renewable energy projects come into development in the NKLM it is likely to spur an increase in the price of residential properties. It is also not unrealistic to expect agricultural land prices to escalate for those properties that are suited to renewable energy project development.
- All of the alternatives will have similar beneficial and direct economic implications for the regional GDP, however, those alternatives (such as Alternative 4) that can prioritise and optimise the wage and goods and services expenditure on the more remote economically marginalised communities along their respective routings will have a much more beneficial impact at this micro/local level.
- Alternative 4 is also assumed to be the least likely to impact on existing and future mining activities as per the information at the Specialists' disposal, and Alternative 5 should be avoided as it is the most likely to do so in the future. However, this assumption must be tested for all corridors going forward, especially the preferred route that will be subject to the Basic Assessment Report (BAR) process required for environmental authorisation through the further interrogation of available data and requesting comments from prospecting rights holders during the respective public participation stages of these respective processes.
- Potential impacts on tourism attractions and operations, as well strategic development initiatives in this regard identified in the Spatial Development Frameworks (SDF) and Integrated Development Plans (IDP) documents, are likely to be minimal should the western section (the Kleinzee - Springbok leg only) be ruled out as a preferred option.

The need and desirability for the project is beyond question as it is apparent that future economic growth - both in the NKLM and at a regional level - and ensuring security of local electricity supply, urgently requires the construction thereof. While this high level economic impact assessment has identified issues and areas of concern as it relates to the various corridor alternatives under assessment, it is not apparent to the authors of this study that any of these permutations are fatally flawed from an economic perspective, but they will have varying levels of benefit or negative impact at the local level. The potential job creation and skills development

potential of the project, while short lived (construction phase), will be of significant benefit to local economically marginalised communities if they are prioritised to receive and participate in these benefits. The direct and indirect economic benefits arising from the project will also be notable, but mostly limited to the powerline's construction phase. However, the real benefits are likely to be cumulative in nature in that the powerline and substation network will enable the development of the energy sector projects planned for the study area, which in turn will stimulate the local economy whose GDP has been in decline for some time.

Impacts on existing and potential mining operations are likely to be relatively insignificant provided the eventual alignment follows existing powerline servitudes and road reserves as far as possible. Some impacts on current agricultural can be anticipated, however, these are also expected to be of low significance should due consideration be taken of these activities in the final design phase of the preferred and selected route. Tourism impacts are likely to be of low significance at the regional level, but do stand the risk of impacting more significantly on a few individual establishments or operations. For this reason, and by applying the precautionary principle, the section of the corridor from Gromis- to Nama substation along Alternative 1 should be avoided, despite the existence of a powerline and servitude along its entire length.

There is no reason why the project would require the physical resettlement of people or households, and the potential for economic displacement of landowners or users will be low provided that all income generating or economic activities occurring on affected land portions are noted in subsequent phases of the assessment process, and disruptions to these avoided or minimised. Land use impacts will be negligible provided the appropriate impact avoidance, mitigation and management principles are adhered to.

It is anticipated that the project will have far more beneficial economic impacts for the residents of the NKLM and its economy than any anticipated negative ones, and where these do eventuate it will be in highly localised or individual situations where it is assumed that affected persons will have recourse for financial and or legal remedy to compensate for any losses that are demonstrated to be the result of the proposed project's activities.

8.2. Visual Assessment

The determination of the potential visual impacts was undertaken in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation phases of the proposed project. The study area for the visual assessment encompassed a geographical area of 130 km^2 (extent of the maps) and included a ten kilometre (10 km) buffer zone from the proposed pylons. The study area constituted of local tourist attractions, residential areas and agricultural activities.

Anticipated issues related to the potential visual impact of the proposed development include the following:

- The visibility of the proposed development to, and potential visual impact on, observers travelling along National Route 14, National Route 7 and secondary roads within the study area;
- The visibility of the powerline to, and potential visual impact on tourists visiting tourist attractions within the study area;

- The visibility of the facility to, and potential visual impact on observers residing within Aggeneis, Carolusberg, Springbok, Buffelsrivier, Kleinsee, Nababeep and O'kiep;
- The Visual Absorption Capacity (VAC) of natural or planted vegetation as well as man-made topographical features;
- Potential visual impacts associated with the construction- and operational-phase; and,
- The potential to mitigate visual impacts.

It is anticipated that the issues listed above may constitute a visual impact at a local scale.

The three alternative routes were sub-divided into four quadrants (**Figure 5**) and each quadrant is discussed in greater detail in the section below.

Quadrant 1

Within quadrant 1, Alternative 1 and 5 traverse over the same terrain parallel to the existing line for approximately forty six kilometres (46 km) from the Aggeneis substation. As per the Landcover Map and photographic evidence (**Appendix 3.2**.) the area consists of low shrubland coupled with bare non vegetated areas. Over the first ten kilometres (10 km) there will be no visual impact due to the undulating topography of the study area towards the south. The visual impact is considered to be moderate within Quadrant 1 as visual intrusion already occurs within this area due to the existing line. The visual impact will be temporary as observers will only consist of motorists travelling through the area with the proposed development not being situated within their direct line of sight.

Quadrant 2

Quadrant 2 includes a study of Alternative 1 and 5. Alternative 5 break away from Alternative 1 towards the north-west to ensure that it does not pass through the Goegap National Park. The visual impact from Alternative 1 will be high as it is situated adjacent to National Route 14 (N14) and the Goegap National Park. Alternative 5 traverse a more mountainous area towards the north which aids in restricting the visual impact to some degree. The visual impact of Alternative 5 is considered to be moderate as limited observers are situated within the area; however, it must be noted that a guest house was observed within this area. Alternative 1 will have a cumulative impact as it will be constructed parallel to the existing line where Alternative 5 will not contribute to the cumulative impact.

Quadrant 3

Quadrant 3 includes a study of Alternative 4 situated towards the north and Alternative 1 and 5 which will run parallel to the existing line in the south. Alternative 4 is considered a no-go area as no developments have taken place within this corridor with scattered tourist facilities within the area. Numerous tourist attractions such as hiking trails and 4x4 routes are situated within this area. From a visual perspective Alternative 4 is considered to be a pristine natural area resulting in the no-go designation. Alternative 1 and 5 is considered to be the preferred line route within Quadrant 3 as the Visual Absorption Capacity of the landscape is high. The visual impact will be moderate to low depending on the elevation of the observer. The highest visual impact will occur within the

towns of Springbok and Buffelsrivier from where the impact will be temporary. Given the existing line's visual intrusion have already occurred within the area; however, the proposed development will contribute to the cumulative impact.

Quadrant 4

Quadrant 4 will have the lowest visual impact of the entire study area due to its remoteness. The landscape consists of undulating topography with dunes situated between Buffelsrivier and Gromis sub-station. No permanent residence occur within the area as the land is occupied by mines. The highest visual impact will occur from the R355 leading to Kleinsee in the west; however, it must be noted that the proposed development will not be situated within close proximity to the road. Furthermore, due to elevation changes of the road the VAC of the study area is increased at a higher elevation of the road. It must be noted that the overall visual impact for Quadrant 4 will be low; however, the cumulative impact will be moderate as there is an existing 132 kV line within the area.

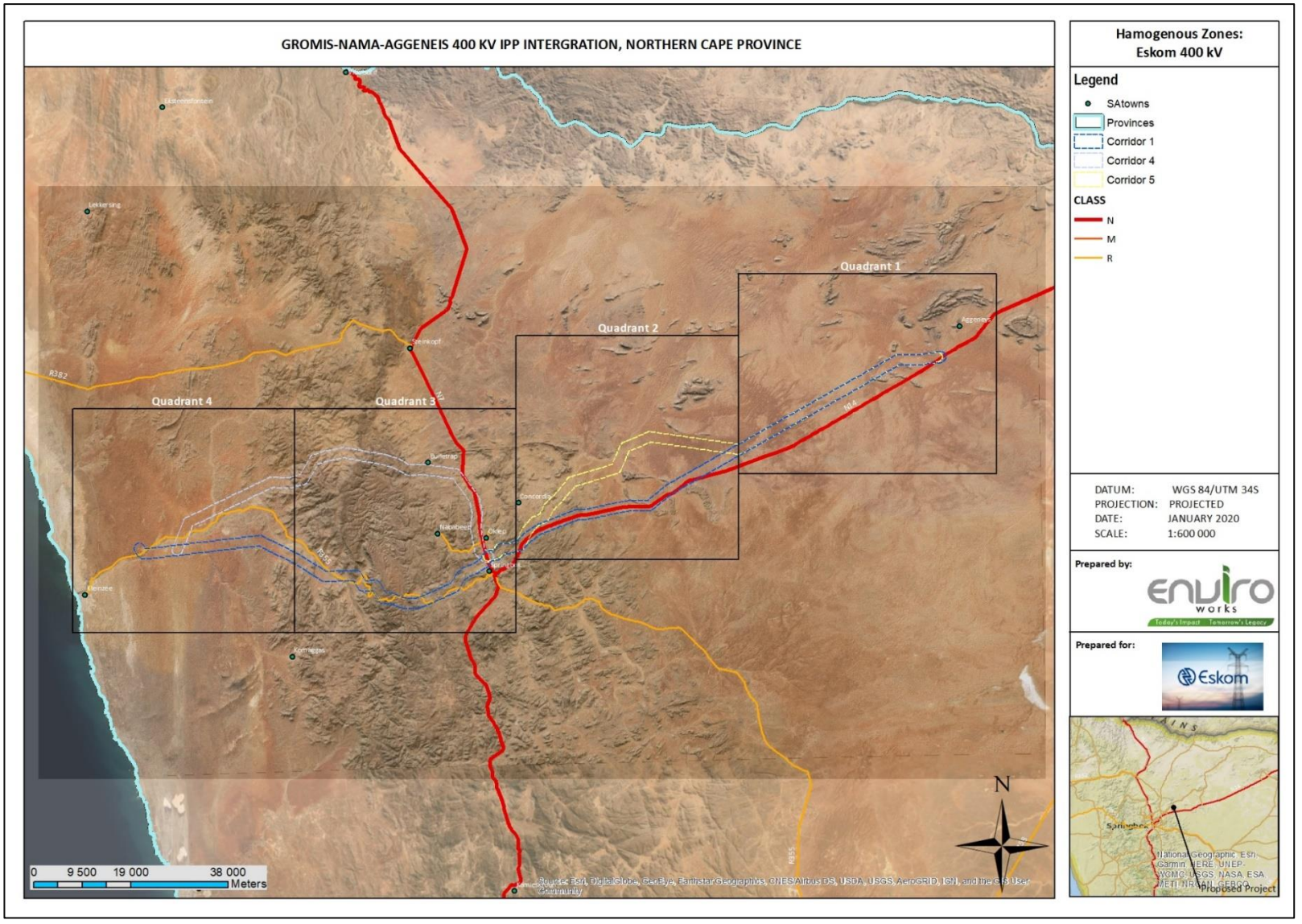


Figure 5 Quadrant locality for each Corridor

After careful consideration of Alternative 1, 4 and 5, it is advised from a visual perspective that Alternative 5 be developed. Although there is not a lot of difference between Alternative 1 and 5 the following points can be considered as motivation for the development of Alternative 5:

- National Route 14 is avoided near Springbok where it deviates from Alternative 1;
- Alternative 5 will not traverse through the Goegap National Park as Alternative 1 but will traverse towards the north of the National Park.

Alternative 4 is not considered to be a viable option due to the pristine natural area and lack of development along the route. Numerous tourist attractions are situated within the area which consist of hiking trails, 4 x 4 routes and guest lodges.

Alternative 5 will have the lowest visual impact of all listed Alternatives. If all mitigation measures are implemented by Eskom the visual impact will be moderate to the residents of Aggeneys, Springbok and Buffelsrivier, commuters making use of National Route 14 (N14) as well as to tourist visiting the surrounding tourist attractions.

8.3. Heritage Assessment

Based on the available information, the area proposed for the powerline alignments constitutes a very sensitive landscape in terms of impacts to historical, archaeological and palaeontological heritage resources. The proposed development of the 400kV powerline may result in the destruction of significant archaeological, palaeontological and built environment heritage resources through the insensitive placement of pylon footings as well as the loss of a sense of place through the development of large scale and intrusive infrastructure within a sensitive cultural landscape. Each proposed alignment therefore has the potential to impact on:

- Historic townscapes and sense of place of historic cores of Springbok, Nababeep, O'Kiep, Carolusberg and Concordia;
- Corbelled houses and other historic structures and farm werfs;
- Archaeological heritage resources specifically heritage associated with:
    - Copper Mining
    - South African War
    - ESA, MSA and LSA (including OES, grinding grooves and ceramics) sites (tend to be associated with granite outcrops and pans)
    - Engraved rock art
    - Marked and unmarked burial grounds
- Heritage associated with Korana wars and the massacre of Khoe and San peoples; and,
- Palaeontological heritage consisting of trace fossils, mammal bone fossils, sharks teeth, mollusc fossils.

The archaeological field assessment (**Appendix 3.3.**) identified a number of sites of heritage significance, including cemeteries, sites associated with the living heritage of the Korana people as well as sites associated with the

Namaqualand Copper Mining Cultural Landscape. Unusually, very few artefacts or sites associated with the Stone Age were identified in the field assessment, however such resources are likely present on the landscape. Impacts to the majority of these resources can be avoided throughthe sensitive placement of individual specific pylons within any of the proposed corridors. Impacts to the broader cultural landscape are more challenging to mitigate.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are much too old to contain fossils. The Tertiary calcretes and Quaternary windblown sands do not preserve fossils except in special circumstances. Since there is an extremely small chance that fossils from the nearby Vryheid Formation may be disturbed a Fossil Chance find protocol has been added to this report. The potential impact to fossil heritage resources is extremely low. Based on the experience of the palaeontologist and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the loose sands of the Quaternary.

There is an existing power line that runs along the proposed alignment for Alternative 1. Potential impacts to the cultural landscape can be mitigated by concentrating such electricity infrastructure along one alignment where the landscape is not pristine. Furthermore, a number of no-go areas have been identified based on the location of the known heritage resources, and incorporating the known sensitivity of rocky outcrops, mountains and waterways for heritage resources.

Based on the outcomes of this assessment, a number of heritage resources of heritage significance were identified within the proposed alignment of Alternative 4 (Grade II, IIIA and IIIB). A number of no-go areas have been recommended within the proposed alignment of Alternative 4. While a number of heritage resources were also identified within the proposed alignment for Alternative 1, these are not as sensitive or as significant (mostly Grade IIIB and IIIC) as the resources within Alternative 4. No heritage resources that aren't also located within the proposed alignment for Alternative 1 were identified within the proposed alignment for Alternative 5. It must be noted that Alternative 5 was added as an additional alternative once fieldwork was already underway and as such, Alternative 5 was not fully assessed. However, the assessment conducted has provided sufficient insight into the kinds of heritage resources that may be impacted by the proposed development along this alignment as only a small section of Alternative 5 deviates from Alternative 1, effectively avoiding the Goegaap Nature Reserve, which was fully assessed. Should this alignment be preferred, a more detailed site verification of the corridor can take place to inform the micro-siting of the proposed pylons to ensure that no significant heritage resources are impacted. Based on the information assessed, it is recommended that Alternative 1 or Alternative 5 are the preferred alignments.

8.4. Agricultural Assessment

The previous scoping report; Strategic Environmental Assessment for Electricity Grid Infrastructure in South Africa (Department of Environmental Affairs, 2016) indicated that the study area was predominately classified as having low sensitivity for agricultural sensitivity. The desktop study also confirmed these results.

During the fieldwork four alternatives were investigated, of which the first alternative followed the existing powerline. During the fieldwork, intensive and collaborative meetings were held with the specialists and Eskom officials and from these discussions it was decided to focus on Alternative 1, 4 and a 5th alternative was added.

A novel soil mapping technique, using the DSMART algorithm (Odgers et al., 2014), was used to produce the soil map. Soil observations were made throughout the study area during the fieldwork to collect data for the mapping purposes. The resulting soil map was used to interpret the agricultural sensitivity. The area has a very low rating, with some existing agricultural lands in the more mountainous terrain and overall very little crop production in the area.

Due to the low rainfall and high temperatures, the agricultural potential is severely impacted and limited by climate. The low rainfall and high temperatures are the main control on irrigation practices in the survey area and not soil suitability. Cropped lands are sparsely distributed in the more mountainous areas, and the flats are solely used for grazing. Even where crops are grown, these would be considered marginal areas and low yields are expected. No irrigation or special crops were encountered during the fieldwork, which correlates with the latest Landuse maps.

Although the presence of powerlines will not heavily affect the agricultural potential of any of the routes, the use of existing roads will be most beneficial. Therefore, all routes are suitable for the development of a new power line from Gromis substation via Nama substation towards Aggeneis substation. The use of existing road networks for the current line would have the least impact and avoid some minor risks of erosion during construction.

8.5. Geo-Hydrological Assessment

Based on a desktop analysis of the investigated area's geo-hydrological conditions, corridor alternative layout routes (Alternative 1, 4 and 5) cannot specifically be distinguished as having more or less impact on the local groundwater regime than the other. This is due to all alternatives extending across geo-hydrological sensitive and non-sensitive areas.

This assessment therefore analysed the overall powerline extension as a whole with a preliminary groundwater susceptibility conclusion based on the desktop screening analysis.

The study area extends across a poor to minor aquifer system with medium to negligible groundwater yielding capacity of moderate to poor water quality. The electrical conductivity (EC) values are expected to vary between 150 mS/m to >520 mS/m, keeping in mind that an EC concentration of >170 mS/m exceeds the allowable limits for human consumption according to 2014 SANS241 drinking water standards. The aquifer has a least groundwater vulnerability rating that is only vulnerable to continuously discharged or leached pollutants in the long term.

Due to the study area's aquifer system having a **poor/minor** aquifer classification and **least** aquifer vulnerability rating, it can be assumed that the aquifer has a **LOW** susceptibility for contamination by anthropogenic activities.

A list of impacts related to the proposed development which may be associated with groundwater contamination and degradation are listed below. This list is derived from impact management outcomes and actions for the development and expansion of infrastructure for the overhead transmission and distribution of electricity as part of a generic environmental management program (EMPr) (RSA, 2019):

- Environmental awareness training
- Site Establishment development
- Water Supply Management
- Storm and wastewater management
- Solid and hazardous waste management
- Protection of watercourses and estuaries
- Vegetation clearing
- Sanitation
- Hazardous substances
- Workshop, equipment maintenance and storage
- Batching plants
- Blasting
- Stockpiling and stockpile areas
- Steelwork Assembly and Erection
- Cabling and Stringing
- Temporary closure of site
- Landscaping and rehabilitation

Alternative 1

This extension is expected to pose the least risk for groundwater degradation compared to the other alternatives. This is due to the overall extension having the smallest surface area, and the majority of the extension being localized along an already existing public road.

The extent of this alternative is expected to have lower construction and operational phase risks to groundwater degradation compared to the other two alternatives.

Throughout the mountainous terrain extension of this and all other corridors, the surface to groundwater infiltration is expected to be increased and therefore an increased susceptibility for groundwater contamination by conservative pollutants during construction and operational (monitoring) phase is expected. This will, however, be localized to an extension already exposed to roadside anthropogenic pollution, which

may be timeously exaggerated by stormwater flushing during rainfall events (minimal). Recorded data did not indicate great groundwater abstraction in close proximity to this corridor along the mountainous terrain, which reduces vulnerability.

West of the mountainous terrain, the corridor extends past multiple mining facilities with some being in operation and some in enclosure phase. It is expected that these mines may have deteriorated the channeled downstream water quality of the local groundwater regime.

This corridor does extend along an estimated 3,5km of the Buffels Rivier and other non-perennial watercourses. Watercourse intersections should be avoided or intersected perpendicularly where possible to reduce associated impacts. Groundwater abstraction and dependency in close proximity to this corridor appear to be limited.

Alternative 4

The estimated groundwater impact at this corridor is expected to be low. Throughout the mountainous terrain, the surface to groundwater infiltration is expected to be increased and therefore an increased susceptibility for groundwater contamination by conservative pollutants during construction and operational (monitoring) phase isexpected.

This corridor intersects multiple seasonal fountains and non-perennial streams. Direct contact with these intersections should be avoided or minimized where possible. Groundwater abstraction and dependency in close proximity to this corridor appear to be limited.

Alternative 5

The estimated groundwater impact at this corridor is expected to be low. This corridor relates to all properties mentioned of Alternative 1. Alternative 5 varies from Alternative 1 in that it breaks away from Alternative 1 for an approximate 45km. The corridor extends across non-perennial watercourses that are not exposed to Alternative 1, therefore making it less favourable. For example, this corridor extends along an estimated >11km of a non-perennial watercourse (Kirrie River) which is not preferred. The watercourse intersection should be avoided or intersected perpendicular to minimize the impact.

The corridor should also avoid extending close by existing boreholes within its buffer to reduce structural and quality damage to the usable groundwater.

From the estimated impact assessment rating exercise it can be concluded that corridor Alternative 1 is the most preferred corridor with the least estimated impact on the local groundwater regime. Alternative 5 is estimated as having the second-lowest impact and Alternative 4 having the most estimated impact on the local groundwater regime.

Alternative 1 is most preferred as it extends along existing corridor infrastructure, therefore localizing potential impacts to an already affected environment compared to corridor Alternatives 4 and 5 which extends away from this, posing new unique potential impacts and increasing the overall groundwater impact potential footprint.

8.6. Botanical and Freshwater Assessment

The study area is situated in the Northern Cape Province, known for rich natural heritage, high levels of solar radiation on non-cloudy days and a semi-arid and arid climate. The natural wealth of the study area has received international recognition, with the Succulent Karoo recognized as the only arid biodiversity hotspot in the world. Nearly a third of the plant species found in the Northern Cape Province is endemic to the province (occurs in no other province) and an estimated 286 of the endemic species are classified as threatened. The natural environment not only has intrinsic biodiversity value (supporting and maintaining diverse communities and terrestrial flora and species dependent on watercourses and wetlands), the surface freshwater system plays a very important role in sustaining ecological and economic health. The study area is also largely dependent on the natural environmental for tourism (e.g. Namaqua and West Coast Flower Route) and related industries and livestock.

The alternative corridors are characterized by a dry climate, especially when compared to the rest of South Arica. The terrestrial floral diversity is varied within the study area, with extremely high levels of biodiversity of international significance located to the west and decreasing in sensitivity and significance to the east of the study area. The aquatic ecosystems are overall characterized by ephemeral and non-perennial surface water systems due to the arid- to semi-arid climate.

Most of the land cover is natural, with varying degrees of degradation present, mostly from overgrazing, resulting in reduced vegetation cover, invasion by Invasive Alien Plants (IAPs) and erosion. A small proportion is transformed through urbanisation, agricultural and mining developments. Impacts on freshwater ecosystems from associated land use activities of the transformed landscape are relatively localised within the corridor context. More widespread impacts to freshwater systems tend to be linked to livestock farming practices and infestation of IAPs.

River systems are predominantly non-perennial/ephemeral in the area. Very few surface watercourses are present throughout the year and mostly include storage dams. The rivers of South Africa are commonly describe in terms of the ‘Ecoregions’ in which it occurs. The broad Level 1 Ecoregion delineation is based on shared attributed of river ecosystems based on attributed such as physiography, climate, rainfall, geology and potential natural vegetation. Most of the river ecosystems of this study area fall within the Namaqua Highland-, Nama Karoo- and Western Coastal Belt.

Wetlands, on the other hand are characterised by Bioregions, which is sub-division of biomes, based on the rainfall and climate. All wetlands of the study area are characterised by the Bushmanland Bioregion. Due to the xeric climatic conditions, wetlands occupy a very small portion of watercourses. The area supports wetland types dominated by floodplain wetland habitat along rivers, channelled-valley bottom wetlands and endorheic pans that are more unique to the region.

In terms of the terrestrial flora, the study area can be divided into two broad ecological regions, called biomes: Succulent- and Nama Karoo. The Succulent Karoo has an arid to semi-arid climate and is known for its exceptional floral richness and high levels of endemism, especially of succulent and bulbous species. The biome is recognised as one of three global biodiversity hotspots in southern Africa with unrivalled levels of diversity and endemism for an arid region. There are some drainage systems that originate from catchments outside the Succulent Karoo biome flowing through the biome. The watercourses are generally small and ephemeral in nature. Where the Succulent Karoo transitions into the Nama Karoo biome, on the inland borders to the east, the high levels of succulence and endemism transition to arid ecosystems typified by a much lower biodiversity and few species of conservation concern.

The second biome in this study area, Nama Karoo, occurs on the central plateau of the western half of South Africa. Floral richness and species endemism is not particularly high within the Nama Karoo, nor are there many rare or endangered species. This biome is considered the third largest in South Africa, with 1.6% being formally protected. Historically, the biome was home to large herds of game. The current landscape has been converted to fenced farms, used as rangeland for stock.

Impacts were identified from the existing Generic EMPr for the development and expansion of substation infrastructure for the transmission and distribution of electricity and impact assessments specifically focused on assessing impacts of energy generating and distribution infrastructure within Strategic Environmental Areas. Impacts associated with the proposed development range from those that are direct (e.g. pylon construction and clearing areas for servitudes) to those that are indirect and which occur over longer timeframes (e.g. habitat fragmentation, hydrological changes and alien plant infestation).

From a terrestrial flora and freshwater perspective, the dominating source of potential impacts that the proposed project will have during its life cycle will be directly and indirectly related to habitat loss and the transformation of habitats. Other significant sources of impact include changes in surface hydrology and disturbance due to human presence and activities.

In terms of watercourses, service- and access roads and the power line itself will almost inevitably cross rivers, riparian zones, streams and wetlands. Crossing of watercourses, placement of infrastructure or construction itself can cause disturbance to watercourse bed and banks, and their buffers. The life cycle will however require very little water and impacts will not be consumptive.

The overall impacts of the proposed development and associated activities can be summarized as potentially causing a risk of habitat destruction, increased levels of disturbance and degradation (for terrestrial flora and freshwater ecosystems), establishment and spread of IAPs, increased soil erosion, as well as cumulative impacts on broad-scale ecological processes. The majority of impacts will be created during construction, with the effect carrying on in the operation phase for some of the impacts.

From this study it is recommended that Alternative 5 is the preferred alternative. Alternative 1 (and the proportions of 4 and 5 where the routed converge with Alternative 1) offers the greatest opportunity to make

use of existing infrastructure such as access roads and similar linear developments, despite crossing sensitive CBA1 areas. Alternative 1 (and the proportions of 4 and 5 where the routed converge with Alternative 1) has a larger area transformed (thus more developments), Alternative 4 in contrast has less transformed areas and access. The natural environment is in a more pristine condition in the western section of this alternative. Similarly, both the western section of Alternative 4 and the eastern section of Alternative 1 has wide sections of CBA 1s (and a Protected Area (PA) in the case of Alternative 1) going across the entire corridor width. The length of these section are also much larger (>460m) than the required distance between pylon placement. Using Alternative 5 as the preferred route could help limit the distance and size of new footprint clearing and further transformation, by limiting new disturbance as close as possible to existing or past disturbances. Alternative 5 is also mostly covered by less sensitive and more degraded ecological areas when compared to the corresponding section of Alternative 1 and 4. This alternative will also successfully navigate around the CBA 1 and PA areas in the eastern section of the study area that Alternative 1 & 4 passes through. If all mitigation measures are followed, both Alternative 1 & 5 could be viable and feasible options from the view point of terrestrial flora perspective, but Alternative 5 is the preferred Alternative. Alternative 4 is considered not feasible due to the larger distance and area of disturbance that it would cause to an area in a relatively good ecological condition and also a larger portion of Succulent Karoo Biome will be impacted compared to Alternative 1 and 5, with limited access and infrastructure to make use of. Alternative 1 and 5 can make use of existing access and similar infrastructure, is the more direct distances of the three options and also has the lesser impact on the Succulent Karoo biome.

It is anticipated that construction directly within watercourses can be avoided in all three alternative by the sensitive alignment of the route and pylon placement, thus limiting disturbance and habitat destruction within aquatic ecosystems. Crossing of watercourses will be inevitable in all three Alternatives, but it is still anticipated that impacts will be minimal if mitigation measures are applied and it is refrained from placing infrastructure directly within watercourse. Alternative 1 and 5 are the preferred alternative from a freshwater perspective as the most use can be made of exiting watercourse crossings and few if any) new crossings will be necessary.

8.7. Faunal Assessment

The desktop study indicated that the study area falls within the range of 76 mammals, 82 reptiles and 14 amphibian species. Faunal species likely to be impacted by the proposed substation and power line development are smaller, less mobile species (certain reptiles and amphibians).

The impacts associated with the proposed substation and power line development include:

i. Loss of faunal habitat and ecological structure;
ii. Direct impact on faunal communities;
iii. Indirect faunal impact through increased predation by Pied Crows; and,
iv. Disturbance to faunal communities.

Alternative 1

The corridor of Alternative 1 mostly follows the existing 220 kV power line, only deviating slightly to the north where it reaches Spektakel Pass and Buffelsrivier town. This is the most direct route, spanning approximately 174 km from Aggeneis substation via Nama substation to Gromis substation. It is located within close proximity to the National Road 14 (N14) in the east and also follows a short section of the Regional Road 355 (R355) in the west. A number of identified sensitive features fall within this alternative including two protected areas, Goegap Provincial Nature Reserve and Karas Nature Reserve (Wilderness Foundation Africa, WWF) in the middle section, with approximately 25 km of the route falling within these protected areas. The alternative also traverses an extensive area of CBA1 and CBA2. A large area of CBA1 is situated west of Springbok town where the corridor traverses some mountainous areas and the Buffels- and Komaggas Rivers. The alternative also traverses extensive areas of CBA2 in both the east and western sections of the route with interspersed Ecological Support Areas (ESAs). Impact of the development on the sensitive features are of potential concern, especially relating to CBA1 and Protected Areas (PAs). However, a mitigating factor is the presence of the existing power line along this proposed alternative. The new power line would likely be adjacent to the existing power line thus reducing the extent of new servitude roads that would be required and associated habitat transformation. Habitat loss and disturbance associated with this alternative would therefore be reduced and the affected area would be relatively intact. It is the most direct of the alternatives, therefore has the smallest footprint compared to the other alternatives.

Alternative 4

Alternative 4 runs north of Alternative 1 in the western section of the site. It is a considerably longer corridor than Alternative 1, spanning approximately 90 km in length from Nama- to Gromis substations, compared to 76 km for Alternative 1 for the related section, consequently increasing the sum total of habitat loss and degradation. Alternative 4 traverses a number of CBAs, although a considerably smaller area within Tier 1 CBAs than Alternative 1. Tier 2 CBAs are also found interspersed with ESAs and Other Natural Areas (ONAs). Despite traversing these sensitive features, the extent of the relatively homogenous mountainous area should not disturb ecological processes and disturbance on faunal communities will likely be local with low direct impact. However, this region has no existing power line and no telephone lines were seen during the site visit, thus a new development in this region would provide considerable new nesting sites in an otherwise mostly treeless environment. Indirect impact of a possible artificial increase in the Pied Crow population could be significant for tortoise populations and other sensitive fauna species that are frequently preyed upon by crows. Additionally this Alternative would require the construction of new servitude roads and a new disturbance corridor would be created. This will result in habitat degradation and loss, which is usually more extensive for mountainous regions that are difficult to access. The substantial increased length of this Alternative also makes this a less favourable route from a faunal perspective.

Alternative 5

This Alternative runs between Aggeneis- and Nama substations. It is a variation of Alternative 1, following the same route as Alternative 1 in the west but deviating north in the east, avoiding mountainous areas and the two protected areas, Goegap Provincial Nature Reserve and Karas Nature Reserve (Wilderness Foundation Africa,

WWF) before reaching Nama substation where it merges with Alternative 1 east of Springbok town. There are several CBA1s along this route associated with isolated mountains and drainage channels. It also traverses extensive CBA2 areas that are associated with undulating red dunes and shallow depressions that will sporadically hold water and form important breeding grounds for some amphibian species. The deviation of Alternative 5 traverses some sensitive features including dry river beds and associated flood plains, however, the landscape in this region has been heavily impacted by human activities, particularly where it approaches human settlements. Existing roads are also found along the deviation thus despite not following power line infrastructures a disturbance corridor already exists to some extent. This Alternative was added as an additional alternative to avoid the protected areas; it is thus the preferred option for the new development, provided that sensitive features are avoided

Faunal Impacts

The development of the new Gromis-Nama-Aggeneis 400 kV line and establishment of a 400/132 kV yard at Nama substation is likely to result in a variety of impacts, associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat to hard infrastructure including substations, access roads, and power line towers.

8.8. Avifaunal Assessment

The most prominent direct negative impacts on birds by electricity infrastructure in South Africa are mortality through electrocution and collisions (references in Froneman and Van Rooyen, 2019).

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. The electrocution risk is largely determined by the pole/tower design. In South Africa, large raptors and particularly vultures, are most prone to electrocution on electricity infrastructure (references in Froneman and Van Rooyen, 2019).

Collision mortality is probably the biggest threat posed by transmission lines to birds in South Africa. Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds. 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 power lines. The most likely candidates for collision mortality on the proposed power lines are Ludwig's Bustard, Kori Bustard, Karoo Korhaan, Southern Black Korhaan and Secretarybird (references in Froneman and Van Rooyen, 2019).

Due to the similarity of the study area and the route corridors from an avifaunal perspective the below descriptions relate to the entire area rather than a per-alternative description. The route corridor alternatives and related study area traverses the Succulent and Nama Karoo Biomes, and from east to west includes parts of the Bushmanland, Namaqualand Hardeveld and Namaqualand Sandveld Bioregions. The area supports approximately 200 species of birds, including at least 21 red-listed species, of which six are regional endemics,

and commences (in the east near Aggeneys) inside of the Haramoep & Black Mountain IBA (SA035) (references in Froneman and Van Rooyen, 2019).

It is envisaged that the proposed Gromis-Nama-Aggeneis 400 kV IPP Integration Power Line will have two major potential impacts on Red Data avifauna, namely displacement due to disturbance of breeding birds, especially breeding Martial Eagles on existing transmission lines, and mortality of large terrestrial species due to collisions with the earthwire of the proposed line. The latter impact is especially concerning as far as the Endangered Ludwig's Bustard is concerned, as the species is known to be highly susceptible to this impact, and conventional mitigation methods, i.e. the marking of the earthwire with Bird Flight Diverters, seems to have limited success in reducing mortality for this species. It must therefore be accepted that even with current state of the art mitigation, Ludwig's Bustard collisions are likely to still take place, irrespective of which corridor is ultimately selected (references in Froneman and Van Rooyen, 2019).

The cumulative impact of transmission lines in the Karoo as far as collision mortality of large terrestrial species is concerned is alarming, and potentially catastrophic as far as Ludwig's Bustard is concerned, with an estimated 41% of the population being killed annually, with Kori Bustards also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). The addition of another transmission line will potentially aggravate the situation further. Ludwig's Bustard migratory movements are along a broad east-west axis, which is a mitigating factor to some extent as the line also follows a broad east-west axis, and does not cut diagonally across the general flight path of this species when doing long distance migratory flights. However, research has shown that the highest collision risk occurs when birds are resident in an area between migratory movements, presumably because they fly higher during migratory flights (references in Froneman and Van Rooyen, 2019).

No electrocution risk is envisaged as the clearances (phase – phase and phase – earth) on the proposed 400 kV line are too large for any bird to physically bridge, thereby eliminating any potential for a bird causing a short circuit.

The route corridor alternatives all emerged with very similar risk scores (**refer Appendix 3.7**), indicating that the expected impacts are very similar for all alternatives. However, Alternative 1 is the preferred alternative, the reason being that this alternative is situated next to the existing transmission powerline (between Aggeneis-, Nama- and Gromis substations) which potentially reduces the risk of collisions. Placing the new line next to an existing transmission line should reduce the risk of collisions in the long term, because it creates a more visible obstacle to birds and the resident birds, particularly breeding adults, are used to an obstacle in that geographic location and have learnt to avoid it. Whereas it is acknowledged that this alternative could potentially result in significant short term temporary displacement impacts on breeding eagles on the adjoining existing transmission line during the construction phase, this should be weighed up against the reduction of the risk of long term collision impacts on large terrestrial species. In addition it is recommended that the tower placement of the new proposed line be staggered in relation to the existing line so as to increase the visibility of the line in an attempt to further mitigate the collision risk posed by the powerline. Although Alternative 1 is preferred from an

avifaunal perspective Alternative 5 can also be considered as it is the second-best option (references in Froneman and Van Rooyen, 2019).

The proposed mitigation measures should reduce the impact of the proposed line, except for collisions in grassland and low shrubland (specifically as a result of Ludwig's Bustard), where the collision impact will remain medium, even with mitigation.

9. POTENTIAL IMPACT ASSESSMENT

This section of the report deals with showing the results from each of the Specialist Assessments' impact ratings. Each specialist identified potential impacts that the proposed development might have during the different development phases in terms of their respective specialist fields. The reader is directed to the full specialist studies attached in **Appendix 3** for more detail and explanation on each of the identified potential impacts. This section will give a summary of the Significance score assigned to each identified potential impacts, according to the standard Impact Rating Methodology of **Section 7**. Again, the reader is directed to the specialist reports in **Appendix 3** for the rational on how Significance scores were derived (i.e. based on the anticipated duration, extent, irreplaceability, reversibility, magnitude and probability of the impact).

9.1. Impact rating significance

9.1.1. Socio-Economic impact ratings

a. Social impact ratings

The findings of this study indicate that if mitigation measures are implemented, negative impacts can be lowered to acceptable levels. Thus, implementation of mitigation measures will ensure that the proposed development of a 400 kV power line from Gromis substation via Nama substation to Aggeneis substation will have social benefits that outweigh the negative impacts. Please take note that if mitigation measures are not adhered to then the proposed power line could have high negative impacts on the area's tourism industry, farmers and local communities.

Table 5 Summary of impact rating significance for the construction phase (Social Impacts).

Impact	Location of Power Line						
	Areas within 1 km of farmhouses, towns or residential areas		Areas within 1 km of guesthouses or areas of social, cultural or tourism importance		Open/Farmland		"No-go" alternative
	Before mitigation	After mitigation	Before mitigation	After mitigation	Before mitigation	After mitigation	
Increase in dust and noise	52 M	33 L	52 M	33 L	36 L	27 L	No Change
Potential increase in crime	72 M	36 L	64 M	36 L	64 M	32 L	No Change
Health implications	57 M	38 L	57 M	38 L	38 L	19 L	No Change
Positive psychological effect	22 L (+)	44 L (+)	42 M	36 L	18 L (+)	18 L (+)	27 L
Disruption of daily living	56 M	36 L	56 M	36 L	36 L	20 L	No Change
Loss of sense of place	60 M	39 L	68 M	45 M	26 L	13 L	No Change
Decreased tourism potential for the surrounding area	18 L	9 L	76 M	54 M	18 L	9 L	No Change
Increased employment	33	52	27	44	28	33	25

opportunities during the construction phase	L (+)	M (+)	L (+)	M (+)	L (+)	L (+)	L
Economic knock-on effects	36 L (+)	44 M (+)	24 L (+)	40 M (+)	14 L (+)	33 L (+)	44 M
Detracting from important cultural/heritage areas	36 L	20 L	68 M	30 L	24 L	10 L	No Change
Decreased availability of medicinal plants for traditional doctors	32 L	26 L	32 L	26 L	32 L	26 L	No Change
Disruption of family structures	51 M	L	51 M	32 L	45 M	30 L	No Change
Increased anxiety amongst farmers	72 M	39 L	45 M	20 L	64 M	36 L	No Change
Improved quality of life for impoverished communities (job creation)	28 L (+)	42 M (+)	45 M	30 L	28 L (+)	42 M (+)	60 M

Table 6 Summary of impact rating significance for the operational phase (Social Impacts).

Impact	**Location of Power Line**						
	Areas within 1 km of farmhouses, towns or residential areas		**Areas within 1 km of guesthouses or areas of social, cultural or tourism importance**		**Open/Farmland**		**"No-go" alternative**
	Before mitigation	**After mitigation**	**Before mitigation**	**After mitigation**	**Before mitigation**	**After mitigation**	
Positive psychological effect	24 L (+)	36 L (+)	42 M	14 L	28 L (+)	42 M (+)	No Change
Loss of sense of place	72 M	32 L	80 M	36 L	45 M	30 L	No Change
Decreased tourism potential for the surrounding area	56 M	30 L	76 M	36 L	39 L	28 L	No Change
Benefits for landowners receiving compensation	70 M (+)	75 M (+)	70 M (+)	75 M (+)	70 M (+)	75 M (+)	36 L
Economic knock-on effects	48 M	45 M (+)	57 M	42 M (+)	76 MH (+)	95 MH (+)	64 M
Detracting from important cultural/heritage areas	51 M	30 L	80 M	32 L	51 L	30 L	No Change
Improved quality of life for impoverished communities	24 L (+)	42 M (+)	24 L (+)	42 M (+)	24 L (+)	42 M (+)	33 L
Increased infrastructure capacity for Independent Power Producers (IPPs)	75 MH (+)	N/A	75 MH (+)	N/A	75 MH (+)	N/A	68 M
Sterilisation of minerals	60 M	36 L	60 M	36 L	60 M	36 L	42 M

b. Economic impact ratings

Table 7 Summary of impact rating significance for the planning and design phase (Economic Impacts).

Impact	Location of Power Line							
	Alternative 1		Alternative 4		Alternative 5		"No-go" alternative	
	Before mitigation	After mitigation	Before mitigation	After mitigation	Before mitigation	After mitigation	Before mitigation	After mitigation
Job creation and skills development	76 M (+)	110 H (+)	76 M (+)	110 H (+)	76 M (+)	110 H (+)	135 H	135 H
Direct and indirect economic impacts	48 M	76 M (+)	76 M (+)	110 H (+)	76 M (+)	110 H (+)	135 H	135 H
Mining	26 L	13 L	26 L	13 L	48 M	48 M	26 L	26 L
Agriculture	48 M	26 L	13 L	13 L	13 L	13 L	No change in status quo	No change in status quo
Tourism and Heritage	51 M	38 L	13 L	13 L	13 L	13 L	No change in status quo	No change in status quo
Property value and land use	66 M	26 L	18 L	18 L	26 L	26 L	No change in status quo	No change in status quo
Physical resettlement or economic displacement	66 M	26 L	18 L	18 L	18 L	18 L	No change in status quo	No change in status quo

Table 8 Summary of impact rating significance for the construction phase (Economic Impacts).

Impact	Location of Power Line					
	Alternative 1		Alternative 4		Alternative 5	
	Before mitigation	After mitigation	Before mitigation	After mitigation	Before mitigation	After mitigation
Job creation and skills development	76 M (+)	110 H (+)	76 M (+)	110 H (+)	76 M (+)	110 H (+)
Direct and indirect economic impacts	76 M (+)	110 H (+)	76 M (+)	110 H (+)	76 M (+)	110 H (+)
Mining	51 M	18 L	18 L	18 L	18 L	18 L
Agriculture	48 M	26 L	18 L	18 L	18 L	18 L
Tourism and Heritage	18 L	18 L	18 L	18 L	18 L	18 L
Property value and land use	18 L	18 L	18 L	18 L	18 L	18 L
Physical resettlement or economic displacement	48 M	18 L	18 L	18 L	48 M	18 L

Table 9 Summary of impact rating significance for the operational phase (Economic Impacts).

Impact	Location of Power Line					
	Alternative 1		Alternative 4		Alternative 5	
	Before mitigation	After mitigation	Before mitigation	After mitigation	Before mitigation	After mitigation
Job creation and skills development	18 L(+)	18 L(+)	18 L(+)	18 L(+)	18 L(+)	18 L(+)
Direct and indirect economic impacts	18 L(+)	45 M(+)	18 L(+)	45 M(+)	18 L(+)	45 M(+)
Mining	18	18	18	18	51	18

Impact	Location of Power Line					
	Alternative 1		Alternative 4		Alternative 5	
	Before mitigation	After mitigation	Before mitigation	After mitigation	Before mitigation	After mitigation
	L	L	L	L	M	L
Agriculture	18 L	18 L	18 L	18 L	18 L	18 L
Tourism and Heritage	18 L	18 L	18 L	18 L	18 L	18 L
Property value and land use	66 M	26 L	18 L	18 L	26 L	26 L
Physical resettlement or economic displacement	26 L	26 L	26 L	26 L	26 L	26 L

9.1.2. Visual impact ratings

The Operational Phase of the proposed development could have a moderate visual impact on observers within a five kilometer (5 km) radius should mitigation measures not be implemented. The methodology for the assessment of potential visual impacts states the nature of the potential visual impact (e.g. the visual impact on individuals who travel along the N7, R316 and R320 as well as those residing within and visiting the project extent).

Table 10 Summary of impact rating significance for the operational phase (Visual Impacts).

Impact	Location of Power Line						
	Alternative 1		Alternative 4		Alternative 5		"No-go" alternative
	Before mitigation	After mitigation	Before mitigation	After mitigation	Before mitigation	After mitigation	
Impact on the sense of place for surrounding users.	95 MH	68 M	120 H	84 MH	64 M	45 M	No construction phase impacts are associated with the no-go alternative thus no assessment has been undertaken.

9.1.3. Heritage impact ratings

The proposed development will have a negative impact on the heritage resources situated on the three different alternative corridors proposed for this project. The majority of the resources can and should be mitigated, should they be impacted especially sites associated with the historic farmscape. The cemeteries and living heritage areas should be avoided as far as possible. The historic Namaqualand Copper Mining Landscape has high heritage significance, and sites associated with this cultural landscape must not be impacted. Even though no lithic material was documented during this survey, the presence of background scatter, or the probability of subsurface material should be taken into consideration during the construction phase of the project. Due to the nature of archaeological and palaeontological heritage, it is not possible to establish more detailed impact ratings for each alignment at this stage.

Table 11 Summary of impact rating significance for the construction phase (Heritage Impacts).

Impact	Location of Power Line					
	Alternative 1		Alternative 4		Alternative 5	
	No-go areas & Observations + recommended buffer	Rest of corridor	No-go areas & Observations + recommended buffer	Rest of corridor	No-go areas & Observations + recommended buffer	Rest of corridor
Destruction of Heritage Resources	112 H	28 L	112 H	28 L	112 H	28 L
Impacts on palaeontology	112 H	28 L	112 H	28 L	112 H	28 L

Table 12 Summary of impact rating significance for the operational phase (Heritage Impacts).

Impact	Location of Power Line					
	Alternative 1		Alternative 4		Alternative 5	
	Before mitigation	After Mitigation	Before mitigation	After Mitigation	Before mitigation	After Mitigation
Impact on cultural landscape	34 L	34 L	116 H	116 H	116 H	116 H

9.1.4. Agricultural impact ratings

Table 13 Summary of impact rating significance for the planning and design (construction) phase (Agriculture Impacts).

Impact	Location of Power Line							
	Leptosols in mountainous areas		Deep soil		All alternative corridors		Sensitivity class 'medium'[1]	
	Before mitigation	After Mitigation	Before mitigation	After Mitigation	Before mitigation	After Mitigation	Before mitigation	After Mitigation
Loss of agricultural land use, caused by direct occupation of land by footprint of power line infrastructure	N/A	N/A	N/A	N/A	N/A	N/A	24 L	12 L
Loss of agricultural land use due to fragmentation of agricultural land.	N/A	N/A	N/A	N/A	N/A	N/A	24 L	12 L
Disturbance to crop spraying by aircraft over land occupied by power lines	N/A	N/A	N/A	N/A	N/A	N/A	30 L	12 L
Soil Erosion caused by alteration of run-off characteristics due to vegetation removal and surface disturbance and compaction, particularly on access roads and construction camps.	N/A	N/A	N/A	N/A	63 M	26 L	N/A	N/A
Loss of topsoil due to poor topsoil management	N/A	N/A	N/A	N/A	51 M	26 L	N/A	N/A
Groundwater contamination	N/A	N/A	48 M	18 L	N/A	N/A	N/A	N/A
Stream contamination	48 M	18 L	N/A	N/A	N/A	N/A	N/A	N/A

[1] 'Medium' sensitivity class as identified in the Agricultural oil Sensitivity map of Appendix 3.4. – Figure 8

9.1.5. Geo-hydrological impact ratings

Table 14 Summary of impact rating significance for the planning and design (construction) phase (Geo-hydrological Impacts).

Impact	Location of Power Line					
	Alternative 1		Alternative 4		Alternative 5	
	Before mitigation	After Mitigation	Before mitigation	After Mitigation	Before mitigation	After Mitigation
Environmental awareness training	63 M	4 L	63 M	4 L	63 M	4 L
Site establishment development	48 M	1 L	48 M	1 L	48 M	1 L
Water Supply Management	68 M	7 L	76 M	7 L	68 M	7 L
Storm and waste water management	56 M	4 L	60 M	4 L	56 M	4 L
Solid and hazardous waste management	60 M	7 L	66 M	7 L	66 M	L
Protection of watercourses and estuaries	51 M	7 L	51 M	7 L	57 M	7 L
Vegetation clearing	48 M	1 L	48 M	1 L	48 M	1 L
Sanitation	48 M	2 L	64 M	2 L	56 M	2 L
Hazardous substances	57 M	3 L	76 M	3 L	57 M	3 L
Workshop, equipment maintenance and storage	39 L	1 L	60 M	1 L	45 M	1 L
Batching plants	39 L	1 L	45 M	1 L	45 M	1 L
Blasting	72 M	6 L	72 M	6 L	72 M	6 L
Stockpiling and stockpile areas	24 L	3 L	36 L	3 L	24 L	3 L
Steelwork Assembly and Erection	39 L	6 L	45 M	6 L	39 L	6 L
Cabling and Stringing	64 M	7 L	72 M	7 L	72 M	7 L
Temporary closure of site	39 L	2 L	39 L	2 L	39 L	2 L
Landscaping and rehabilitation	60 M	6 L	68 M	7 L	60 M	6 L

9.1.6. Botanical and Freshwater impact ratings

The tables below rates the significance of the identified potential impact. The ratings are applied in the instance that no mitigation measures are implemented, and then repeated to assess the significance of the impacts, assuming recommended mitigation measures are implemented. The tables also explain the rationale for how impacts and their subsequent ratings have been assigned to spatial features across all alternatives) in order to spatially represent impacts. The spatial representation of impact was also mapped for the study and the details of the mapping procedure and the resulting maps can be viewed in Appendix 2 and 5 respectively.

Table 15 Summary of impact rating significance for the construction phase (Botanical and Freshwater Impacts).[2]

Impact	Before Mitigation	After mitigation	Location of power line
Vegetation destruction, habitat loss and impact on plant species of conservation concern	80 M	18 L	Sensitive Vegetation Types
	33 L	14 L	Vegetation Remnants
	1 L	1 L	Transformed areas, existing roads & power lines
Loss of riparian- and wetland habitat and vegetation	100 H	60 M	Watercourses, with 32m buffer
	33 L	12 L	Vegetation Remnants
	1 L	1 L	Transformed areas, existing roads & power lines
Disruption of broad-scale ecological processes and hydrological flow	80 M	42 M	Watercourses, with 32m buffer and ESAs
	24 L	7 L	Vegetation Remnants
	1 L	1 L	Transformed areas, existing roads & power lines
Compaction of soils and creation of preferential flow paths within and adjacent to wetland and river habitat	76 M	30 L	Slopes > 1:1.5, Bushman Arid Grassland & Namaqua Inland Duneveld and watercourses & 32m buffer
	27 L	1 L	Rest of the area not included in above and below
	1 L	1 L	Transformed areas, existing roads & power lines
Soil disturbance, soil compaction and increased erosion	76 M	30 L	CBA1, CBA2, ESA, Protected areas, Areas earmarked for protection & watercourses and their 32m buffers
	27 L	1 L	Vegetation Remnants
	1 L	1 L	Transformed areas, existing roads & power lines
Pollution of aquatic ecosystems	51 M	3 L	Watercourses, with 32m buffer
	24 L	1 L	100m Buffer around rivers and 500m around wetlands
	1 L	1 L	Other areas not included in above
Impact on protected areas or areas earmarked for protection, Critical Biodiversity Areas and broad-scale ecological processes	80 M	42 M	CBA1, CBA2, ESA, Protected areas, Areas earmarked for protection & watercourses and their 32m buffers
	24 L	7 L	Vegetation Remnants
	1 L	1 L	Transformed areas, existing roads & power lines
Increased opportunity for alien invasive plant establishment and spread	80 M	21 L	Vegetation Remnants
	21 L	1 L	Transformed areas, existing roads & power lines

[2] The alternative corridors were divided into homogenous units based on certain shared characteristic based on each impact. Each unit was rated separately in terms of impacts. 'Location in corridor' specifies the units for which impact ratings were calculated.

Table 16 Summary of impact rating significance for the operational phase (Botanical and Freshwater Impacts).[3]

Impact	Before Mitigation	After mitigation	Location of power line
Vegetation destruction, habitat loss and impact on plant species of conservation concern	80 M	18 L	Sensitive Vegetation Types
	33 L	14 L	Vegetation Remnants
	1 L	1 L	Transformed areas, existing roads & power lines
Disruption of broad-scale ecological processes and hydrological flow	80 M	42 L	Watercourses, with 32m buffer and ESAs
	24 L	7 L	Vegetation remnants
	1 L	1 L	Transformed areas, existing roads & power lines
Soil disturbance, soil compaction and increased erosion	76 M	30 L	CBA1, CBA2, ESA, Protected areas, Areas earmarked for protection & watercourses and their 32m buffers
	27 L	1 L	Vegetation Remnants
	1 L	1 L	Transformed areas, existing roads & power lines

9.1.7. Faunal impact ratings

Table 17 Summary of impact rating significance for the construction- and operational phase (faunal Impacts).

Impact	Location of Power Line						No-go alternative
	Alternative 1		Alternative 4		Alternative 5		
	Before mitigation	After Mitigation	Before mitigation	After Mitigation	Before mitigation	After Mitigation	
Loss of faunal habitat and ecological structure	90 M	60 M	80 M	50 M	80 M	50 M	No impact
Direct faunal impacts	90 M	39 L	80 M	33 L	80 M	33 L	No impact
Indirect faunal impacts from influx of in Pied Crows	63 M	54 M	92 M	60 M	92 M	60 M	No impact
Disturbance	65 M	40 M	75 M	40 M	65 M	40 M	No impact
Cumulative impact on fauna	90 M	45 M	90 M	45 M	90 M	45 M	No impact

9.1.8. Avifaunal impact ratings

Table 18 Summary of impact rating significance for the construction- and operational phase (Avifaunal Impacts; #1 Water & wetlands; #2 Mountainous areas; #3 Thicket & Woodland; #4 Grassland & Low shrubland; #5 Cultivated areas; #6 Mines & Built-up areas).

Impact	Habitat	Location of Power Line						No-go alternative
		Alternative 1		Alternative 4		Alternative 5		
		Before mitigation	After Mitigation	Before mitigation	After Mitigation	Before mitigation	After Mitigation	
Collisions	#1	22 L	22 L	11 L	11 L	N/A	N/A	N/A

[3] The alternative corridors were divided into homogenous units based on certain shared characteristic based on each impact. Each unit was rated separately in terms of impacts. 'Location in corridor' specifies the units for which impact ratings were calculated.

Impact	Habitat	Location of Power Line						
		Alternative 1		Alternative 4		Alternative 5		No-go alternative
		Before mitigation	After Mitigation	Before mitigation	After Mitigation	Before mitigation	After Mitigation	
	#2	45 M	28 L	60 M	30 L	42 M	26 L	N/A
	#3	26 L	24 L	26 L	24 L	26 L	12 L	N/A
	#4	76 M	45 M	76 M	45 M	76 M	48 M	N/A
	#5	26 L	26 L	N/A	N/A	N/A	N/A	N/A
	#6	11 L	11 L	11 L	11 L	11 L	11 L	N/A
Displacement due to habitat destruction and disturbance	#1	16 L	16 L	16 L	16 L	N/A	N/A	N/A
	#2	39 L	39 L	39 L	39 L	39 L	26 L	N/A
	#3	20 L	20 L	20 L	20 L	20 L	20 L	N/A
	#4	39 L	24 L	39 L	24 L	39 L	24 L	N/A
	#5	8 L	8 L	N/A	N/A	N/A	N/A	N/A
	#6	6 L	6 L	6 L	6 L	6 L	6 L	N/A

9.2. Spatial representation of impact ratings

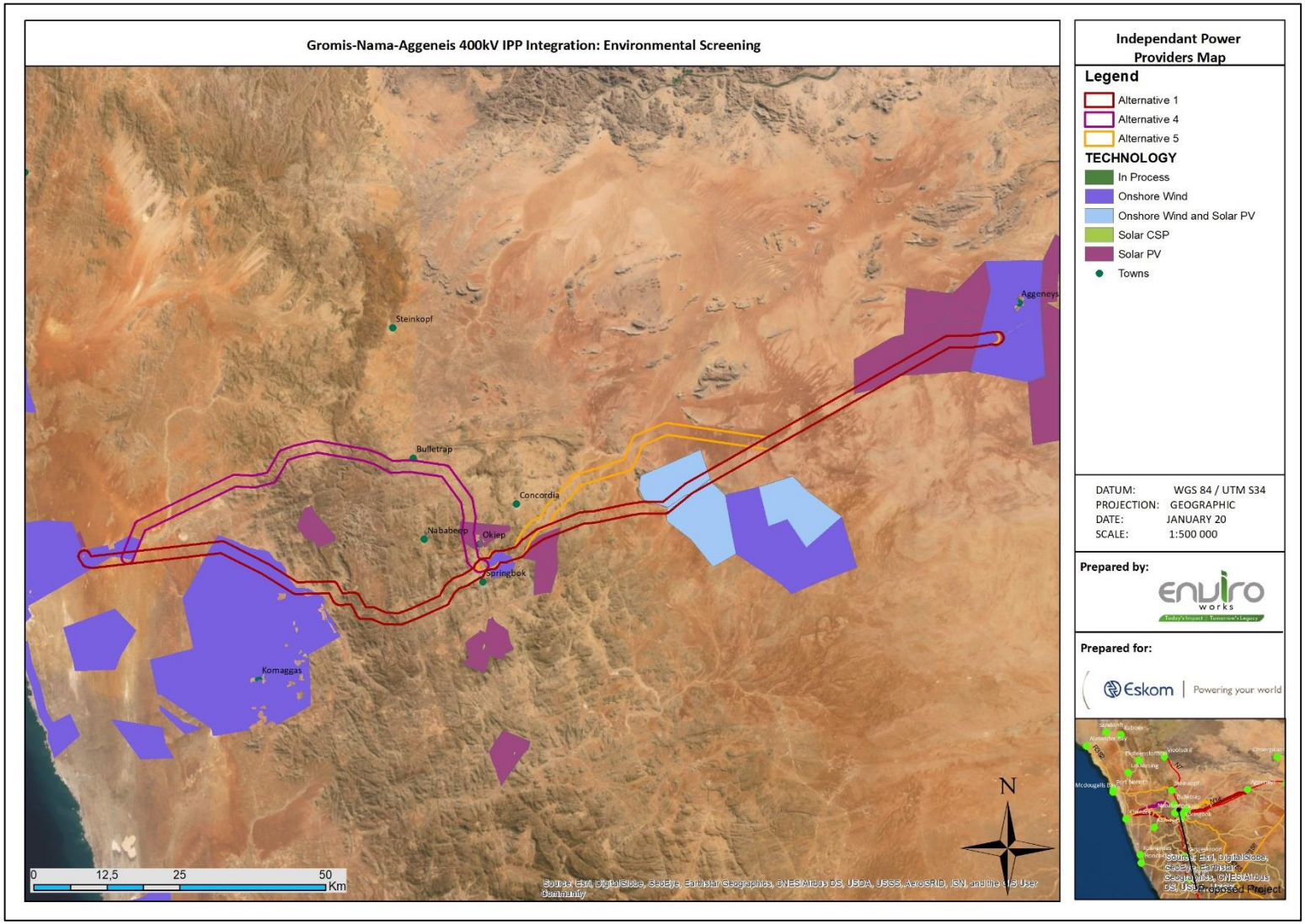


Figure 6 Properties in the study area that have a current application or approved Environmental Authorisation for a Renewable Energy development

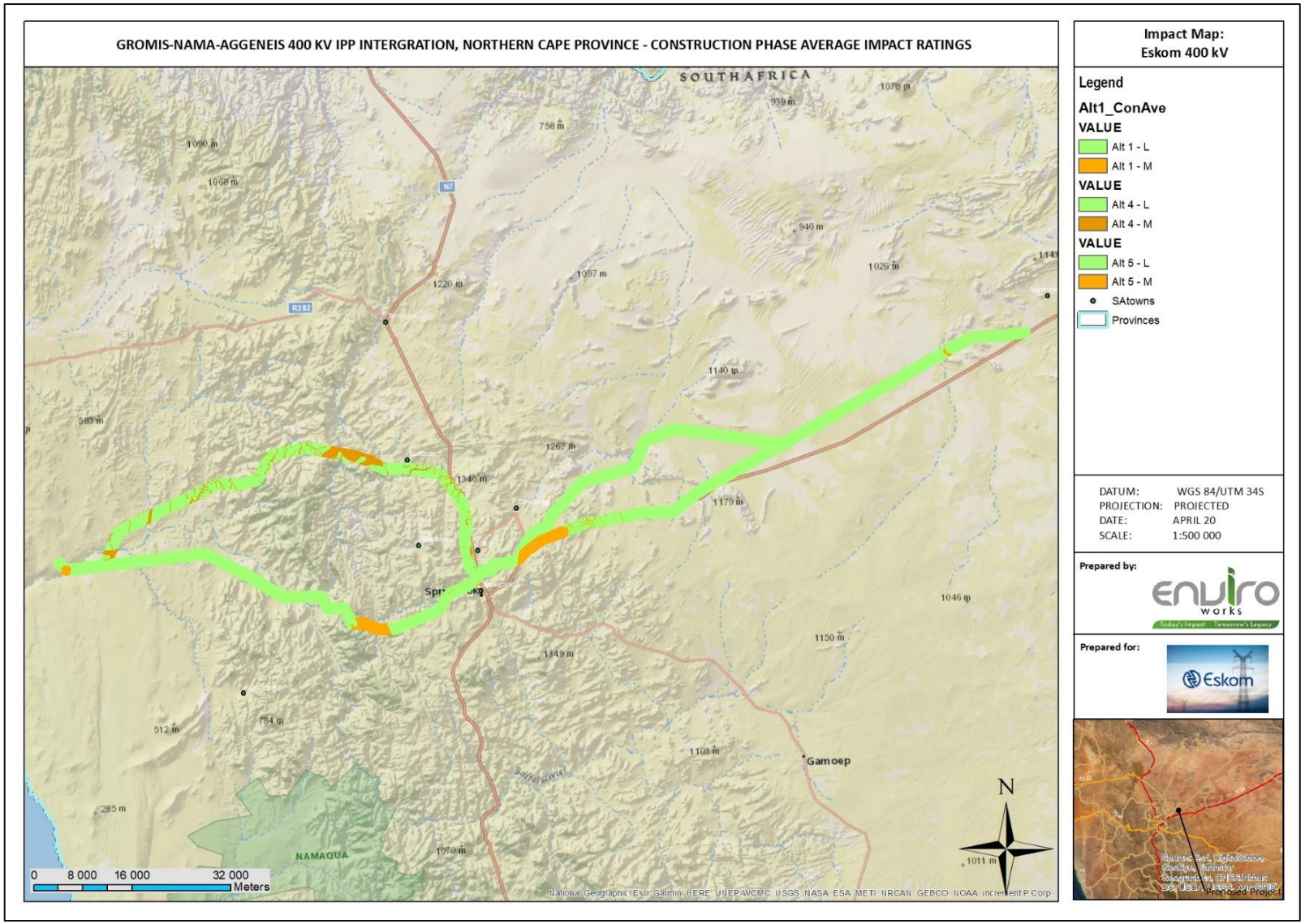


Figure 8 Average impact rating for the construction phase

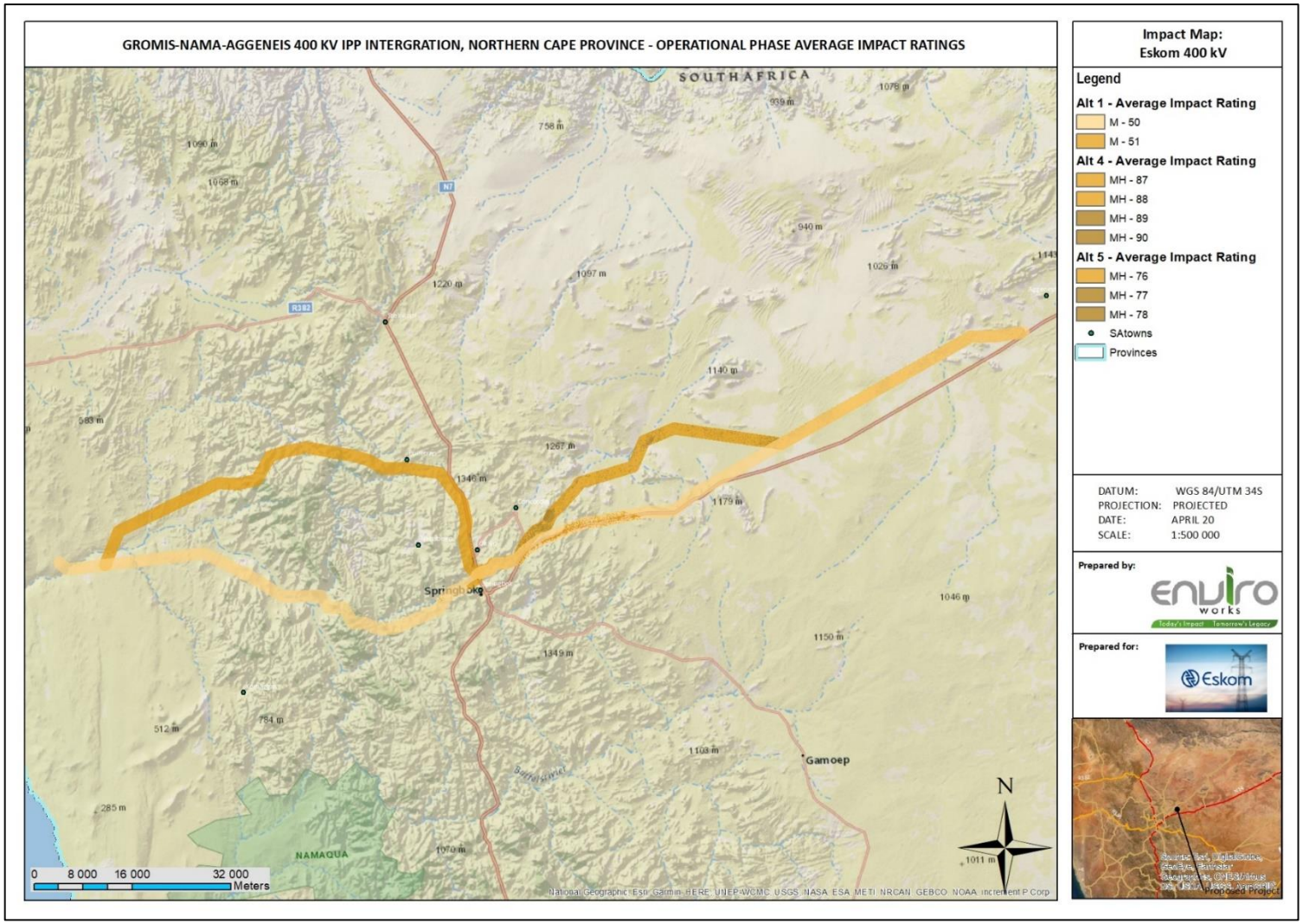


Figure 8 Average impact rating for the operational phase

9.2.1. Specialists preferred Alternative

Each specialists' impact rating, as per **Section 9.1**. above, were mapped. Details of the mapping procedure can be viewed in **Appendix 2**. The resulting individual impact rating maps of each of the specialists' impacts can be viewed in **Appendix 5**. The average impact rating per Alternative was calculated for each Specialist during the Construction and Operational Phase in order to discern a pattern of the Preferred Alternative based on the lowest overall impact rating. The average impact rating per Alternative for each specialist study is summarized in the table below. In the case where the average impact ratings were very similar, more than one alternative was highlighted, but the lowest average during the construction phase was marked in red.

From the table it can be seen there is a clear preference of Alternative 4 and 5 in terms of the socio-economic aspects. One of the main reasons is that there are areas of high tourism importance along the western section of Alternative 1, and that the line could cause a cumulative 'sense of place' impact in the western section of Alternative 1. It should be noted that there are many planned and approved Renewable Energy development within this area (Figure 6), especially concentrated along Alternative 1 and are in close proximity to Alternative 5. This means that over time the 'sense of place' would likely shift in the long term, as more Renewable Energy developments replace agricultural areas to utilize the highly suitable area. This would mean that the power line would actually fit into the more 'industrial' land use in the future.

This result is in line with the recommendation from the Visual Specialist that recommended Alternative 5. In the western section of Alternative 1 the topography would largely shield the new power line and the Visual Absorption Capacity would mitigate the visual impact despite guest houses and the lookout point along this route. Alterative 4, which is largely natural and also used extensively by the tourism industry does not have the Visual Absorption Capacity nor will the topography be as effective to mitigate the visual impact and loss of 'sense of place'. Alternative 4 was also disregarded by the Heritage specialist, as many significant and sensitive features were found in this this Alternative. Heritage features are off less significance in Alternative 1 and 5, and can be more readily avoided if Alternative 1 or 5 are used. The strategy for preserving the cultural landscape, recommended by the Heritage Specialists, is to concentrate electricity infrastructure along one alignment where the landscape is not pristine, such as in the areas of Alternative 1 and 5.

Alterative 5 is preferred over Alternative 1 by most specialists, because it avoids the important conservation and protected area found along Alternative 1 (and where Alternative 4 coincides with it) and still follows existing infrastructure for most of its length. Most of the specialist recommended to confine the new development as close as possible to the existing line in order to cluster impacted areas, limit disturbance, avoid creating impact in new areas and to make use of existing infrastructure such as access roads. This was true from an Agricultural, Faunal, Avifaunal, Geo-hydrological, Botanical and Freshwater perspective. In the case of Avifaunal impacts, staggering the new and existing power line could actually reduce bird mortalities caused by collisions by making the obstruction more visible. One of the sensitive areas identified in most studies were the protected and conservation areas along Alternative 1, which made Alternative 5 a more preferred alternative. As both

alternatives follow the same route for most of the length and have existing disturbances, new impacts will be limited and very similar. Both Alternative 1 and 5 are considered feasible alternatives from most of the specialists' recommendations but Alternative 5 is the most preferred across all project phases.

Table 19 Summary of the average impact rating per Alternative for each specialist assessment

Specialist	Phase	Average Impact Rating		
		Alternative 1	Alternative 4	Alternative 5
Social	Construction	32.65	30.01	32.11
Social	Operation	47.34	46.02	46.07
Economic	Planning	54	34	38
Economic	Construction	47	34	38
Economic	Operation	25	19	25
Visual	Construction	95	120	64
Visual	Operation	95	120	64
Heritage	Construction	35.60	35.84	30.37
Heritage	Operation	34	116	116
Agricultural	Construction	32.85	27.77	28.48
Geo-hydrological	Construction	52	58	53
Botanical & Freshwater	Construction	37.52	48.07	38.67
Botanical & Freshwater	Operation	46.04	45.88	45.20
Faunal	Construction	77	82	79
Avifaunal	Construction	29.31	32.20	32.92

The resulting specialist impact rating maps were combined by averaging the impact rating and producing two maps, as above. These two maps illustrates the overall average impact ratings for the proposed development during the construction- (Figure 7) and operational phase (Figure 8) respectively. Impact ratings are represented according to the categories in Table 4, where higher value indicate greater anticipated impact significance. In order to evaluate the results to recommend the Preferred Alternative, the average impact rating proportions per alternative were compared as per the table below.

Table 20 Comparison of impact significance ratings amongst Alternative corridors assessed during the screening, comparing the proportion each alternative covered by the respective significance categories.

	Alternative 1	Alternative 4	Alternative 5
Phase	**Construction**		
Low impact significance	90.26%	90.10%	94.10%
Medium impact significance	9.74%	9.90%	5.60%
Medium-High impact significance	0%	0%	0%
Mean impact rating	33.38	32.54	31.82
Phase	**Operation**		
Low impact significance	0%	0%	0%
Medium impact significance	100%	27.06%	41.02%
Medium-High impact significance	0%	72.94%	58.98%
Mean impact rating	58.86	73.88	65.62

The construction phase is of relatively short duration, when compared to the entire life-cycle of the project (<12 months vs. >20 years). It is also expected that construction impacts are temporary, with the majority of the impacts seizing after the construction phase has ended and assuming all mitigation measures implemented effectively and the site suitable rehabilitated. It is the operation of the power line that will have the most permanent or long-term impact on the surrounding environment.

In terms of the 'short-term' and relatively temporary construction phase impacts, Alternatives 1 & 5 are the Preferred Alternative, with Alternative 5 having the lowest mean impact rating for the entire corridor and Alternative 1 has the largest proportion of area with a low impact significance rating.

In terms of the 'long-term' and more permanent operational phase impacts, Alternative 1 is the Preferred Alternative. Alternative 1 has both the lowest mean impact rating for the entire corridor and the entire corridor is classified as having an average medium impact rating significance.

The section below will introduce the 'no-go' areas identified by the impact assessments and incorporate these areas with the construction- and operational phase impact rating map to recommend the Preferred Alternative.

9.2.2. No-Go Areas

One of the outcomes of the specialist impact assessments were to identify potential 'no-go' areas. These areas are defined as having an exceptionally high level of sensitivity. Development within these areas could cause unacceptably high levels of impact and should be avoided at all practical and feasible cost. Each specialist identified potential 'no-go' areas where applicable. Where practically possible, these areas were mapped and included in the overall impact map results. Each specialists' identified 'no-go' areas are listed in the table below and are represented in the final impact rating map below.

Table 21 Summary of 'no-go' areas identified by specialists during this assessment.

10.2.1. Socio-Economic
a. Social
While the power line will facilitate several positive economic impacts, it would pass through a scenic landscape with a rich cultural heritage, an important tourism industry and a large marginal population. These factors make the area particularly susceptibility to potential negative impacts, especially any impacts that will affect the 'sense of place'. Poor location of the power line would threaten the viability of existing tourism related features such as guest resorts and nature reserves. Such impacts can be mitigated by avoiding 'No-Go' areas, ensuring the power line is not placed near sensitive receptors. Based on the findings of a desktop evaluation, the site visit and the comments received, No-Go Areas were roughly mapped along the three route alternatives investigated. While no feedback, positive or negative, has been received from the guesthouses in the area, it was assumed that placing the power line near existing guesthouses and resorts would detract from their sense of place. A one-kilometer buffer was thus placed around all guesthouses, resorts and important historic sites or monuments as 'no-go'. A buffer was also placed over the viewshed of the Gemsbok Lapa and the scenic 'Uitkyk Punt' (Look Out Point). Farm homesteads, mines, towns and residential areas were assumed to be less sensitive to a change in sense of place. Farm homesteads were plotted with a one hundred-meter buffer. Mines, towns, residential areas and the Goegap Nature Reserve were outlined but not buffered. The No-Go buffers placed around guesthouses, tourist attractions and farm steads are considered to have 'soft edges' and in cases the power line may be placed within the buffer, depending on the topography and consultation with affected parties. An illustration of the soft 'no-go' areas are illustrated below.

It is recommended to Avoid placing the power line within or near No-Go areas. Do not locate the power line near farmsteads and residential areas, within 500m, and guesthouses and tourist attractions, within 1 km. Based on consultation with individual landowners, distances could be reduced.

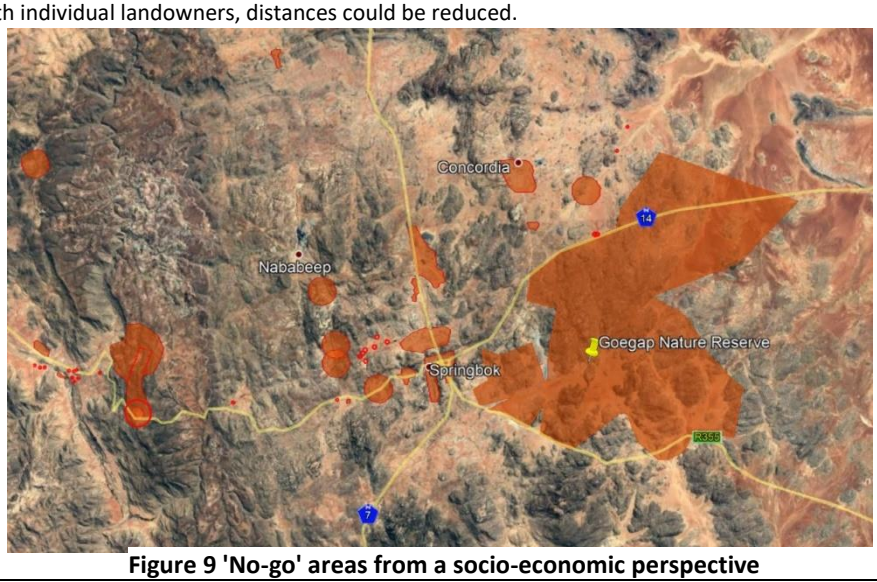


Figure 9 'No-go' areas from a socio-economic perspective

10.2.1. Visual

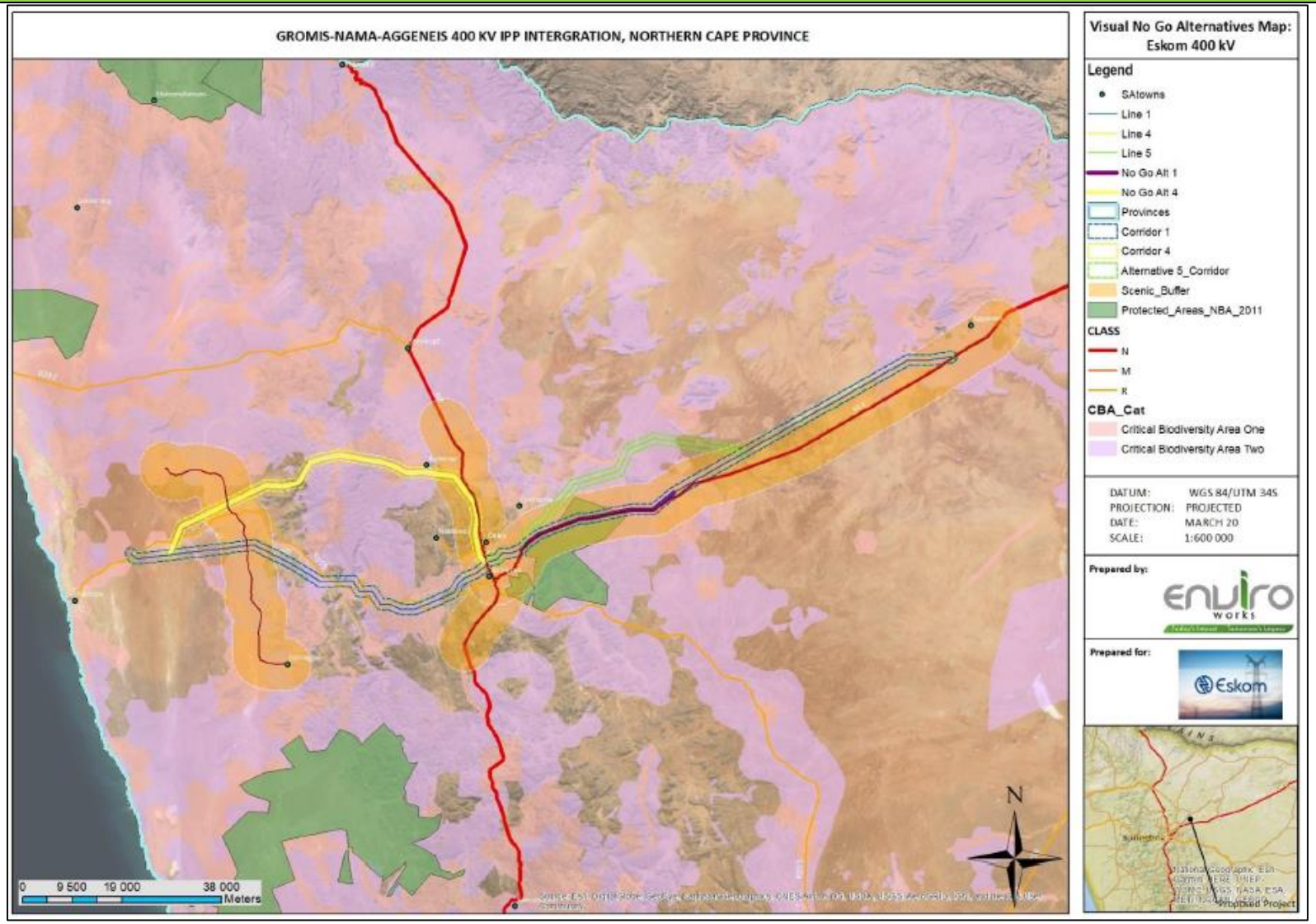


Figure 10 'No-go' areas identified from a visual aspect

10.2.2. Heritage

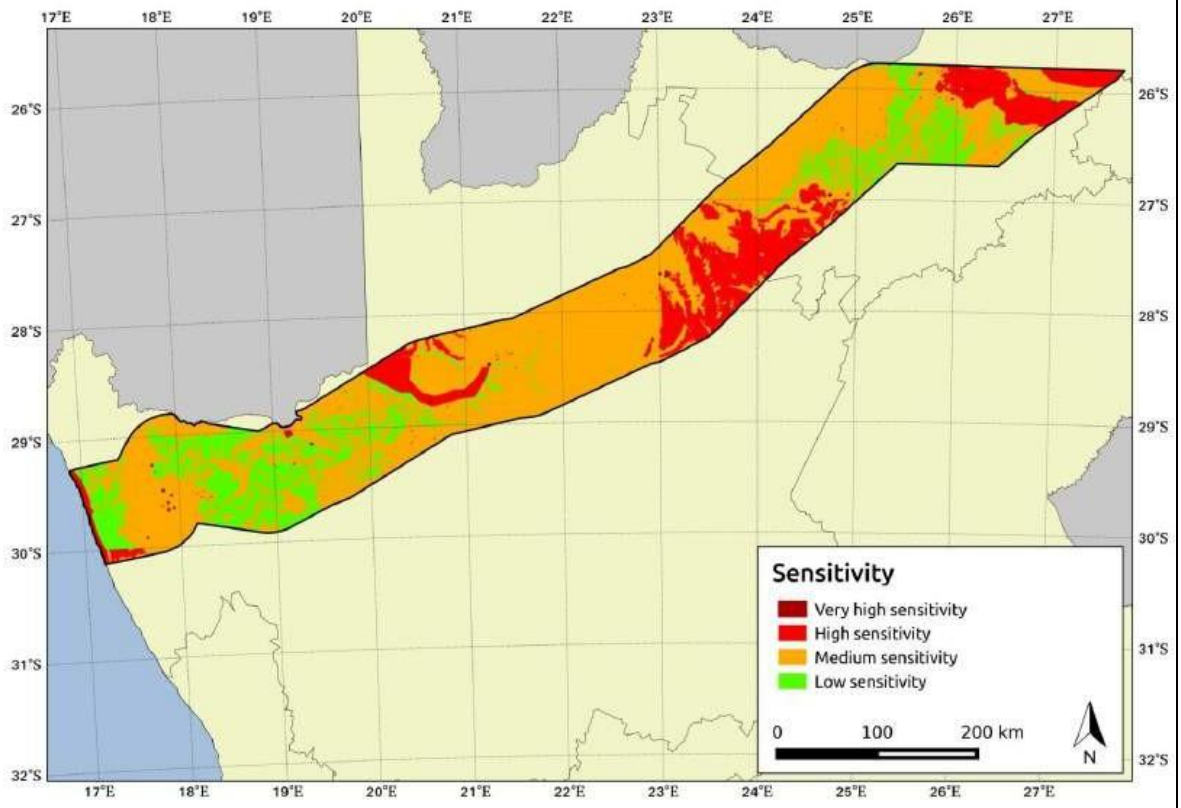


Figure 11 Sensitive areas identified from the National Screening Tool

The 'no-go' areas identified in the map above should be adhered to, this also includes the observations from the field assessment and their recommended buffers (Table 6 of Appendix 3.3.)that should be adhered to when placing the development footprint.

10.2.3. Agricultural

No highly sensitive areas were surveyed in the study. There are very few cropped land that should be avoided as much as possible and no irrigation was encountered.

10.2.4. Geo-hydrological

It was found that in some areas, geological structures were targeted for both groundwater exploration and preferred corridor foundation instalment, at areas where corridor layout angles change. These areas should be avoided from being excavated or blasted to reduce the risk of damage to limited boreholes. The client should also refrain from using these sites and prominent geological outcrops as storage sites for any toxic chemicals, oils, faulty machinery etc., as these sites are associated with increased surface to groundwater infiltration rates.

Areas known to collect surface water drainage should also be avoided as far as possible during construction and operational (monitoring roads) phase. Alternatively, intersecting watercourses should be intersected perpendicularly to minimize the estimated groundwater impact.

10.2.5. Botanical and Freshwater

- Avoid CBAs, Protected Areas and riparian- and wetland beds and banks as far as possible (maps included for this study);
- Watercourses and their 32m buffers should be considered no-go areas for infrastructure placement as far as practically possible; and,
- Avoid impact to restricted and specialised habitats such as azonal vegetation types, cliffs, large rocky outcrops, quartz fields, bases of koppies, inselbergs, mountains or rocky outcrops, pebble patches and rock sheets and populations of species of conservation concern (not mapped at this scale of the study).

10.2.6. Faunal

A series of faunal microhabitats have been identified within the study site. Ephemeral pans, drainage lines, rocky outcrops are of highest conservation concern as they are high in biodiversity and support species of conservation

concern. Apart from avoiding these sensitive features, the footprint of the power line should be kept to a minimum and vegetation clearing should only be carried out if completely necessary. All of the route corridor alternatives pass through a variety of sensitive areas including Nature Reserves in the central part of the study area, mountainous shrublands and large drainage channels in the eastern section (Buffels Rivier). *Vachellia erioloba* forests west of Kommagas is also considered to be sensitive. Although the Alternatives pass through numerous habitats that are sensitive for fauna, the sensitive features such as rocky outcrops and drainage channels can generally be avoided and mitigated through design considerations and tower placement. 'No-go' areas from a faunal perspective are thus:

- Drainage lines
- Ephemeral wetlands or pans. These sensitive features depend exclusively on rainfall and flooding events and can sometimes be dry for years but are important biodiversity features and development may change drainage patterns and affect fauna communities (including birds, amphibians and fish) that use the pans.
- Rocky hills and steep slopes which cannot be restored once destroyed by blasting, trenching or road building.
- If any bat roosts are identified during future field visits.

10.2.7. Avifaunal

Although no specific no-go areas were identified from an avifaunal perspective, it is recommended that all the proposed mitigation measures be implemented to minimise the impacts as far as is practically possible.

Table 22 Comparison of impact significance ratings amongst Alternative corridors assessed during the screening, comparing the proportion each alternative covered by the respective significance categories.

	Alternative 1	Alternative 4	Alternative 5
Phase	**Construction with 'no-go' areas**		
Low impact significance	68.54%	39.05	73.09%
Medium impact significance	0.02%	0.91%	0.02%
Medium-High impact significance	31.13%	23.85%	26.60%
High impact significance	0.00%	0.00%	0.00%
Very high impact significance	0.32%	36.19%	0.30%
Mean impact rating	36.72	71.74	33.08
Phase	**Operation with 'no-go' areas**		
Low impact significance	0%	41.15%	0%
Medium impact significance	71.35%	0%	73.08%
Medium-High impact significance	28.65%	11.81%	11.36%
High impact significance	0%	47.04%	15.56%
Mean impact rating	48.91	74.90	49.47

When taking into account the 'no-go' areas with the average construction impact significance, Alternative 5 emerges as having the lowest overall mean impact significance for the entire corridor. Alternative 1 has a slightly larger mean impact significance. When looking at the impact rating map (Figure 14) it does seem that the areas of high significance within Alternative 5 can be successfully avoided by the careful planning of the route alignment and pylon placement. Alternative 4 is excluded from further consideration due to the very high proportion of the area classified as having very high impacts (36.19%). The spatial arrangement of the high impact significance areas will make it difficult, if not impractical, to avoid these sensitive areas within Alternative 4.

When taking into account the 'no-go' areas with the average operational impact significance, Alternative 1 emerges as having the lowest overall mean impact significance for the entire corridor. Alternative 5 has a very similar mean impact significance and in addition, has a larger proportion of the corridor rated as having Medium significance, and a smaller proportion with Medium-High significance, compared to Alternative 1. Alternative 5 does have a proportion of 15.56% rated with High significance. When looking at the impact rating map (Figure 15) it does seem that the areas of high significance can be successfully avoided by the careful planning of the

route alignment and pylon placement. Alternative 4 is excluded from further consideration due to the very high proportion of the area classified as having high impacts (almost 50%). The spatial arrangement of the high impact significance areas will make it difficult, if not impractical, to avoid these sensitive areas within Alternative 4.

Alternative 1 & 5 emerged as having a similar, and low mean impact significance for both the construction and operational phase. If one considers the pattern of impact significance categories distribution between Alternative 1 and 5, it is apparent that Alternative 1 has numerous areas of Medium-High significance that's crosses the entire corridor width. The length of these sections are much larger (>460m) than the required distance between pylon placement. The spatial pattern of Alternative 5 however is more spread out between areas of High and Medium-High significance rating. The sections crossing the corridor are narrower compared to Alternative 1, which in turn will make avoiding placement of infrastructure in these areas more practically feasible.

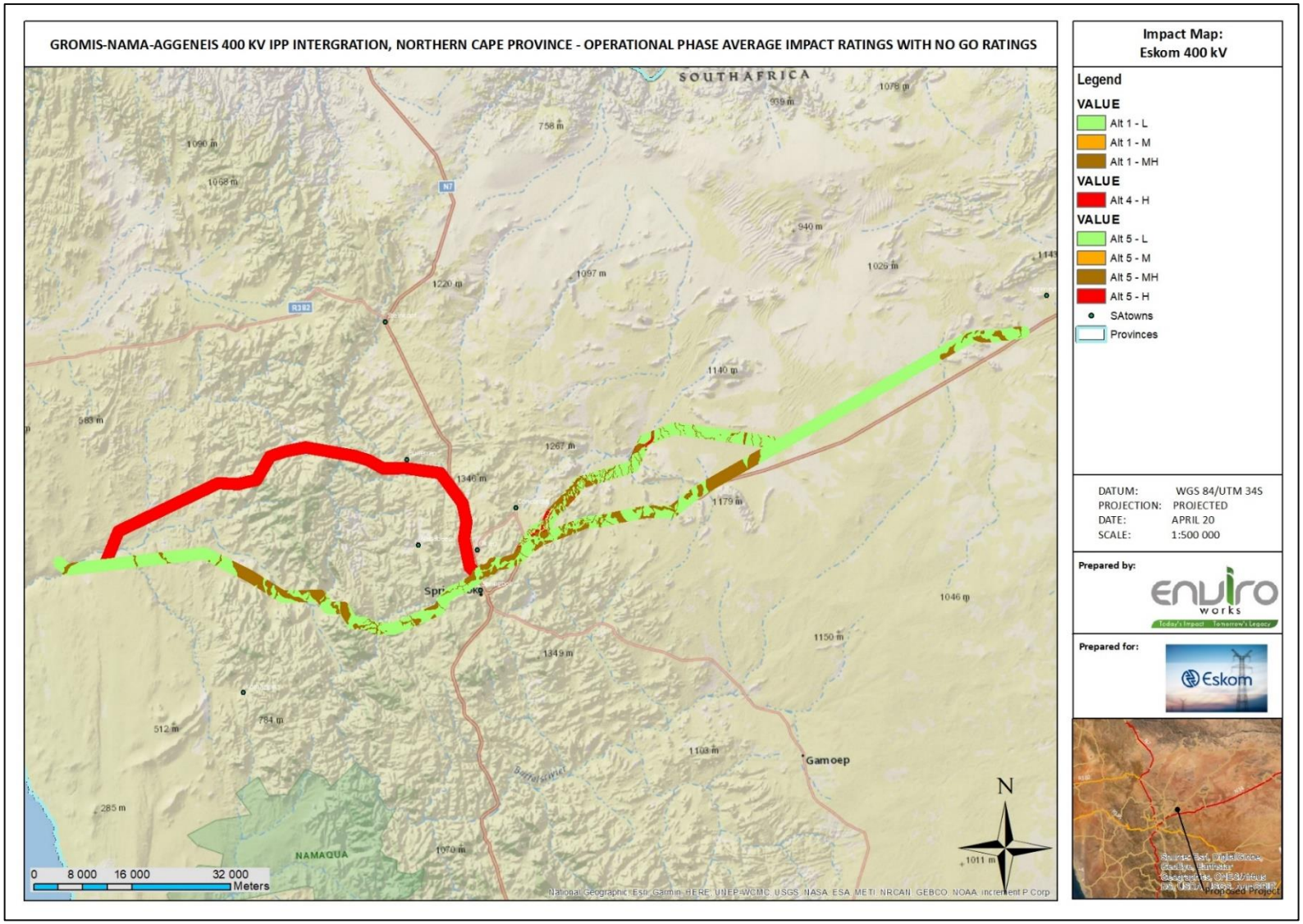


Figure 12 Final impact rating map for the construction phase, including 'no-go' areas

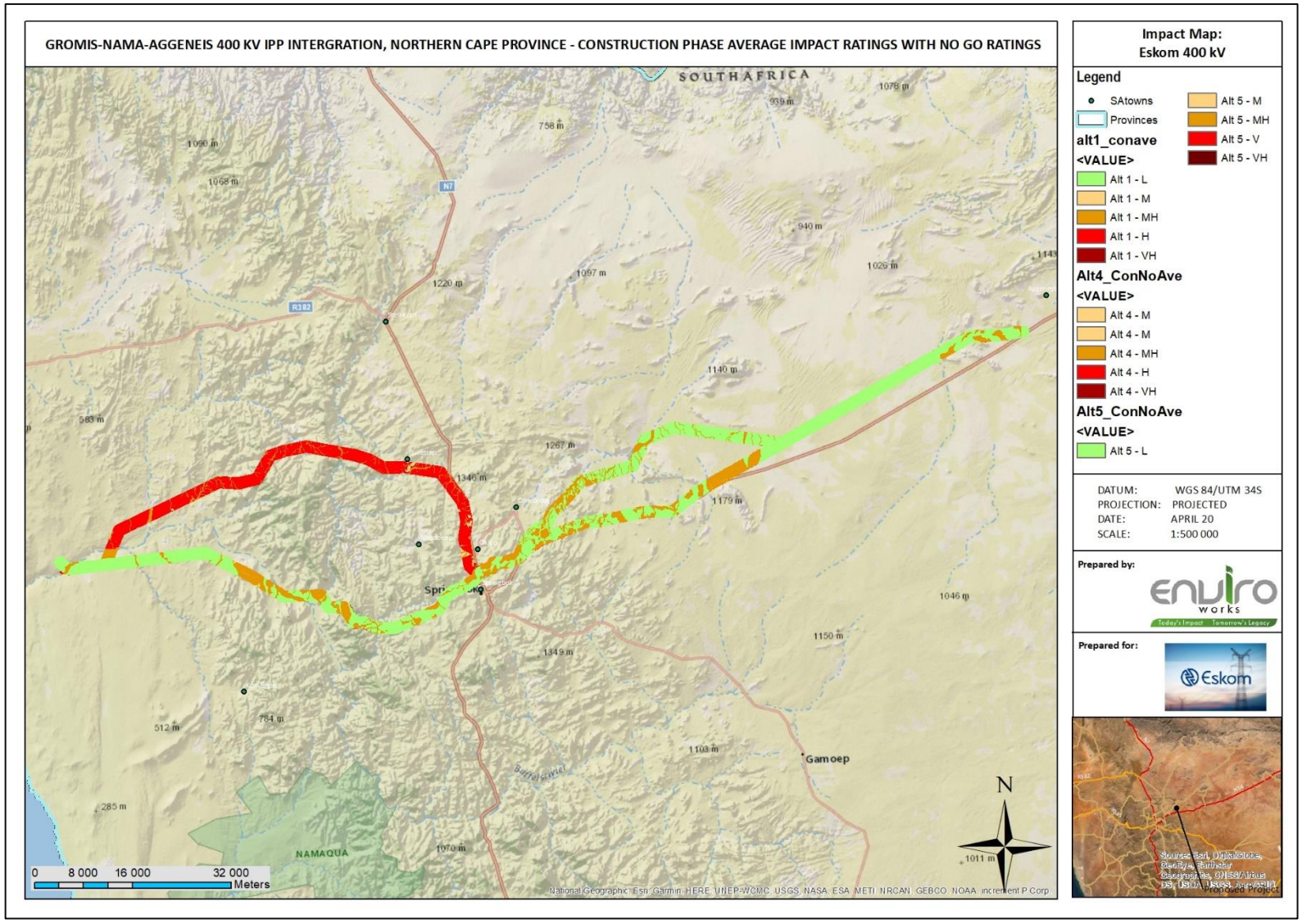


Figure 13 Final impact rating map for the operational phase, including 'no-go' areas

10. MITIGATION MEASURES

Each specialist provided suitable mitigation measures for the identified potential impacts, that should be implemented to avoid, reduce or mitigate the significance of potential impacts. The Proponent must adhere to all the mitigation measures stipulated in the Generic Environmental Management Programme (EMPr) for the Development and Expansion of Substation Infrastructure for the Transmission and Distribution of Electricity, gazetted on 22 March 2019 (RSA, 2019). In addition to this the follow mitigation measures, as recommended by each of the specialist studies - and summarised below - should be adhered to.

10.1. Social Mitigation

a. Construction phase

Table 23 Mitigation measures to mitigate identified impacts during the construction phase (Social Impacts).

Impact	Location of Power Line			
	Areas within 1 km of farmhouses, towns or residential areas	Areas within 1 km of guesthouses or areas of social, cultural or tourism importance	Open/Farmland	"No-go" alternative
Increase in dust and noise	• Ensure dust mitigation measures are in place and put into practice • Notify residents prior to conducting activities that may cause excessive noise • Use attenuation for machinery where possible.			No mitigation as there will be no impact and the environment will remain unaffected.
Potential increase in crime	• Do not locate the power line near farmsteads and residential areas, within 500m, and guesthouses and tourist attractions, within 1 km. Based on consultation with individual landowners, distances could be reduced. • Contractors to strictly monitor for any non- employees on site and to report any immediately. • All employees are required to have a form of identification. • No farm gates to be left open. • Farmers to report cases of livestock theft to the Contractor to investigate internally. • Contractors to work closely with farm watch groups.			No mitigation as there will be no impact and the environment will remain unaffected.
Health implications	• Monitor dust levels and ensure dust mitigation measures are in place. • All employees to be supplied with appropriate PPE. • HIV/AIDS awareness talks to be incorporated into induction talks. • No non-employees to be allowed on the construction site/construction camp.			No mitigation as there will be no impact and the environment will remain unaffected.
Positive psychological effect	• Do not create false expectations with regards to the number of jobs that can/will be created. • As far as possible make use of local labour. • Minimise negative psychological impacts by not routing the power line near tourist attractions and /or places of cultural significance.			No mitigation as the only alternative is to construct the power line.
Disruption of daily living	• Minimise disturbance to landowners/inhabitants through proper planning and notify them in good time of when access will be needed. • Ensure noise is kept to a minimum. • Do not block access roads. • Do not remove fences prior to consent of landowner.			No mitigation as there will be no impact and the environment will remain unaffected.
Loss of sense of place	• Keep noise and dust generating activities to a minimum and time such activities between 08:00 – 17:00 during weekdays. • Keep construction sites/camps neat and tidy, screen with inconspicuous netting, paint reflective materials a matt colour and			No mitigation as the impact is positive.

Impact	Location of Power Line			
	Areas within 1 km of farmhouses, towns or residential areas	**Areas within 1 km of guesthouses or areas of social, cultural or tourism importance**	**Open/Farmland**	**"No-go" alternative**
	minimise lighting at night. • Employees to conduct themselves in an appropriate manner. A Code of Conduct must be drawn up and the employees are to abide by the code.			
Decreased tourism potential for the surrounding area	• Avoid placing the powerline near sensitive tourism locations. • Ensure dust mitigation measures are in place. • Screen construction site/camp and keep neat. • Clear as little vegetation as possible. • Strictly adhere to working hours 08:00-17:00. • Avoid construction over weekends, holidays and the flower season (September / October).			No mitigation as the impact is positive.
Increased employment opportunities during the construction phase	• As far as possible, hire staff from the surrounding areas. • As far as possible make use of local service providers.			No mitigation as no development will take place.
Economic knock-on effects	As far as possible make use of local service providers for accommodation, sustenance, equipment hire, construction materials etc.			No mitigation as no development will take place.
Detracting from important cultural/heritage areas	• Avoid placing the powerline near areas or sites of cultural/heritage significance. • Ensure dust mitigation measures are in place. • Screen construction sites/camps and keep neat. • Clear as little vegetation as possible. • Strictly adhere to working hours 08:00-17:00. • Avoid construction over weekends.			No mitigation as there will be no impact and the environment will remain unaffected.
Decreased availability of medicinal plants for traditional doctors	• Any endangered and/or threatened plant species occurring within the development footprint should be transplanted. • Following construction, rehabilitation of cleared areas should ensure that the species diversity is restored to that of the original area as far as is possible.			No mitigation as there will be no impact.
Disruption of family structures	• No unauthorized persons to be permitted on site. • The Proponent could consider providing transport for workers to and from site. The contractor should draw up a Code of Conduct. Workers conducting themselves in a way contrary to this should be dismissed. Any dismissals must be in line with South Africa's labour legislation. • When construction will span a long period of time, the contractor should make allowance for construction workers to return home either on weekends or a regular basis. • As far as feasible fill positions with locals from the area.			No mitigation as there will be no impact.
Increased anxiety amongst farmers	• Maintain contact with farmers in the surrounding area and keep them updated regarding planned construction activities. • Contractors to work closely with farm watch groups. • Contractors to strictly monitor for any non- employees on site and to report any immediately. • All employees are required to have a form of identification. • No farm gates to be left open. • Farmers to report cases of livestock theft to the Contractor to investigate internally.			No mitigation as there will be no impact and the environment will remain unaffected.
Improved quality of life for impoverished communities (job creation)	• As far possible employ local personnel from the surrounding areas. • Do not place the power line near sensitive areas which may incur job losses if negatively impacted.			No mitigation as the power line will not be constructed.

b. Operational phase

Table 24 Mitigation measures to mitigate identified impacts during the operational phase (Social Impacts).

Impact	Location of Power Line			
	Areas within 1 km of farmhouses, towns or residential areas	**Areas within 1 km of guesthouses or areas of social, cultural or tourism importance**	**Open/Farmland**	**"No-go" alternative**
Positive psychological effect	• As far as possible employ local personnel from the surrounding areas. • Do not place the power line where it could negatively impact existing industries.			No mitigation as there will be no impact and the environment will remain unaffected
Loss of sense of place	• Avoid placing the power line within or near No-Go areas. Do not locate the power line near farmsteads and residential areas, within 500m, and guesthouses and tourist attractions, within 1 km. Based on consultation with individual landowners, distances could be reduced. • Avoid placing the power line near areas or sites of cultural/heritage significance. • The route of power line should place the line in such as position that potential for visual intrusion is minimised. • Shiny sections on structures should be painted a mat non-reflective colour. • Over time weathering will cause pylons to fade. As such, painting shiny structures a mat non-reflective colour should not be necessary.			No mitigation as there will be no impact and the environment will remain unaffected
Decreased tourism potential for the surrounding area	• Avoid placing the power line within or near No-Go areas. Do not locate the power line near farmsteads and residential areas, within 500m, and guesthouses and tourist attractions, within 1 km. Based on consultation with individual landowners, distances could be reduced. • Avoid placing the power line near areas or sites of cultural/heritage significance. • Route of power line should place the line in such as position that potential for visual intrusion is minimised. • Over time weathering will cause pylons to fade. As such, painting shiny structures a mat non-reflective colour should not be necessary.			No mitigation as there will be no impact and the environment will remain unaffected.
Benefits for landowners receiving compensation	Where the power line passes through communal ground make meaningful compensation that will aid in the long-term upliftment of communities, e.g. through the provision of infrastructure or facilities.			No mitigation as the power line will not be constructed.
Economic knock-on effects	Do not place the power line near sensitive receptors, such as guesthouses that could be negatively affected			No mitigation as the only alternative is to construct the power line.
Detracting from important cultural/heritage areas	• Avoid placing the power line within or near No-Go areas. Do not locate the power line near farmsteads and residential areas, within 500m, and guesthouses and tourist attractions, within 1 km. Based on consultation with individual landowners, distances could be reduced. • Avoid placing the power line near areas or sites of cultural/heritage significance. • Route of power line should place the line in such as position that potential for visual intrusion is minimised. • Over time weathering will cause pylons to fade. As such, painting shiny structures a mat non-reflective colour should not be necessary.			No mitigation as there will be no impact and the environment will remain unaffected.
Improved quality of life for impoverished communities	Where the power line passes through communal ground make meaningful compensation that will aid in the long term upliftment			No mitigation as the power line will not be

Impact	Location of Power Line			
	Areas within 1 km of farmhouses, towns or residential areas	**Areas within 1 km of guesthouses or areas of social, cultural or tourism importance**	**Open/Farmland**	**"No-go" alternative**
	of communities, e.g. through the provision of infrastructure or facilities.			constructed.
Increased infrastructure capacity for Independent Power Producers (IPPs)	N/A			No mitigation as the only alternative is to construct the power line.
Sterilisation of minerals	Consult with the relevant authorities with regards to mineral deposits and mining rights and ensure the line does not cross areas of known mineral deposits and/or where existing mining rights exist. This should be explored in detail once the final route is chosen.			No mitigation as the only option is to build the power line.

10.2. Economic Mitigation

a. Planning and design phase

Table 25 Mitigation measures to mitigate identified impacts during the planning and design phase (Economic Impacts).

Impact	Location of Power Line			
	Alternative 1	**Alternative 4**	**Alternative 5**	**"No-go" alternative**
Job creation and skills development	Prioritise the communities of Buffelsrivier and Kommagas for construction phase employment and upskilling initiatives.	Prioritise the communities of Bulletrap and Nababeep for construction phase employment and upskilling initiatives.	Prioritise the communities of Carolusberg and Concordia for construction phase employment and upskilling initiatives.	N/A
Direct and indirect economic impacts	This alternative alignment is screened by topography as far as possible from the existing accommodation establishments located along this corridor.	Prioritise the economically marginalised communities in proximity to these corridors.		N/A
Mining	Avoid the existing operations in proximity to Nama substation (explore line evacuation options to the north of Gromis and existing mine infrastructure. East of Springbok toward Aggeneys the routing should stay as close as possible to existing powerline and/or road or reserves (or variations thereof that stay closer to the N14).	None put forward or applicable.	As per Alternative 1.	None put forward or applicable.
Agriculture	Avoid the cropped areas as far as possible through careful route selection and pylon placement that will not impact on cultivated land.	None put forward or likely to be required.	Route powerline as far away as possible from these farmsteads.	N/A
Tourism and Heritage	None put forward other than avoidance of Alternative 1 between Gromis and Nama substations as a viable alternative for tourism related impacts.	None put forward.	None put forward.	N/A
Property value and land use	Ensure that the line is as least disruptive on scenic panoramas in the vicinity of the Naries Namakwa retreat. The "pinch point" on Alternative 1's western approach to Springbok must be carefully sighted to avoid	None put forward.	Ensure the powerline route is kept as far removed as possible from homesteads I this area.	N/A

Impact	Location of Power Line			
	Alternative 1	**Alternative 4**	**Alternative 5**	**"No-go" alternative**
	residential areas and housing if this is selected as the preferred option by Eskom.			
Physical resettlement or economic displacement	Avoid unnecessary sterilisation of residential land parcels. Explore alternative horizontal alignment within this corridor further northwards.	None put forward.	None put forward.	N/A

b. Construction phase

Table 26 Mitigation measures to mitigate identified impacts during the construction phase (Economic Impacts).

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
Job creation and skills development	Prioritise economically marginalised communities for employment.		
Direct and indirect economic impacts	None put forward.		
Mining	Sufficient engagement and liaison between key actors will ensure this can be manged.	None put forward.	
Agriculture	Ensure construction activity is timed to avoid disturbances to standing crops and time construction in a manner that avoids peak season or harvesting activities. Adhere to the management principles and mitigation measures contained in the Generic EMPr.	None put forward.	
Tourism and Heritage	Adhere to the management principles and mitigation measures contained in the Generic EMPr.		
Property value and land use	Ensure construction activity remains within the construction servitude and does not affect neighbouring land portions and/or landowner activities.		
Physical resettlement or economic displacement	Ensure final route design is cognizant of sensitives identified in the BAR and land acquisition processes.		

c. Operational phase

Table 27 Mitigation measures to mitigate identified impacts during the operational phase (Economic Impacts).

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
Job creation and skills development	None put forward.		
Direct and indirect economic impacts	Renewable energy sector development in the study area will be a highly significant project induced cumulative benefit to the regional economy.		
Mining	None put forward.		Discard this alternative if subsequent investigations to this report indicate there are highly viable deposits along this routing that are likely to become operational mines.
Agriculture	None put forward.		
Tourism and Heritage	None put forward.		
Property value and land use	None put forward.		
Physical resettlement or economic displacement	None put forward.		

10.3. Visual Mitigation

Table 28 Mitigation measures to mitigate identified impacts during the construction phase (Visual Impact).

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
Impact on the sense of place for surrounding users.	• All areas disturbed by construction activities must be subject to landscaping and rehabilitation; • All spoil and waste will be disposed to a registered waste site and certificates of disposal provided; • All slopes in excess of 2% (1:50) must be contoured in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983; • All slopes in excess of 12% (1:8.3) must be terraced in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983; • Berms that have been created should have a slope of 1:4 and be replanted with indigenous species and grasses; • The project must be timed so that rehabilitation can take place at the optimal time for vegetation establishment; • Access roads are to be kept clean; • Site offices and structures should be limited to one location and carefully situated to reduce visual intrusions. Roofs should be grey and non-reflective; • Construction camps as well as development areas should be screened with netting; • Lights within the construction camp should face directly down (angle of 90˚); • Vegetation clearance should be limited to the development footprint only; • Litter should be strictly controlled, as the spread thereof through wind could have a very negative visual impact; • Avoid shiny materials in structures. Where possible shiny metal structures should be darkened or screened to prevent glare; and, • Mitigation of visual impacts associated with the construction phase would entail proper planning, management and rehabilitation of the construction site. Mitigation measures include the following: o Reduce the time of construction through careful planning of logistics and ensure the productive implementation of resources; o Limit disturbance of the environment to the development footprint; o Limit construction activities to business hours (07:00 – 17:00); • The use of different pylon types should be avoided, where possible, particularly where these are in visual proximity to each other; • Maintenance roads required for transmission lines should use existing access roads or farm roads as far as possible; • Signage, if essential, should be discrete and confined to entrance gates. No corporate or advertising signage should be permitted.		

Table 29 Mitigation measures to mitigate identified impacts during the operational phase (Visual Impact).

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
Impact on the sense of place for surrounding users.	There are no special visual management actions that are applicable during the operational phase once the transmission infrastructure has been installed, except for the standard maintenance of revegetation work as part of an Environmental Management Programme (EMPr).		

10.4. Heritage Mitigation

a. Construction phase

Table 30 Mitigation measures to mitigate identified impacts during the construction phase (Heritage Impacts).

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
Destruction of Heritage Resources	• The no-go areas identified must be adhered to		
Impacts on palaeontology	• A Chance Fossil Finds Procedure must be implemented (see Appendix 1B) • Although all possible care has been taken to identify sites of cultural importance during the investigation of the study area, it is always possible that hidden or subsurface sites could be overlooked during the assessment. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted. • If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. A professional archaeologist must be contracted as soon as possible to inspect the findings. A Phase 2 rescue excavation operation may be required subject to permits issued by SAHRA.		

b. Operational phase

Table 31 Mitigation measures to mitigate identified impacts during the operational phase (Heritage Impacts).

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
Impact on cultural landscape	Alternative 1 is the preferred alternative as infrastructure is concentrated. The no-go areas identified must be adhered to, and the sites identified in this report are not impacted by the final pylon footprints.	The no-go areas identified must be adhered to, and the sites identified in this report are not impacted by the final pylon footprints.	

10.5. Agricultural Mitigation

The highest risks are associated with construction. Therefore, runoff control and safely disseminating run-off water from all hardened surfaces is very important. The proper rehabilitation of construction sites post construction is crucial.

Table 32 Mitigation measures to mitigate identified impacts during the planning, design and construction phase (Agriculture Impacts).

Impact	Location of Power Line			
	Leptosols in mountainous areas	**Deep soil**	**All alternative corridors**	**Sensitivity class 'medium'[4]**
Loss of agricultural land use, caused by direct occupation of land by footprint of power line infrastructure	Avoid current cropped land, impact on grazing will be minimal.			
Loss of agricultural land use due to fragmentation of agricultural land.	Cropped lands are already fragmented, therefore it can be avoided.			
Disturbance to crop spraying by aircraft over land occupied by power lines	Limited cropped lands do not justify crop spraying.			

[4] 'Medium' sensitivity class as identified in the Agricultural oil Sensitivity map of Appendix 3.4. – Figure 8

Impact	Location of Power Line			
	Leptosols in mountainous areas	Deep soil	All alternative corridors	Sensitivity class 'medium'[4]
Soil Erosion caused by alteration of run-off characteristics due to vegetation removal and surface disturbance and compaction, particularly on access roads and construction camps.	Control runoff and reduce areas were water accumulates at high velocity			
Loss of topsoil due to poor topsoil management	Topsoil must be stripped and stockpiled for rehabilitation			
Groundwater contamination	Good waste management practices			
Stream contamination	Good waste management practices			
Mitigation measures from Generic EMPr (RSA, 2019)	• Plan the fine-scale positioning of pylons, access roads and construction camps to have minimal disturbance on agricultural activities and agricultural land. Pylons should be positioned on existing boundaries or edges of agricultural units of land wherever possible, so as not to interfere with agricultural activities within a unit; • Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion. Soil surface stabilising measures must be used if necessary, on all areas that are highly susceptible to erosion. Plan the fine-scale positioning of pylons, access roads and construction camps to avoid land that has contour banks. If any contour banks are disturbed, fully restore their integrity and that of the run-off system of which they are a part, after disturbance. The effectiveness of the run-off control system and the occurrence of any erosion on site or downstream must be monitored. Corrective action must be implemented to the run-off control system in the event of any erosion occurring; • Restrict all vehicle traffic within the footprint of disturbance and control dust during construction; if an activity will mechanically disturb below surface in any way, then any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled for re-spreading during rehabilitation. Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them. Dispose of all subsurface spoils from excavations where they will not impact on undisturbed land. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. Erosion must be controlled where necessary on newly top soiled areas, which are likely to be susceptible to erosion.			

10.6. Geo-hydrological Mitigation

Table 33 Mitigation measures to mitigate identified impacts during the planning, design and construction phase (Geo-hydrological Impacts).

Impact	Location of Power Line		
	Alternative 1	Alternative 4	Alternative 5
Environmental awareness training	Conduct environmental awareness training prior to commencement of the activities. All staff should be aware of the conditions and controls linked to the EA and within the EMPr and made aware of their individual roles and responsibilities in achieving compliance with the EA and EMPr. Environmental awareness training must include as a minimum of the following: a) Description of significant environmental impacts, actual or potential, related to their work activities. b) Mitigation measures to be implemented when carrying out specific activities. c) Emergency preparedness and response procedures.		

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
	d) Emergency procedures. e) Procedures to be followed when working near or within sensitive areas. f) Wastewater management procedures. g) Water usage and conservation. h) Solid waste management procedures. i) Sanitation procedures.		
Site establishment development	Specific footprints, layout and extensions of infrastructure should aim to avoid environmentally sensitive areas. The layout of the following infrastructure should be known where applicable. Offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous materials storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas , cooking and ablution facilities, waste and wastewater management. This will help determine and ensure that the site does not impact on sensitive areas identified in the environmental assessment or site walk through. Sites must be located where possible on previously disturbed areas and/or elevated areas, away from watercourses.		
Water Supply Management	The Contractor must ensure the following: • The vehicle abstracting water from a river does not enter or cross it and does not operate from within the river. • No damage occurs to the river bed or banks and that the abstraction of water does not entail stream diversion activities. • All reasonable measures to limit pollution or sedimentation of the downstream watercourse are implemented. Ensure water conservation is being practiced by: • Minimising water use during cleaning of equipment; • Undertaking regular audits of water systems; and • Including a discussion on water usage and conservation during environmental awareness training. • The use of grey water is encouraged where possible.		
Storm and waste water management	Runoff from cement/ concrete batching areas must be strictly controlled, and contaminated water must be collected, stored and either treated or disposed of off-site, at a location approved by the project manager; All spillage of oil onto concrete surfaces must be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility. Natural storm water runoff not contaminated during the development and clean water can be discharged directly to watercourses and water bodies, subject to the Project Manager's approval and support by the ECO. Water that has been contaminated with suspended solids, such as soils and silt, may be released into watercourses or water bodies only once all suspended solids have been removed from the water by settling out these solids in settlement ponds. The release of settled water back into the environment must be subject to the Project Manager's approval and support by the ECO.		
Solid and hazardous waste management	All measures regarding waste management must be undertaken using an integrated waste management approach. Sufficient, covered waste collection bins (scavenger and weatherproof) must be provided. A suitably positioned and clearly demarcated waste collection site must be identified and provided. The waste collection site must be maintained in a clean and orderly manner. Waste must be segregated into separate bins and clearly marked for each waste type for recycling and safe disposal. Staff must be trained in waste segregation. Bins must be emptied regularly. General waste produced onsite must be disposed of at a registered waste disposal sites/ recycling company. Hazardous waste must be disposed of at a registered waste disposal site. Certificates of safe disposal for general, hazardous and recycled waste must be maintained.		
Protection of watercourses and estuaries	All watercourses must be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and contaminated water or organic material resulting from the contractor's activities. In the event of a spill, prompt action must be taken to clear the polluted or affected areas. Where possible, no development equipment must traverse any seasonal or permanent wetland. No return flow into the estuaries must be allowed and no disturbance of the estuarine functional zone should occur. Development of permanent watercourse or estuary crossing must only be undertaken where no alternative access to tower position is available. There must not be any impact on the long term morphological dynamics of watercourses or estuaries. Existing crossing points must be favoured over the creation of new crossings (including temporary access). When working in or near any watercourse or estuary, the following environmental controls and consideration must be taken:		

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
	a) Water levels during the period of construction; No altering of the bed, banks, course or characteristics of a watercourse. b) During the execution of the works, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g. including ensuring that construction equipment is well maintained. c) Where earthwork is being undertaken in close proximity to any watercourse, slopes must be stabilised using suitable materials, i.e. sandbags or geotextile fabric, to prevent sand and rock from entering the channel. d) Appropriate rehabilitation and re-vegetation measures for the watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows.		
Vegetation clearing	Indigenous vegetation which does not interfere with the development must be left undisturbed Rivers and watercourses must be kept clear of felled trees, vegetation cuttings and debris. Only a registered pest control operator may apply herbicides on a commercial basis and commercial application must be carried out under the supervision of a registered pest control operator, supervision of a registered pest control operator or is appropriately trained. No herbicides must be used in estuaries.		
Sanitation	Mobile chemical toilets are installed onsite if no other ablution facilities are available. The use of ablution facilities and or mobile toilets must be used at all times and no indiscriminate use of the veld for the purposes of ablutions must be permitted under any circumstances. Where mobile chemical toilets are required, the following must be ensured: a) Toilets are located no closer than 100 m to any watercourse or water body. b) Toilets are secured to the ground to prevent them from toppling due to wind or any other cause. c) No spillage occurs when the toilets are cleaned or emptied and the contents are managed in accordance with the EMPr. d) Toilets are emptied before long weekends and workers holidays, and must be locked after working hours. e) Toilets are serviced regularly and the ECO must inspect toilets to ensure compliance to health standards. f) A copy of the waste disposal certificates must be maintained.		
Hazardous substances	The use and storage of hazardous substances are to be minimised and non-hazardous and non-toxic alternatives substituted where possible. All hazardous substances must be stored in suitable containers. Containers must be clearly marked to indicate contents, quantities and safety requirements. All storage areas must be bunded. The bunded area must be of sufficient capacity to contain a spill / leak from the stored containers. Bunded areas are to be suitably lined with a SABS approved liner. An Alphabetical Hazardous Chemical Substance (HCS) control sheet must be drawn up and kept up to date on a continuous basis. Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. The Contractor must ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers; The tanks/ bowsers must be situated on a smooth impermeable surface (concrete) with a permanent bund. The floor of the bund must be sloped, draining to an oil separator. Provision must be made for refueling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray must be used to ensure small spills are contained. All empty externally dirty drums must be stored on a drip tray or within a bunded area. No unauthorised access into the hazardous substances storage areas must be permitted. An appropriately sized spill kit kept onsite relevant to the scale of the activity/s involving the use of hazardous substance must be available at all times. The responsible operator must have the required training to make use of the spill kit in emergency situations.		
Workshop, equipment maintenance and storage	Where possible and practical all maintenance of vehicles and equipment must take place in the workshop area. During servicing of vehicles or equipment, especially where emergency repairs are effected outside the workshop area, a suitable drip tray must be used to prevent spills onto the soil. Leaking equipment must be repaired immediately or be removed from site to facilitate repair. Workshop areas must be monitored for oil and fuel spills. Appropriately sized spill kit kept onsite relevant to the scale of the activity taking place must be available. The workshop area must have a bunded concrete slab that is sloped to facilitate runoff into a collection sump or suitable oil/ water separator where maintenance work on vehicles and equipment can be performed. Water drainage from the workshop must be contained and managed in accordance with Storm and waste water management.		
Batching plants	Concrete mixing must be carried out on an impermeable surface. Batching plants areas must be fitted with a containment facility for the collection of cement laden water. Dirty water from the batching		

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
	plant must be contained to prevent soil and groundwater contamination. Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains. A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted. Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licenced disposal facility. Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site. Sand and aggregates containing cement must be kept damp to prevent the generation of dust. Any excess sand, stone and cement must be removed or reused from site on completion of construction period and disposed at a registered disposal facility.		
Blasting	Any blasting activity must be conducted by a suitably licensed blasting contractor. Notification of surrounding landowners, emergency services site personnel of blasting activity 24 hours prior to such activity should taking place on Site. Blasting should not occur within a 50m buffer of effective blast range based on variable geotechnical conditions to preserve borehole casing stability.		
Stockpiling and stockpile areas	All material that is excavated during the project development phase (either during piling (if required) or earthworks) must be stored appropriately on site in order to minimise impacts to watercourses, and water bodies. All stockpiled material must be maintained and kept clear of weeds and alien vegetation growth by undertaking regular weeding and control methods. Topsoil stockpiles must not exceed 2 m in height. During periods of strong winds and heavy rain, the stockpiles must be covered with appropriate material (e.g. cloth, tarpaulin etc.). Where possible, sandbags (or similar) must be placed at the bases of the stockpiled material in order to prevent erosion of the material.		
Steelwork Assembly and Erection	During assembly, care must be taken to ensure that no wasted/unused materials are left on site e.g. bolts and nuts. Emergency repairs due to breakages of equipment must be managed in accordance with Workshop, equipment maintenance and storage.		
Cabling and Stringing	Residual solid waste (off cuts etc.) shall be recycled or disposed of in accordance with Solid waste and hazardous Management. Management of equipment used for installation shall be conducted in accordance with Workshop, equipment maintenance and storage. Management of hazardous substances and any associated spills shall be conducted in accordance with Hazardous substances.		
Temporary closure of site	Bunds must be emptied (where applicable) and need to be undertaken in accordance with the impact management actions included in Hazardous substances and Workshop, equipment maintenance and storage. Hazardous storage areas must be well ventilated. Security personnel must be briefed and have the facilities to contact or be contacted by relevant management and emergency personnel. Cement and materials stores must have been secured. Toilets must have been emptied and secured. Refuse bins must have been emptied and secured. Drip trays must have been emptied and secured.		
Landscaping and rehabilitation	All spoil and waste must be disposed of to a registered waste site. Stockpiled topsoil must be used for rehabilitation (refer to Stockpiling and stockpiled areas). Stockpiled topsoil must be evenly spread so as to facilitate seeding and minimise loss of soil due to erosion. The rehabilitation must be timed so that rehabilitation can take place at the optimal time for vegetation establishment. Where impacted through construction related activity, all sloped areas must be stabilised to ensure proper habitation is effected and erosion is controlled. Sloped areas stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly.		

10.7. Botanical and Freshwater Mitigation

a. Construction phase

Table 34 Mitigation measures to mitigate identified impacts during the construction phase (Botanical and Freshwater Impacts).

Impact	Location of Power Line
	Applicable to all alternatives
Vegetation destruction, habitat loss and impact on plant species of conservation concern	• Minimise impact to the environment through the planned and restricted movement of vehicles on site. • Avoid habitat loss and impact on sensitive vegetation and habitat types. • Avoid loss of Species of Conservation Concern (SCC) from development footprints. • It is advised to use existing access roads as far as possible or to limit the distance and width of new access roads as much a practically possible. Existing roads (from National road network) and

Impact	Location of Power Line Applicable to all alternatives
	existing service roads from Eskom lines and farm roads (most farm boundaries/fences have tracks on either side) are preferred. • Areas where there are still remnants of untransformed vegetation are seen as undesirable. • Development footprint placing should avoid natural vegetation remnants as far as possible. • Vegetation clearing is restricted to the authorised development footprint of the proposed infrastructure. • The development alternatives/pylon placements with the highest incidence of Redlist status species should be avoided and clearing should be avoided in ecosystems with a threatened status. If constructed in a sensitive manner, the impact of such power lines can be kept to a fairly low level and consists of a temporary construction track (that may be used as service roads occasionally during operation) and some disturbance around the foundations of the pylons. In most instances it is not necessary to establish a corridor of cleared vegetation for the power line within this study area.
Loss of riparian- and wetland habitat and vegetation	• Limit environmental degradation as a result of the survey and pegging operations. • Limit environmental degradation as a result of assembly and erecting of towers. • Limit environmental degradation as a result of stringing. • Limit placement to existing degraded/disturbed areas and avoid placing towers within watercourses. • Minimise impact to the environment through the planned and restricted movement of vehicles on site. • It is advised to use existing access roads as far as possible or to limit the distance and width of new access roads as much a practically possible. Existing roads (from National road network) and existing service roads from Eskom lines and farm roads (most farm boundaries/fences have tracks on either side) are preferred. • Watercourses and their 32m buffers and vegetation remnants should be avoided where practically possible. • Areas where there are still remnants of untransformed vegetation are seen as undesirable. • Development footprint placing should avoid natural vegetation remnants as far as possible. • Vegetation clearing should be restricted to the authorised development footprint of the proposed infrastructure. • Clearing should be avoided in ecosystems with a threatened status. If constructed in a sensitive manner, the impact of such power lines can be kept to a fairly low level and consists of a temporary construction track (that may be used as service roads occasionally during operation) and some disturbance around the foundations of the pylons. In most instances it is not necessary to establish a corridor of cleared vegetation for the power line in the study area.
Disruption of broad-scale ecological processes and hydrological flow	• Minimise impact to the environment through the planned and restricted movement of vehicles on site. • Limit transformation, loss or fragmentation of rivers and wetlands. • It is advised to use existing access roads as far as possible or to limit the distance and width of new access roads as much a practically possible. Existing roads (from National road network) and existing service roads from Eskom lines and farm roads (most farm boundaries/fences have tracks on either side) are preferred. • Areas where there are still remnants of untransformed vegetation are seen as undesirable. • Critical Biodiversity areas (CBA1, CBA2, ESA) & watercourses and their 32m buffers and vegetation remnants should be avoided where practically possible. • Protect watercourses. • Pollution and contamination or loss and fragmentation of the watercourse environment and erosion should be prevented and avoided. • Limit transformation, loss or fragmentation of rivers and wetlands. • Run-off water, from the construction and development footprint, should avoid as far as practically possible watercourses (rivers, streams and wetlands), and limit impacts on watercourses of ecological importance or that are ecologically sensitive. • A minimum buffer of 32 meter is recommended as no-go areas around watercourses (legislative distance for triggering activities according to listing notices). • Development of permanent watercourse crossings must only be undertaken where no alternative access to tower position is available. • Crossing should be designed and constructed to allow migration and movement of fish.
Compaction of soils and creation of preferential	• Minimise impact to the environment through the planned and restricted movement of vehicles on site.

Impact	Location of Power Line
	Applicable to all alternatives
flow paths within and adjacent to wetland and river habitat	• Avoid steep slopes or uneven terrain, as these areas will have a larger impact such as increased risk of soil erosion due to the cut and fill that is usually required. • Special provision will have to be made in areas with deep, loose sand to ensure that the tracks do not grow wider or become multiple tracks as drivers seek to find easier routes. • It is important that any disturbed areas and roads that will not be used for maintenance during the operational phase should be rehabilitated and monitored.
Soil disturbance, soil compaction and increased erosion	• Reduce erosion and sedimentation as a result of stockpiling. • Impacts on the environment should be minimised during site establishment and the development footprint should be kept to demarcated development area. • Sensitive areas should be avoided where practically possible for stockpiling and stockpile areas. Critical Biodiversity areas (CBA1, CBA2, ESA) & watercourses and their 32m buffers and vegetation remnants should be avoided where practically possible for stockpiling and site establishment. • Location of camps must be within approved area to ensure that the site does not impact on sensitive areas identified in the environmental assessment or site walk through. • Sites must be located where possible on previously disturbed areas. • Areas outside development footprint should be considered no-go areas.
Pollution of aquatic ecosystems	• Minimise impact to the environment through the planned and restricted movement of vehicles on site. • It is advised to use existing access roads as far as possible or to limit the distance and width of new access roads as much a practically possible. Existing roads (from National road network) and existing service roads from Eskom lines and farm roads (most farm boundaries/fences have tracks on either side) are preferred. • Areas where there are still remnants of untransformed vegetation are seen as undesirable. • Impacts to the environment caused by stormwater and wastewater discharges during construction should be avoided. • No untreated storm- and wastewater should be released into the environment. • Run-off water, from the construction and development footprint, should avoid as far as practically possible watercourses (rivers, streams and wetlands), and limit impacts on watercourses of ecological importance or that are ecologically sensitive. • A minimum buffer of 32 meter is recommended as no-go areas around watercourses (legislative distance for triggering activities according to listing notices). • Clean, secure and well maintained toilet facilities should available to all staff in an effort to minimise the risk of disease and impact to the environment. • Soil and surface water contamination should be avoided. • Minimise spillages and contamination of soil and surface water. • Sensitive areas should be avoided. A general minimum buffer of 100m for rivers and streams are recommended, as well as a 500m buffer for wetlands. • Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains.
Impact on protected areas or areas earmarked for protection, Critical Biodiversity Areas and broad-scale ecological processes	• Access to restricted areas should be prevented and the development footprint should be kept to demarcated development area. • No effect on ability to meet conservation targets for unprotected vegetation types. • Vegetation clearing should be restricted to the authorised development footprint of the proposed infrastructure. • Areas with a high incidence of Redlist status species should be avoided and clearing should be avoided in ecosystems with a threatened status. If constructed in a sensitive manner, the impact of such power lines can be kept to a fairly low level and consists of a temporary construction track (that may be used as service roads occasionally during operation) and some disturbance around the foundations of the pylons. In most instances it is not necessary to establish a corridor of cleared vegetation for the power line in the study area. • Critical Biodiversity areas (CBA1, CBA2, ESA) & watercourses and their 32m buffers should be seen as area requiring restricted access. • Areas outside development footprint should be considered no-go areas.
Increased opportunity for alien invasive plant establishment and spread	• Limit environmental degradation as a result of the survey and pegging operations. • Limit environmental degradation as a result of assembly and erecting of towers. • Limit environmental degradation as a result of stringing. • Areas disturbed during the development phase should be returned to a state that approximates the original condition.

Impact	Location of Power Line
	Applicable to all alternatives
	• Indigenous species must be used for rehabilitation planting where it compliments or approximates the original condition. • Areas where there are still remnants of untransformed vegetation are seen as undesirable. • Development footprint placing should avoid natural vegetation remnants as far as possible. • Vegetation clearing should be restricted to the authorised development footprint of the proposed infrastructure. • Limit placement within existing degraded/disturbed areas and avoid placing towers within watercourses or ecosystems with threatened status (protected areas, areas earmarked for protection or CBA1, CBA 2 or ESA areas). • In sensitive areas, tower assembly must take place off-site or away from sensitive positions.

b. Operational phase

Table 35 Mitigation measures to mitigate identified impacts during the operational phase (Botanical and Freshwater Impacts).

Impact	Location of Power Line
	Applicable to all alternatives
Disruption of broad-scale ecological processes and hydrological flow	• Protection of watercourses. • Pollution and contamination or loss and fragmentation of the watercourse environment and erosion should be prevented. • Limit transformation, loss or fragmentation of rivers and wetlands. • Special provision will have to be made in areas with deep, loose sand to ensure that the tracks do not grow wider or become multiple tracks as drivers seek to find easier routes. • A minimum buffer around watercourses of 32 meter is recommended as no-go areas (legislative distance for triggering activities according to listing notices). • Development of permanent watercourse crossings must only be undertaken where no alternative access to tower position is available. • Crossing should be designed and constructed to allow migration and movement of fish.
Vegetation destruction, habitat loss and impact on plant species of conservation concern	• Minimise impact to the environment through the planned and restricted vegetation clearing for servitudes/maintenance roads. • Vegetation clearing should be restricted to the authorised development footprint of the proposed infrastructure. • Only absolute necessary area and amount of vegetation should be cleared to ensure the safe and proper functioning of infrastructure during maintenance activities.
Soil disturbance, soil compaction and increased erosion	• Sensitive areas should be avoided where practically possible. Critical Biodiversity areas (CBA1, CBA2, ESA) & watercourses and their 32m buffers and vegetation remnants should be avoided where practically possible. • Sites must be located where possible on previously disturbed areas or as close as possible to existing disturbances. • Monitor infrastructure during operation for signs of erosions, and implement remediation measures immediately.

10.8. Faunal Mitigation

Table 36 Mitigation measures to mitigate identified impacts during the construction- and operational phase (Avifaunal Impacts).

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
Loss of faunal habitat and ecological structure	• All construction and maintenance activities must be carried out according to the generally accepted environmental best practice and the temporal and spatial footprint of the development must be kept to a minimum. • The boundaries of the development footprint areas are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area.		

Impact	Location of Power Line		
	Alternative 1	**Alternative 4**	**Alternative 5**
	• Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which will affect faunal habitats adjacent to the development area, need to be strictly managed. • Any natural areas beyond the development footprint, which have been affected by the construction activities, must be rehabilitated using indigenous plant species. Rehabilitation of disturbed areas must be carried out immediately after construction has been completed and rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas to approximate the original condition or at least 85% thereof. • Erosion control measures must be implemented in areas sensitive to erosion such as exposed soil, edges of slopes (including trenches cut for construction) etc. These measures include but are not limited to - the use of sand bags, hessian sheets, silt fences and retention or replacement of vegetation; • Education and awareness campaigns on faunal species and their habitat must form part of staff induction procedures to help increase awareness, respect and responsibility towards the environment for all staff and contractors.		
Direct faunal impacts	• Preconstruction walk-trough of the power line and substation sites need to be conducted by a fauna specialist to identify and verify sensitive fauna habitats • No collection, trapping or hunting of fauna is to take place. Access control must be implemented to ensure that no illegal trapping or poaching takes place. • During construction any fauna directly threatened by the activities should be removed to a safe location by the ECO or other suitably qualified person. • No deliberate or intentional killing of fauna is allowed; • No fires should be allowed within the site as there is a risk of runaway veld fires. • Harvesting of firewood or any plant material is prohibited. • No unauthorized persons must be allowed onto the site and site access should be strictly controlled • During the construction phase, workers must be limited to areas under construction and access to the undeveloped areas must be strictly controlled; • All construction vehicles should adhere to a low speed limit (40km/h for cars and 30km/h for trucks) to avoid collisions with susceptible species such as geckos, snakes, tortoises, rabbits and hares. • All personnel must undergo environmental induction with regards to fauna and including awareness about not harming or collecting fauna. • All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.		
Indirect faunal impacts from influx of in Pied Crows	• Pied Crow nesting deterrents must be installed on horizontal and cross beam sections on any self-supporting towers where they occur in shrubland biomes (including treeless habitats) and do not follow existing power line infrastructures. Preconstruction walk-through of the power line sites must be conducted by a faunal specialist to identify towers that would require nesting deterrents based on surrounding habitat and other available nesting sites. • Nesting deterrent measures include but are not limited to the use of nest excluders on horizontal and particularly cross arm sections which are typically preferred by crows. • The design of the anti-climb fence must not offer any suitable sites for nest of crows. This can be done by modifying structures so that they are angled downwards to avoid having horizontal platforms. Anti-climb fences must also be set as low as possible on the towers to discourage nesting by Pied Crows. • Ecological research into the conservation impacts of pied crow is strongly encouraged to better understand the ecosystem-level implications of increased numbers of pied crows in shrubland biomes. Research should also focus on evaluating cost effective mitigation measures for new power line developments.		
Disturbance	• In line with an approved Construction EMPr, strict control must be maintained over all activities during construction. • The ECO must be notified of any Red Data species identified in this report observed to be roosting and/or breeding in the vicinity. • All animal burrows/dens in close proximity to the works areas must be marked as Access restricted areas.		
Cumulative impact on fauna	• All above mentioned recommended mitigation for faunal impacts should be followed to reduce the overall long term impact of this new development.		

Impact	Location of Power Line		
	Alternative 1	Alternative 4	Alternative 5
	• Development must avoid High Sensitivity features of the site. • No interference with livestock must occur without the landowner's written consent and with the landowner or a person representing the landowner being present; • No poaching must be tolerated under any circumstances. All animal burrows/dens in close proximity to the works areas must be marked as Access restricted areas; • In areas where snakes are abundant, snake deterrents to be deployed on the pylons to prevent snakes climbing up, being electrocuted and causing power outages; and • No Threatened or Protected species (ToPs) and/or protected fauna as listed according NEMBA (Act No. 10 of 2004) and relevant provincial ordinances may be removed and/or relocated without appropriate authorisations/permits. • Preconstruction walk-through of the substation and power line sites by a faunal specialist to identify and verify areas of faunal sensitivity. • During construction and decommissioning phases any fauna directly threatened by the activities should be removed to a safe location by the ECO or other suitably qualified person. • The construction sites must be confined to disturbed areas or areas identified with low conservation importance. All construction sites must be demarcated, and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. • No excavated holes or trenches should be left open for extended periods as fauna may fall in and become trapped. Any open trenches should be checked regularly for trapped fauna. • The construction of new servitude roads should be limited. All servitude roads should be monitored for erosion after construction and appropriate action taken to avoid and reduce erosion including the use of runoff management and control features. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. • No unauthorized persons should be allowed onto the site and site access should be strictly controlled • All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes; tortoises and snakes are often persecuted out of fear or superstition. • Mountainous areas, where erosion and degradation are likely to occur, should have careful route planning to avoid sensitive features (such as isolated rocky outcrops) and rugged terrain where possible. • No pylons should be located on or near Wetlands (500m buffer) and Major Rivers (32m buffer) if practically and feasible avoidable.		

10.9. Avifaunal Mitigation

Table 37 Mitigation measures to mitigate identified impacts during the construction- and operational phase (Avifaunal Impacts).

Impact	Location of Power Line		
	Alternative 1	Alternative 4	Alternative 5
Collisions	• Alternative 1 emerged as the alternative with the lowest overall significance point and consequently the lowest collision risk to birds. It is therefore recommended that this corridor is selected. This decision is further substantiated by the powerline sensitive Red Data species habitat preference risk rating analysis (see section 15 of **Appendix 3.7**). • Once the final alignments and tower positions have been selected, the sections of the line that would need the application of Bird Flight Diverters to mitigate for potential collisions should be indicated by the avifaunal specialist. This walk-through exercise should be informed by an analysis of satellite imagery supplemented by on site ground-truthing. • In the case of nocturnal collisions, e.g. flamingos roosting or flying from / to a dam, the recently developed Viper LED bird flight diverter should be employed. • See **Appendix 1A** for the recommended Bird Flight Diverter and spacing. • It is recommended that the tower placement of the new proposed line be staggered in relation to the existing line so as to increase the visibility of the line in an attempt to further mitigate the collision risk posed by the powerline (If Alternative 1 is chosen).		

Impact	Location of Power Line		
	Alternative 1	Alternative 4	Alternative 5
Displacement due to habitat destruction and disturbance	• Restrict the construction activities to the construction footprint area. • Do not allow any access to the remainder of the property during the construction period. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum. • The recommendations of the specialist ecological study must be strictly adhered to, especially as far as rehabilitation of vegetation is concerned. • Prior to construction commencing an inspection, preferably by helicopter if possible, should be conducted in order for the avifaunal specialist to record any large raptor nests on existing transmission lines that could be impacted by the construction of the proposed line. • Should any nests be recorded, it would require management of the potential impacts on the breeding birds once construction commences, which would necessitate the involvement of the avifaunal specialist, and the Environmental Control Officer. An effective communication strategy should be implemented whereby the avifaunal specialist is provided with a construction schedule which will enable them to ascertain when, and where breeding Red Data eagles could be impacted by the construction activities. This could then be addressed through the timing of construction activities during critical periods of the breeding cycle, once it has been established that a particular nest is active.		

10.10. Improving landscape connectivity

Linear developments, such as the existing roads and fence lines present barriers to movement to certain species (C. Geldenhuys, pers. comm.) and the additional power line could potentially impact on broad scale ecological processes, which implies connectivity in the landscape (see Section 8.6. and Section 9.1.6. above).

During the Public Participation engagement Period with Conservation Stakeholders (Appendix 4), it was suggested to improve or facilitate general landscape connectivity along the N14 (with particular focus along the Goegap Nature Reserve). This could be done by utilizing the large storm water drainage tunnels underneath the tarred road. The culverts will act as connecting corridors between the landscape to the north and south of the road. This could allow small to medium sized mammal and reptile species to safely cross between the areas.

The practical implications and feasibility of using the stormwater culverts for landscape connectivity along the N14 (possibly, but not limited to where the power line corridor overlaps the Goegap Nature Reserve), will have to be negotiated with SANRAL and discussed further with Conservation Authorities. This could be done during the land-negotiation phase.

11. MONITORING

To ensure the continuous protection of the environment during all project phases it is necessary to implement monitoring as part of the EMPr. Monitoring will aid to assess the accuracy of identified impacts, indicate the efficiency of suggested mitigation measures and assist to make the necessary changes to the EMPr needed. Each specialists suggested monitoring requirements related to their respective fields and is summarised in the table below. It is recommended that these monitoring requirements be included in the EMPr of the proposed project in the BA phase.

Table 38 Suggested monitoring requirements that should be incorporated into the EMPr for implementation of the proposed project.

11.1. Socio-Economic Monitoring
11.1.1. **Social Monitoring**
None suggested at this level of study at this time. During the BA phase monitoring requirements could be suggested for inclusion. It must be ensured that the suggested mitigation measures (**Section 11**) are implemented during all project phases through the means of internal and/or external compliance monitoring.
11.1.2. **Economic Monitoring**
None suggested at this level of study at this time. During the BA phase monitoring requirements could be suggested for inclusion. It must be ensured that the suggested mitigation measures (**Section 11**) are implemented during all project phases through the means of internal and/or external compliance monitoring.
11.2. Visual Monitoring
None suggested at this level of study at this time. During the BA phase monitoring requirements could be suggested for inclusion. It must be ensured that the suggested mitigation measures (**Section 11**) are implemented during all project phases through the means of internal and/or external compliance monitoring.
11.3. Heritage Monitoring
Monitoring Programme for Palaeontology – to commence once the excavations for power lines and access roads begin. 1. The following procedure is only required if fossils are seen on the surface and when excavations commence. 2. When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone, coal) should be put aside in a suitably protected place. This way the excavation activities will not be interrupted. 3. Photographs of similar fossil plants must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones. This information will be built into the EMP's training and awareness plan and procedures. 4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment. 5. If there is any possible fossil material found by the developer/environmental officer/employees then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible. 6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits. 7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils. 8. If no fossils are found and the excavations have finished then no further monitoring is required.
11.4. Agricultural Monitoring
The highest risks are associated with construction. Therefore, runoff control and safely dissemination run-off water from all hardened surfaces is very important. The proper rehabilitation of construction sites post construction. The effectiveness of the run-off control system and the occurrence of any erosion on site or downstream must be monitored. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.
11.5. Geo-hydrological Monitoring
None suggested at this level of study at this time. During the BA phase monitoring requirements could be suggested for inclusion. It must be ensured that the suggested mitigation measures (**Section 11**) are implemented during all project phases through the means of internal and/or external compliance monitoring.
11.6. Botanical and Freshwater Monitoring

- Planning stage: avoid high-threat status ecosystems, as well as flora species of conservation (SCC). This should be done by conducting more detailed field verification and site walkthroughs to determine distribution range or known occurrences of these species. The route alignment should allow for flexibility in determining the final route and pylon placement to avoid locally sensitive features and populations. Should sections of the planned route transect the known locations or distribution of an SCC, a taxon-specific specialist should be appointed to confirm the sensitivity and assess the significance of potential impacts on that SCC. The impact assessment process must prove to the relevant competent authority that the proposed development will not have an unacceptable negative impact on SCC populations, both locally and regionally. Any identified impacts should be avoided or mitigated. All mitigation measures from the specialist study to be incorporated into the EMPr. A South African Council for Natural Scientific Professions (SACNASP) accredited botanist must conduct the site verification in accordance with the NEMA regulations.
- Pre-construction: A walk-through and on-site verification, by a SACNASP accredited in the appropriate field, of the final power line route is mandatory to identify any watercourses and features that should be avoided or buffered from impact, and to identify and locate any plant SCC that should be subject to search and rescue prior to construction.
- Pre-construction: The final power line route and pylon placement should be verified in the field by the appropriate accredited specialists and at the appropriate time of year. In the winter rainfall areas, all fieldwork for flora should take place from late July through to mid-September depending on the exact timing of rainfall. In the summer rainfall areas, fieldwork should take place following good rainfall and growth of the vegetation. In most areas this is usually late summer to early autumn (February to April).
- Pre-construction: Where high sensitivity areas cannot be avoided and there is significant habitat loss in these areas, an offset study should be conducted to ascertain whether an offset is an appropriate mechanism to offset the impact on the high sensitivity area. This should include an identification of offset receiving areas as well as an estimate of the required extent of the offset and the degree to which the offset would be able to compensate for the assessed impacts.
- Construction & Operation: The successful establishment and persistence of plant species of high conservation concern translocated during the search and rescue should be monitored for at least five years after construction is completed. An appropriate frequency would be a year after translocation and every second year thereafter.
- Operation: Management of alien invasive species within the powerline corridor during operation requires chemical stump treatment and germination control or with methods appropriate to the invasive species.

11.7. Faunal Monitoring

- An alien plant monitoring and eradication program should be in place to prevent alien plant proliferation and invasion. The program should continue until disturbed areas have recovered and properly stabilized.
- All servitude roads should be monitored for erosion after construction and appropriate action taken to avoid and reduce erosion including the use of runoff management and control features.
- Rehabilitation of disturbed areas must be carried out immediately after construction has been completed and rehabilitated areas must be monitored to ensure the establishment of re-vegetated areas to approximate the original condition or at least 85% thereof.
- An environmental control officer should be appointed by Eskom to monitor impacts, and mitigation management activities, report on non-compliance to relevant contractors, and to oversee implementation of recommended actions. Mitigation measures are also related to the design of the towers used and avoiding the placement of towers on sensitive features.

11.8. Avifaunal Monitoring

It is recommended that quarterly carcass inspections are conducted along the entire line to establish if there are any collision hot-spots that need to be marked with Bird Flappers or BFDs, and to assess the efficacy of the Bird Flappers or BFDs already applied to selected sections of the line. Scavenger removal trials has established that large carcasses in the Karoo are still detectable up to three months after the collision event.

12.ALIGNMENT WITH SPATIAL PLANNING GUIDELINES

Specialist studies used the results from the National Screening Tool as a point of departure during the desktop studies. The impact assessments were also informed by the two previous Strategic Environmental Assessments done previously for the study area and of similar development types (Department of Environmental Affairs, 2015, 2016). Most studies used the Northern Cape CBA map to identify sensitive features, compare alternatives, identify potential impacts and rate their significance. The Provincial CBA map captures the principals of the key strategies and interventions recommended in the Northern Cape Spatial Development Framework [SDF] (Northern Cape Province, 2019). The Provincial SDF aims that spatial planning categories A & B: Core and Buffer Areas of the Natural Environment conserve existing ecological corridors and consolidate and rehabilitate any remnants of corridors that link ecosystems, secure additional potential areas that will aid in conservation targets and establish a system of protected areas. The table below summarises how each specialist study aligns with the most relevant spatial planning guidelines.

Table 39 Summary how each specialist study aligns with the most relevant spatial planning guidelines.

12.1. Socio-Economic
12.1.1. **Social**
This study did a specific review of applicable planning and policy documents. The reader is referred to the relevant section of the study (Section 2 of Appendix 3.1.1.). The reviewed documents informed the impact identification, rating of their significance and recommendation of suitable mitigation measures.
12.1.2. **Economic**
This study did a specific review of applicable planning and policy documents. The reader is referred to the relevant section of the study (Section 2 of Appendix 3.1.2.). The reviewed documents informed the impact identification, rating of their significance and recommendation of suitable mitigation measures.
12.2. Visual
The study used the results from the National Screening Tool as a point of departure during the desktop study. The impact assessment was informed by the two previous Strategic Environmental Assessments done previously for the study area and of similar development types (Department of Environmental Affairs, 2015, 2016). The Northern Cape CBA map was used to identify sensitive features, compare alternatives, identify potential impacts and rate their significance. The Provincial CBA map captures the principals of the key strategies and interventions recommended in the Northern Cape Spatial Development Framework [SDF] (Northern Cape Province, 2019). The Provincial SDF aims that spatial planning categories A & B: Core and Buffer Areas of the Natural Environment conserve existing ecological corridors and consolidate and rehabilitate any remnants of corridors that link ecosystems, secure additional potential areas that will aid in conservation targets and establish a system of protected areas.
12.3. Heritage
The study used the results from the National Screening Tool as a point of departure during the desktop study. The impact assessment was informed by the two previous Strategic Environmental Assessments done previously for the study area and of similar development types (Department of Environmental Affairs, 2015, 2016).
12.4. Agricultural
The study used the results from the National Screening Tool as a point of departure during the desktop study. The impact assessment was informed by the two previous Strategic Environmental Assessments done previously for the study area and of similar development types (Department of Environmental Affairs, 2015, 2016).
12.5. Geo-hydrological
The study used the results from the National Screening Tool as a point of departure during the desktop study. The impact assessment was informed by the two previous Strategic Environmental Assessments done previously for the study area and of similar development types (Department of Environmental Affairs, 2015, 2016).
12.6. Botanical and Freshwater
The study used the results from the National Screening Tool as a point of departure during the desktop study. The impact assessment was informed by the two previous Strategic Environmental Assessments done previously for the study area and of similar development types (Department of Environmental Affairs, 2015, 2016). The Northern Cape CBA map was used to identify sensitive features, compare alternatives, identify potential impacts and rate their significance. The Provincial CBA map captures the principals of the key strategies and interventions recommended in the Northern Cape Spatial Development Framework [SDF] (Northern Cape Province, 2019). The Provincial SDF aims that

spatial planning categories A & B: Core and Buffer Areas of the Natural Environment conserve existing ecological corridors and consolidate and rehabilitate any remnants of corridors that link ecosystems, secure additional potential areas that will aid in conservation targets and establish a system of protected areas.

12.7. Faunal

Power line infrastructures and their associated development corridors have ecological footprints on natural resources and sensitive ecological systems, however the imposed load of this footprint is relatively small provided that activity is restricted to demarcated zones. The National Screening Tool of the Department of Environmental Affairs was used to assess and visualize the distribution of environmental sensitivities for terrestrial biodiversity. Impact of the development on these sensitive features are of potential concern, especially relating to CBA1 and Protected Areas. The tool integrates multiple input features and maximum score approach is used for any combination of features such that only the highest sensitivity of all input features is reflected in the output summary. The tool found multiple high sensitive features on the overall site and traversing sensitive features is unavoidable. This is particularly true for Alternative 1. But by selecting the shortest route yet avoiding the highest sensitive features (i.e. Protected Areas) the overall route impacts are minimised. This is the globally accepted best approach to minimize overall impacts of powerline infrastructures. Additionally, the sensitivity map is at a relatively coarse scale and sensitive features are likely avoidable by the development footprint with ground truthing.

12.8. Avifaunal

The expansion of electricity grid infrastructure in the Northern Cape Province is being accelerated due to the expansion of renewable energy facilities – especially solar and wind energy facilities that are being constructed (in excess of 15 renewable energy developments with an approved Environmental Authorisation or applications under consideration are located within 30 km of the proposed route alternatives – DEA national screening tool results). It is therefore inevitable that additional powerlines would be required to evacuate the generated electricity and feed that into the existing grid and to expand the existing grid infrastructure. It is known that electricity grid infrastructure poses significant risks to Red Data birds occurring in the study area (Department of Environmental Affairs, 2015).

The cumulative impact of transmission lines in the Karoo and Northern Cape as far as collision mortality of large terrestrial species is concerned is alarming, and potentially catastrophic as far as Ludwig's Bustard is concerned, with an estimated 41% of the population being killed annually, with Kori Bustards also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). The addition of another transmission line will potentially aggravate the situation further. Ludwig's Bustard migratory movements are along a broad east-west axis, which is a mitigating factor to some extent as the line also follows a broad east-west axis, and does not cut diagonally across the general flight path of this species when doing long distance migratory flights. However, research has shown that the highest collision risk occurs when birds are resident in an area between migratory movements, presumably because they fly higher during migratory flights.

13.RECOMMENDATIONS

All specialist findings and recommendations identified in this screening assessment report and specialist studies (final recommendations summarized in the table below) should be incorporated into the project specific EMPr and implemented throughout the entire cycle of the project. The above mentioned sensitive and 'no-go' areas (Section 9.2), Mitigation measures (Section 10) and Monitoring (Section 11) should be implemented in addition to the Generic EMPr (RSA, 2019) during planning & design, construction, post-construction, operation and decommissioning phases of the project.

Table 40 Summary of final specialist recommendations regarding the preferred route alternative.

13.1. Socio-Economic
13.1.1. **Social**
Developing a 400 kV power line from Gromis via Nama to Aggeneis substation and expanding Nama substation will result in several positive spin-offs through facilitating IPP projects in the area, supporting the national electricity grid and energy development goals. National and municipal planning documents are in support of the proposed development so long as the power line does not adversely impact the local tourism industry. Based on the findings, it is recommended that the more populated areas and areas with a high tourism value be avoided. Avoiding these areas will reduce the impacts of visual intrusion, crime and disturbance to daily life. The western section of Alternative 1 and the section passing through the protected areas should thus be avoided. The eastern section of Alternative 1 and Alternative 5 are likely to have similar impacts, both impacting tourist attractions. However, if the No-Go areas within the corridor are avoided, Alternative 5 is expected to have significantly lower impacts than Alternative 1. Based on the outcome of other specialist studies, should Alternative 1 be selected as the preferred route, some of the money saved by taking the shorter route could be invested into local social upliftment initiatives. This would serve to offset the higher negative social impacts incurred by taking Alternative 1. It is recommended that the proposed power line follow the following route: • **Gromis to Nama**: The power line should be constructed along Alternative 4. • **Nama to Aggeneis**: The power line should be constructed along Alternative 5. The final power line route must avoid the No-Go areas, such as the guesthouses and farmsteads. If mitigation measures are implemented, negative impacts can be lowered to acceptable levels. Thus, implementation of mitigation measures will ensure that the proposed development of a 400 kV power line from Gromis substation via Nama substation to Aggeneis substation will have social benefits that outweigh the negative impacts. Please take note that if mitigation measures are not adhered to then the proposed power line could have high negative impacts on the area's tourism industry, farmers and local communities. The construction of an additional power line near the existing line would likely cumulate existing visual impacts. It is typically desirable to cluster industrial infrastructure, keeping other areas free from industrial clutter. Given the area's current 'sense of place' following the route of the existing power line could significantly cumulate visual impacts. Cumulative impacts would be particularly high were the power line to pass through the Goegap Nature Reserve and other protected areas. Should the new power line follow sections of the existing line, it should be plotted in a way that avoids cumulating visual impacts.
13.1.2. **Economic**
Alternatives 4 is the preferred route alignment from an economic impact perspective. This conclusion is as a result of the following factors: • Existing tourism operations will be the least affected by this route alignment; • Current and planned mining areas less likely to be impacted by virtue of this route following the existing powerline servitudes and road reserves for the majority of the Springbok to Aggeneys section that in effect already precludes future development of these corridor areas for mining purposes; • No cultivated agricultural land is likely to be disturbed, or stock farming operations significantly affected, in either the construction or operational phases of the powerline; • No physical resettlement would be necessary and economic displacement is likely to be of minimal negative significance; • More economically marginalised communities like Bulletrap and Nababeep, who by virtue of being in very close proximity to the preferred alternative, stand to benefit from potential employment and skills development

initiatives should Eskom and their contractors prioritise these settlements for employment. It can be expected that some level of Small, Medium and Micro Enterprises (SMME) development can be fostered over time as a result of their proximity to the potential renewable energy projects planned for the north of Springbok; and

- Any potential renewable energy projects located north of Springbok will have an easier (shorter and cheaper) connections to the grid if the preferred alternative is utilised. It is these projects (and those already earmarked for the Kleinzee coastal corridor), and the electricity sector in general, that is expected to be a significant driver of future economic growth in the district.

The Alternative 1 section between Gromis and Nama substations should be deemed the least preferred, and only considered a possibility if other specialist inputs into this screening and impact assessment process consider Alternative 4 to be fatally flawed.

Combined Socio-Economic Recommendation

Based on the findings of the Social and Economic investigations, both reports are in agreement that the western section of Alternative 1 is the least preferred route for connecting Gromis substation to Nama Substation. The two reports differ regarding the section between Nama substation and Aggeneis substation.

The eastern section of Alternative 1 and Alternative 5 are likely to have similar impacts in terms of tourism and social impacts. However, if the No-Go areas within the corridor are avoided, Alternative 5 is expected to have significantly lower impacts than Alternative 1. The Social report recommends that Alternative 5 be followed for the eastern section of the power line. The section of the route passing east of Concordia would need to avoid the No-Go areas, such as the guesthouses and farmsteads within the corridor. The eastern section of Alternative 1 is not recommended as it would pass through the Goegap Nature Reserve and other protected areas, likely impacting their 'sense of place'. However, if the eastern section of Alternative 1 is selected, the power line would be situated close to the N14, i.e. on the extreme northern boundary of Goegap. If the northern boundary of Goegap is an area not frequented by visitors, this route could be considered.

The Economic report recommends that the eastern section of Alternative 1 be followed as opposed to Alternative 5. Of the route alternatives, Alternative 5 has the greatest potential to restrict future mining activities. Furthermore, Alternative 5 passes close by several farmsteads, east of Concordia and is likely to impact the residents.

On the other hand, the eastern section of Alternative 1 would follow an existing power line and road reserves which have effectively already prevented any mining along the route. Expanding these existing reserves/servitudes in order to accommodate the proposed power line would pose the lowest impact on future mining activities.

Taking the above findings into account, the following route is recommended:

- **Gromis to Nama**: The power line should be constructed along Alternative 4.

- **Nama to Aggeneis**: The power line should be constructed along Alternative 1. The route should be placed as close to the National Route 14 highway as possible, remaining on the extreme edges of Goegap Nature Reserve.

    - Goegap Nature Reserve and the managers of adjacent protected areas should be further consulted to better gage the significance of expected impacts. Based on the outcome of this, if the eastern section of Alternative 1 is deemed unfeasible Alternative 5 will need to be further considered. The final power line route would need to avoid the No-Go areas to minimise negative impacts.

13.2. Visual

After careful consideration of Alternative 1, 4 and 5, it is advised from a visual perspective that Alternative 5 be developed. Although there is not a lot of difference between Alternative 1 and 5 the following points can be considered as motivation for the development of Alternative 5:

1. National Route 14 is avoided near Springbok where it deviates from Alternative 1;
2. Alternative 5 will not traverse through the Goegap National Park as Alternative 1 but will traverse towards the north of the National Park.

Alternative 4 is not considered to be a viable option due to the pristine natural area and lack of development along the route. Numerous tourist attractions are situated within the area which consist of hiking trails, 4 x 4 routes and guest lodges.

Alternative 5 will have the lowest visual impact of all listed Alternatives. If all mitigation measures are implemented by Eskom the visual impact will be moderate to residences of Aggeneys, Springbok and Buffelsrivier, commuters making use of National Route 14 (N14) as well as to tourist visiting the surrounding tourist attractions.

13.3. Heritage

Based on the available information, the area proposed for the powerline alignments constitutes a very sensitive landscape in terms of impacts to historical, archaeological and palaeontological heritage resources. The proposed development of the 400kV powerline may result in the destruction of significant archaeological, palaeontological and built environment heritage resources through the insensitive placement of pylon footings as well as the loss of a sense of place through the development of large scale and intrusive infrastructure within a sensitive cultural landscape. Each proposed alignment therefore has the potential to impact on:

- Historic townscapes and sense of place of historic cores of Springbok, Nababeep, O'Kiep, Carolusberg and Concordia
- Corbelled houses and other historic structures and farm werfs
- Archaeological heritage resources specifically heritage associated with
    - Copper Mining
    - South African War
    - ESA, MSA and LSA (including OES, grinding grooves and ceramics) sites (tend to be associated with granite outcrops and pans)
    - Engraved rock art
    - Marked and unmarked burial grounds
- Heritage associated with Korana wars and the massacre of Khoe and San peoples
- Palaeontological heritage consisting of trace fossils, mammal bone fossils, sharks teeth, mollusc fossils

The archaeological field assessment identified a number of sites of heritage significance, including cemeteries, sites associated with the living heritage of the Korana people as well as sites associated with the Namaqualand Copper Mining Cultural Landscape. Unusually, very few artefacts or sites associated with the stone age were identified in the field assessment, however such resources are likely present on the landscape. Impacts to the majority of these resources can be avoided through the sensitive placement of individual specific pylons within any of the proposed corridors. Impacts to the broader cultural landscape are more challenging to mitigate.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are much too old to contain fossils. The Tertiary calcretes and Quaternary windblown sands do not preserve fossils except in special circumstances. Since there is an extremely small chance that fossils from the nearby Vryheid Formation may be disturbed a Fossil Chance find protocol has been added to this report. The potential impact to fossil heritage resources is extremely low. Based on the experience of the palaeontologist and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the loose sands of the Quaternary.

There is an existing 200 kV power line that runs along the proposed alignment for Alternative 1. Potential impacts to the cultural landscape can be mitigated by concentrating such electricity infrastructure along one alignment where the landscape is not pristine. Furthermore, a number of no-go areas have been identified based on the location of the known heritage resources, and incorporating the known sensitivity of rocky outcrops, mountains and waterways for heritage resources. Based on the outcomes of this assessment, a number of heritage resources of heritage significance were identified within the proposed alignment of Alternative 4 (Grade II, IIIA and IIIB). A number of no-go areas have been recommended within the proposed alignment of Alternative 4. While a number of heritage resources were also identified within the proposed alignment for Alternative 1, these are not as sensitive or as significant (mostly Grade IIIB and IIIC) as the resources within Alternative 4. No heritage resources that aren't also located within the proposed alignment for Alternative 1 were identified within the proposed alignment for Alternative 5. It must be noted that Alternative 5 was added as an additional alternative once fieldwork was already underway and as such, Alternative 5 was not fully assessed. However, the assessment conducted has provided sufficient insight into the kinds of heritage resources that may be impacted by the proposed development along this alignment as only a small section of Alternative 5 deviates from Alternative 1, effectively avoiding the Goegaap Nature Reserve, which was fully assessed. Should this alignment be preferred, a more detailed site verification of the corridor can take place to inform the micro-siting of the proposed pylons to ensure that no significant heritage resources are impacted. Based on the information assessed, it is recommended that Alternative 1 or Alternative 5 are the preferred alignments.

13.4. Agricultural

Due to the low rainfall and high temperatures, the agricultural potential is severely impacted and limited by climate. Cropped lands are sparsely distributed in the more mountainous areas, and the flats are solely used for grazing. Even were crops are grown, these would be considered marginal areas and low yields are expected. No irrigation or special crops were encountered during the fieldwork, which correlates with the latest Landuse maps. Since climate is the major control of agricultural potential in this area, most of the areas are classified as low sensitivity. Therefore, powerlines will not have a significant effect on agricultural potential. The use of the existing road network for the current line would decrease the risks of erosion associated with road building and, therefore, Alternative 1 would be the preferred route.

Although the presence of powerlines will not heavily affect the agricultural potential of any of the routes, the use of existing roads will be most beneficial. Therefore, all routes are suitable for the development of a new power line from Gromis substation via Nama substation towards Aggeneis substation. The use of existing road networks of the current line would have the least impact and avoid some minor risks of erosion during construction. It is thus the recommendation

that Alternative 1 is used, and since Alternative 5 is very similar it would also utilize most of the existing road network. Since Alternative 5 very closely mimics Alternative 1, it would also be a viable option.

13.5. Geo-hydrological

From the estimated impact assessment rating it can be concluded that corridor Alternative 1 is the most preferred corridor extension with the least estimated impact on the local groundwater regime. Alternative 5 is estimated as having the second-lowest impact and Alternative 4 having the most estimated impact on the local groundwater regime.

Alternative 1 is most preferred as it extends along existing linear infrastructure, therefore localizing potential impacts to an already affected environment compared to corridor Alternatives 4 and 5 which extends away from this, posing new unique potential impacts and increasing the overall groundwater impact footprint.

It should be noted that Alternative 5 relates to all properties mentioned of Alternative 1 with the only exception being a deviation in extensions of approximate 45km. The deviation however, places Alternative 5 along more than 11km of a non-perennial watercourse (Kirrie River), which is not preferred. Alternative 5 therefore has a higher estimated impact rating than Alternative 1, if no proposed mitigation measures are followed. Should all provided mitigation measures be followed, the estimated impact rating significance of both Alternative 1 and 5 are expected to be similar (i.e. Low).

It should be noted that although local groundwater quality and availability are deteriorated and low, the dependency on water/groundwater sources is very high. This increases the vulnerability of the local groundwater regime to conservative pollutants in the long term and structural degradation during construction.

13.6. Botanical and Freshwater

The Generic EMPr (RSA, 2019) should be implemented during planning & design, construction, post-construction, operation and decommissioning phases of the project. Specialist findings and recommendations identified in this screening assessment-specialist report and upcoming BA-specialist impact assessment report should be incorporated into the project specific EMPr and implemented throughout the entire cycle of the project.

Succulent Karoo and desert ecosystems occupy a large portion of the alternatives and the area is characterised by high level of endemism and sensitive features. These areas should be avoided at all cost. There are many opportunities for the power line routing to follow, and individual placement of pylons should be based on more detailed mapping once specialist investigate the Preferred Alternative during the BA Process. The lower sensitive areas located to the eastern sections Springbok (Nama Karoo Biome) should be more flexible to aligning the line and placing pylons. It is thus recommended that Alternative 5 be the Preferred Alternative from a Botanical and Freshwater perspective, as this alternative will give flexibility in avoiding sensitive habitats and ecosystems and provide flexibility in pylon placement.

Impacts on terrestrial fauna and freshwater ecosystems are unfortunately unavoidable when developing large-scale projects such as strategic power transmission corridors such as this development. In particular, linear developments need to avoid urban areas and limit the impacts on other areas with anthropogenic significance to prevent socio-economic impacts. It is thus critical to strategically plan the placement of the line and development footprints to significantly reduce the impact on freshwater and terrestrial floral biodiversity.

13.7. Faunal

Both route alternatives 1 and 5 are the favourable routes from a faunal perspective. Both of these routes will pose a limited threat to the fauna occurring in the vicinity of the new power line. This is largely due to the disturbance already experienced within the area coupled with the shorter length of the proposed power line. The preferred route though is Alternative 5 as this route follows existing infrastructure for most of its length and avoids Protected Areas.

Given the relative homogeneity of the habitat within the study area as well as existing levels of disturbance (existing power lines and substations, existing roads, urban development, renewable energy developments, and livestock farming), the proposed strengthening project is unlikely to have a significant, long-term impact on the local faunal populations. The findings of the report and severity of the associated impacts should be verified by a more detailed site visit verification during the BA phase.

13.8. Avifaunal

The route corridor alternatives all emerged with very similar risk scores, indicating that the expected impacts are very similar for all three alternatives. However, Alternative 1 is the preferred alternative, the reason being that this alternative is situated next to the existing transmission powerline (between Aggeneis, Nama and Gromis substations) which potentially reduces the risk of collisions. Placing the new line next to an existing transmission line should reduce the risk of collisions in the long term, because it creates a more visible obstacle to birds and the resident birds, particularly breeding adults, are used to an obstacle in that geographic location and have learnt to avoid it. Whereas it is acknowledged that this alternative could potentially result in significant short term temporary displacement impacts on breeding eagles on the adjoining existing transmission line during the construction phase, this should be weighed up against the reduction of the risk of long term collision impacts on large terrestrial species.

In addition, it is recommended that the tower placement of the new proposed line be staggered in relation to the existing line so as to increase the visibility of the line in an attempt to further mitigate the collision risk posed by the powerline. It has been proven that when only the centre 60% of the span is marked, as is currently the Eskom practice, that birds tend to fly into the unmarked sections of the span. By staggering the towers, this problem can be addressed as this results in continuous overlap of marked sections on parallel lines. Although Alternative 1 is preferred from an avifaunal perspective Alternative 5 can also be considered as it is the second-best option.

It is envisaged that the proposed Gromis-Nama-Aggeneis 400kv IPP Integration Power Line will have two major potential impacts on Red Data avifauna, namely displacement due to disturbance of breeding birds, especially breeding Martial Eagles on existing transmission lines, and mortality of large terrestrial species due to collisions with the earthwire of the proposed line. The latter impact is especially concerning as far as the Endangered Ludwig's Bustard is concerned, as the species is known to be highly susceptible to this impact, and conventional mitigation methods, i.e. the marking of the earthwire with Bird Flight Diverters, seems to have limited success in reducing mortality for this species. It must therefore be accepted that even with current state of the art mitigation, Ludwig's Bustard collisions are likely to still take place, irrespective of which corridor is ultimately selected.

The cumulative impact of transmission lines in the Karoo as far as collision mortality of large terrestrial species is concerned is alarming, and potentially catastrophic as far as Ludwig's Bustard is concerned, with an estimated 41% of the population being killed annually, with Kori Bustards also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). The addition of another transmission line will potentially aggravate the situation further. Ludwig's Bustard migratory movements are along a broad east-west axis, which is a mitigating factor to some extent as the line also follows a broad east-west axis, and does not cut diagonally across the general flight path of this species when doing long distance migratory flights. However, research has shown that the highest collision risk occurs when birds are resident in an area between migratory movements, presumably because they fly higher during migratory flights.

No electrocution risk is envisaged as the clearances (phase – phase and phase – earth) on the proposed 400kV line are too large for any bird to physically bridge, thereby eliminating any potential for a bird causing a short circuit.

The proposed mitigation measures should reduce the impact of the proposed line, except for collisions in grassland and low shrubland (specifically as a result of Ludwig's Bustard), where the collision impact will remain medium, even with mitigation.

14.RECOMMENDTIONS FOR DURING THE BA PROCESS

Due to the large scale of the screening assessment to select the preferred route for the proposed power line, it was not possible to conduct a detailed assessment on all aspects that were investigated. A large scale, robust approach had to be adopted considering the time and resource constraints of investigating a large study area with multiple alternatives. Since this screening assessment will be followed by a formal BA application process, each specialist identified additional recommendations that could be undertaken in the next phase, where a finer scale specialist site verifications of individual pylon placement will be allowed for. The recommendations for during the BA process is given in the table below.

Table 41 Recommended further investigations for during the BA application process.

14.1. Socio-Economic
14.1.1. **Social**
Although declining, mining activities remain a key economic contributor to Namakwaland and the possible sterilisation of minerals needs to be prevented. While the public participation process of the Screening Assessment endeavoured to consult all relevant mining companies, the consultation was limited relative to the number of mining rights held within the area. A more in-depth consultation process should be pursued upon assessing the finalised route, before the BA phase. As mentioned, the sterilisation of minerals has been addressed in more detail in the Economic Impact Assessment.
14.1.2. **Economic**
All pertinent mitigation and impact management measures prescribed in the Generic EMPr (RSA, 2019) should be adhered to by Eskom and its contractors, however, the following recommendations are put forward: • Should Alternative 1 in its entirety be selected as the preferred corridor it is essential that the powerline route be shielded as far as is possible from those accommodation and tourism establishments that are along this route. In the Naries Namakwa Retreat situation it is better that the powerline run south of this and the Springbok Kleinzee road (R355) and remain as close as possible to it in its approach to Springbok; • Given the vast areas and farm portions under mineral prospecting applications for which rights have either been issued, are in process, dormant or have lapsed, it is recommended that the potential for any viable future mining projects within the confines of any of the alternatives be a dedicated objective of the public participation process and consultation. Similarly, the preferred alignment that will be subject to its own participation process when the BAR should make this a priority. Although it is the authors opinion that Alternative 4 is unlikely to impact on future mining activities by virtue of it being removed from existing or historical operations, it will be necessary that the forthcoming consultaiton process confirm this; and, • Eskom should pre-emptively engage with the NKLM and representatives of the economically marginalised communities within the study area as to how maximise potential employment opportunities locally, what sorts of skills development is in fact possible, and what would best serve these employees in terms of future energy sector or related work opportunities. Any SMME development opportunities that can be identified in collaboration with stakeholders needs to be undertaken prior to the commencement of construction activities.
14.2. Visual
None recommended at this time.
14.3. Heritage
At the BA phase of the project, a more detailed verification of the selected corridor must take place to inform the micro-siting of the proposed pylons to ensure that no significant heritage resources are impacted.
14.4. Agricultural
None recommended at this time.
14.5. Geo-hydrological
None recommended at this time.
14.6. Botanical and Freshwater
There are habitats and vegetation types within the study area which are considered rare or which contain an abundance of endemic species or species of conservation concern. Some vegetation types are restricted to specialised substrates which are limited in extent and impacts on these habitats cannot be effectively mitigated except through avoidance (Department of Environmental Affairs, 2015). Development within these areas should be limited as much as possible. It was not possible to map all of these fine-scale patterns during this study and their presence must be evaluated through site visits during the appropriate season to the preferred alternative during the BA Process.

The presence of ephemeral watercourses (especially depression wetlands and pans was difficult to map at this level and watercourse presence should be evaluated through site visits of the Preferred Alternative during the BA Process. A site walk-through or finer scale assessments during the BA Process must identify and map cliffs, large rocky outcrops, quartz fields, pebble patches and rock sheets.

In order to reduce potential impacts of the proposed development on freshwater ecosystems watercourses classified with a very high or high sensitivity, and/or good ecological condition should be avoided as far as possible. Where avoidance of sensitive watercourses is not possible, detailed desktop investigations should be conducted, followed by specialist in-field assessments and verification. This will determine whether the fine-scale, micro-sited power line alignment and development footprints can avoid freshwater ecosystems and associated buffers. Following this assessment, appropriate management actions may be determined and implemented as required (Department of Environmental Affairs, 2016).

In addition to the above, the following is recommended for the next phase:

- Use should be made of the most recent and up to date environmental sensitivity maps and least cost path when planning the final placement of the power line route and pylons;
- Design infrastructure (substation expansion, pylon placement and route alignments) should avoid highly sensitivity areas;
- Ground assessments and pre-construction walk-through by specialists should be done to further refine the layout and further reduce impacts on sensitive habitats and protected species through micro-siting of the development footprint;
- Placement of infrastructure should be done in such a way that no threatened or rare, or species of conservation concern are affected;
- Design to use as much common/shared infrastructure as possible with development in nodes, rather than spread out;
- Avoid construction of substations on steep slopes (>25 degrees).
- Do no place infrastructure within the beds and bank of watercourses, and avoid their regulated area as far as possible;
- Limit the amount of watercourse crossings; and,
- Use existing watercourse crossing to avoid creating new temporary or permanent crossing of access roads.

14.7. Faunal

Potential impacts identified during the screening phase should be revised and updated if necessary based on the site verification visit during the BA phase. The proposed development is not predicted to have a detrimental impact on regional populations or Red Data listed species if all recommended mitigation measures listed are adhered to.

Proposed scope of work during the BA phase for the preferred Alternative:

- Finer scale investigation and verification of key faunal species residing within the study area based on the final route alignment and pylon placement;
- Further refinement of delineation and mapping (site verification) of faunal microhabitats and their ability to support Red Data listed or endemic species based on the final route alignment and pylon placement;
- Design infrastructure (substation expansion, tower placement and route alignments) should avoid highly sensitivity areas (to be verified by site verification of route alignment and pylon placement), including avoiding areas of high to very high impact or within no-go areas.
- Ground assessments and pre-construction walk-through by faunal specialist should be done to verify pylon placement and route alignment to reduce impacts on sensitive habitats and protected species through micro-siting of the development footprint;
- Design to use as much common/shared infrastructure as possible with development in nodes, rather than spread out;
- Use should be made of the most recent and up to date environmental sensitivity maps and least cost path when planning the final placement of the power line route and tower placements.

14.8. Avifaunal

Once the final alignments and tower positions have been selected, the sections of the line that would need the application of Bird Flight Diverters to mitigate for potential collisions should be indicated by the avifaunal specialist. This walk-through exercise should be informed by an analysis of satellite imagery supplemented by on site ground-truthing.

Prior to construction commencing an inspection, preferably by helicopter if possible, should be conducted in order for the avifaunal specialist to record any large raptor nests on existing transmission lines that could be impacted by the construction of the proposed line.

15.CONCLUSION

This screening report set out to identify the Preferred Alternative corridor for the development of a new 400 kV power line for the integration of IPP's between the substation of Aggeneis, Nama and Gromis in the Northern Cape Province.

Enviroworks was supplied by three alternative corridors to assess for the proposed development.

A robust approach was taken and made use of a range of specialist impact assessments in the field of environmental, social and economic studies. The approach used by specialists were standardised as much as possible in order to combine the results into a final recommendation.

Taking into account the scope and scale of the study (large spatial scale and resource constraints), the approach was confined to taking a largely desktop based approach to assess the alternatives. Each alternative was investigated in terms of the specialist aspects. The potential impacts that the proposed development could have were identified and significance rated in terms of standard impact rating methodology. By using the impact ratings for each of the specialist impacts, these were mapped and combined to produce and overall impact rating map for each alternatives. Based on the significance ratings of each alternative, Alternative 5 emerged as the Preferred Alternative corridor considering environmental, social and economic aspects.

Alterative 5 is preferred over Alternative 1 by most specialists, because it avoids the important conservation and protected area found along Alternative 1 (and where Alternative 4 coincides with it) and still follows existing infrastructure for most of its length. Most of the specialist recommended to confine the new development as close as possible to the existing line in order to cluster impacted areas, limit disturbance, avoid creating impact in new areas and to make use of existing infrastructure such as access roads. One of the sensitive areas identified in most studies were the protected and conservation areas along Alternative 1, which made Alternative 5 a more preferred alternative. As both alternatives follow the same route for most of the length and have existing disturbances, new impacts will be limited and very similar. Both Alternative 1 and 5 are considered feasible alternatives from most of the specialists' recommendations but Alternative 5 is the most preferred across all project phases.

Alternative 5 emerged as having the lowest overall mean impact significance during the construction phase. When looking at the spatial pattern of sensitive and no-go areas, it does seem that the areas of high significance within Alternative 5 can be successfully avoided by the careful planning of the route alignment and pylon placement. Alternative 4 is excluded from further consideration due to the very high proportion of the area classified as having very high impacts. The spatial arrangement of the high impact significance areas will make it difficult, if not impractical, to avoid these sensitive areas within Alternative 4.

Alternative 1 & 5 emerged as having a similar, and low mean impact significance for both the construction and operational phase. If one considers the spatial pattern of sensitive and no-go areas between Alternative 1 and

5, it is apparent that Alternative 1 has numerous sensitive areas that's crosses the entire corridor width. The length of these sections are much larger (>460m) than the required distance between pylon placement. The spatial pattern of Alternative 5's sensitive areas is more spread out. The sections crossing the corridor are narrower compared to Alternative 1, which in turn will make avoiding placement of infrastructure in these areas more practically feasible.

Going forward it must be noted that Alternative 5 has the greatest potential to restrict future mining activities and in contrast, Alternative 1 would pose the lowest impact on future mining activities. It is suggested to consult with the relevant authorities with regards to mineral deposits and mining rights and ensure the line does not cross areas of known mineral deposits and/or where existing mining rights exist. This should be explored in detail in the next phase of land negotiations. Alternative 5 would need to be discarded if subsequent investigations to this report indicate there are highly viable deposits along this routing that are likely to become operational mines. Should the power line be constructed along Alternative 1, the route should be placed as close to the National Route 14 highway as possible, remaining on the extreme edges of Goegap Nature Reserve in order to minimize impact on this sensitive protected area. Goegap Nature Reserve and the managers of adjacent protected areas should be further consulted to better gage the significance of expected impacts. In all instances the final power line route would need to avoid the No-Go areas as far as much as practically feasible to minimise negative impacts.

Within the Preferred Alternative, the report's recommendations will be used by Eskom in the next phase to negotiate 'right-of way' with landowners. Once this phase is complete, Eskom can approach the Competent Authority for application for the required environmental authorisation in the Basic Assessment (BA) Process.

The impact rating map and identified sensitive (i.e. 'no-go' areas) can be used during the BA Process as a starting point for more detailed site verifications that will typically include ground-truthing site sensitivities to ensure highly sensitive areas are avoided for the final route alignment and pylon placement.

This screening assessment identified suitable mitigation measures for each of the identified impacts and monitoring procedures were also supplied. It is recommended that these mitigation and monitoring measures be included in the project specific EMPr and implemented through-out the project lifetime.

16.REFERENCES

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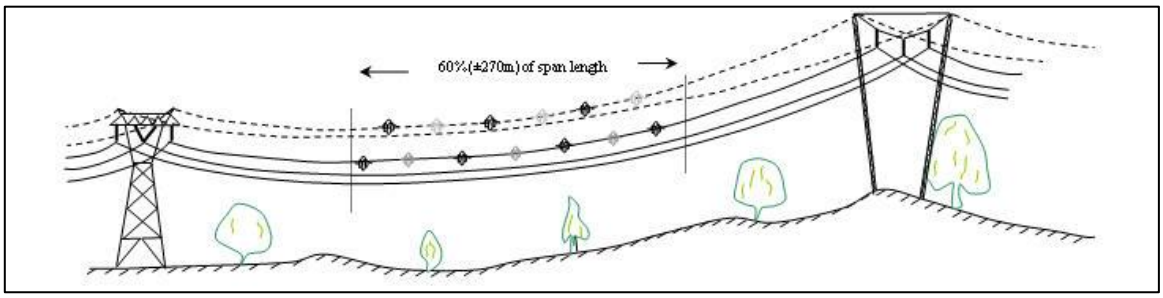
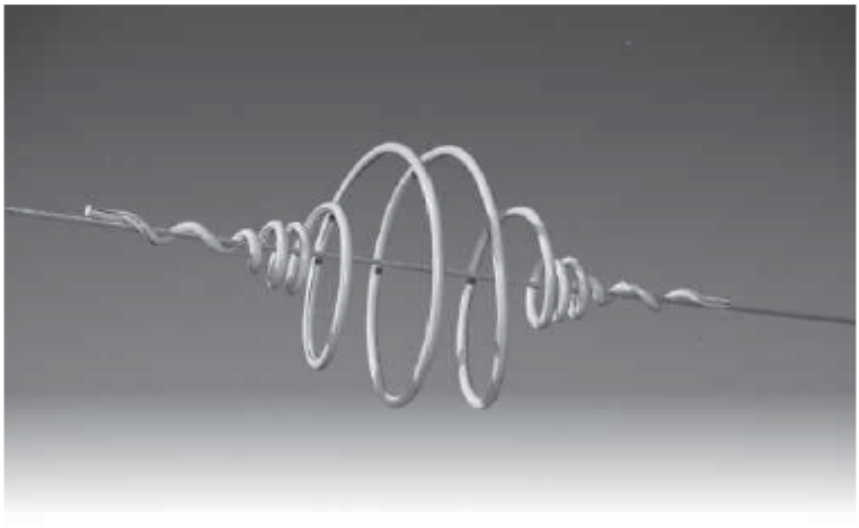
Appendix 1A: Recommended bird flight diverters and spacing



Double Loop Bird Flight Diverter



General Recommendation

The Bird Flight Diverter is designed to make overhead lines visible to birds and provides and economic means of reducing the hazard to both lines and birds. For low and medium voltage construction (up to 40kV) it is applied to the phase conductors (bare or jacketed). For high voltage it is used on the earth wire.

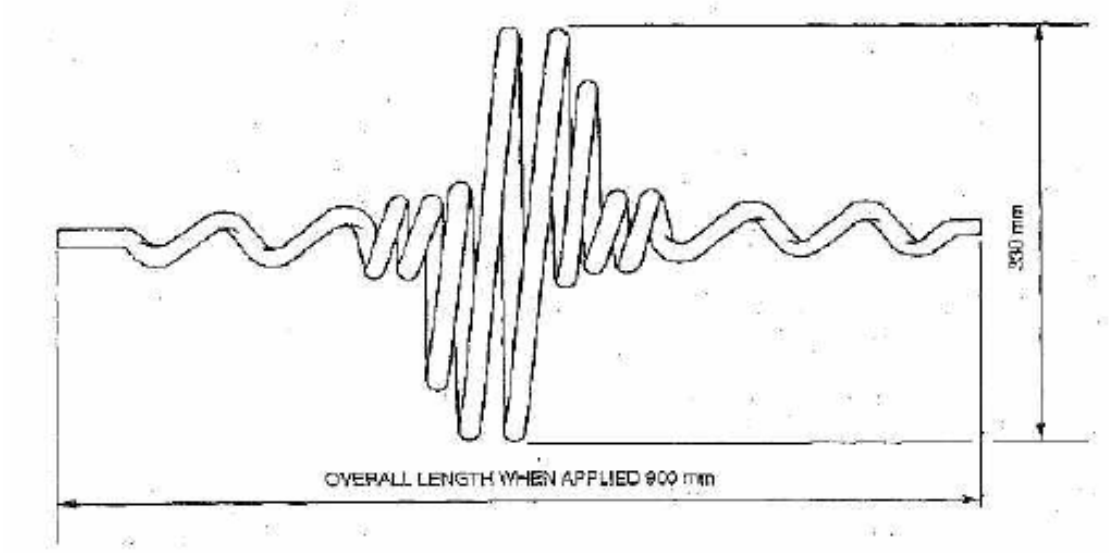
The fitting is light in weight, offers little wind resistance and is easily and quickly applied. The positive grip of the fitting on the conductor ensures that it remains in the applied position and cannot move along the span under vibration.

Visibility: The diverter section increases the visibility profile of the cable or conductor to a degree necessary to ensure safety, but avoids undesirably bulky outline.

Spacing: Spacing distances are not critical and will depend upon local conditions. Since wind resistance is very limited, sufficient fittings can be used to ensure adequate visibility without creating stresses on the line. When marking adjacent spans, overall visibility is improved by staggering the application.

We recommend generally a spacing of 10 or 15 metres.

Double Loop Bird Flight Diverter

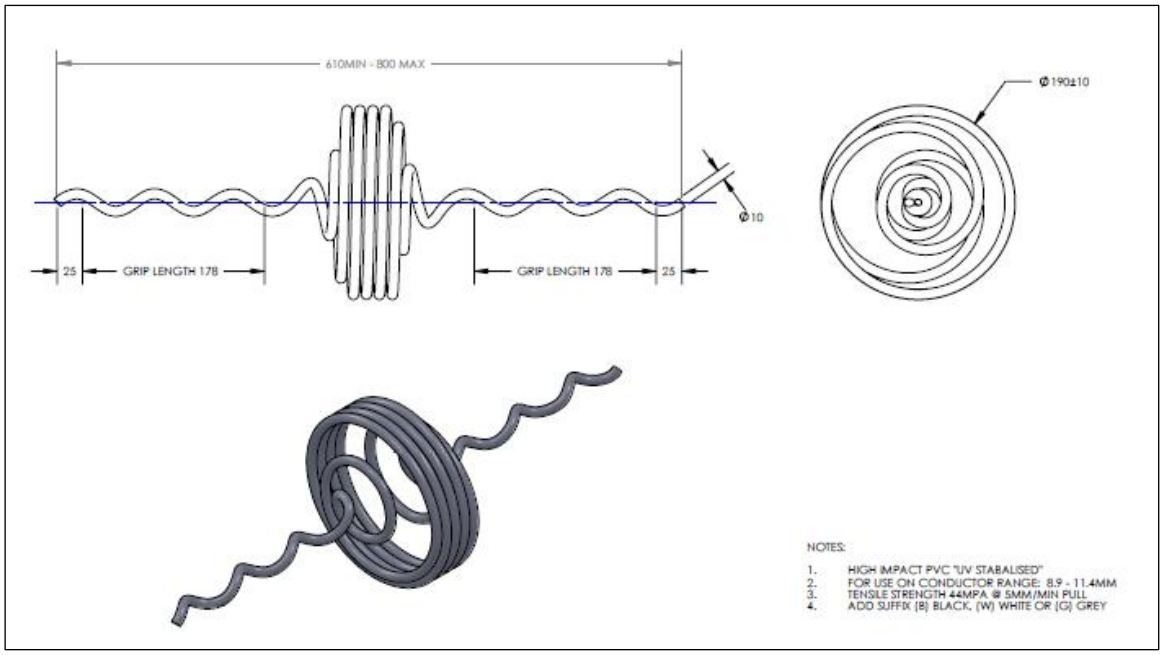


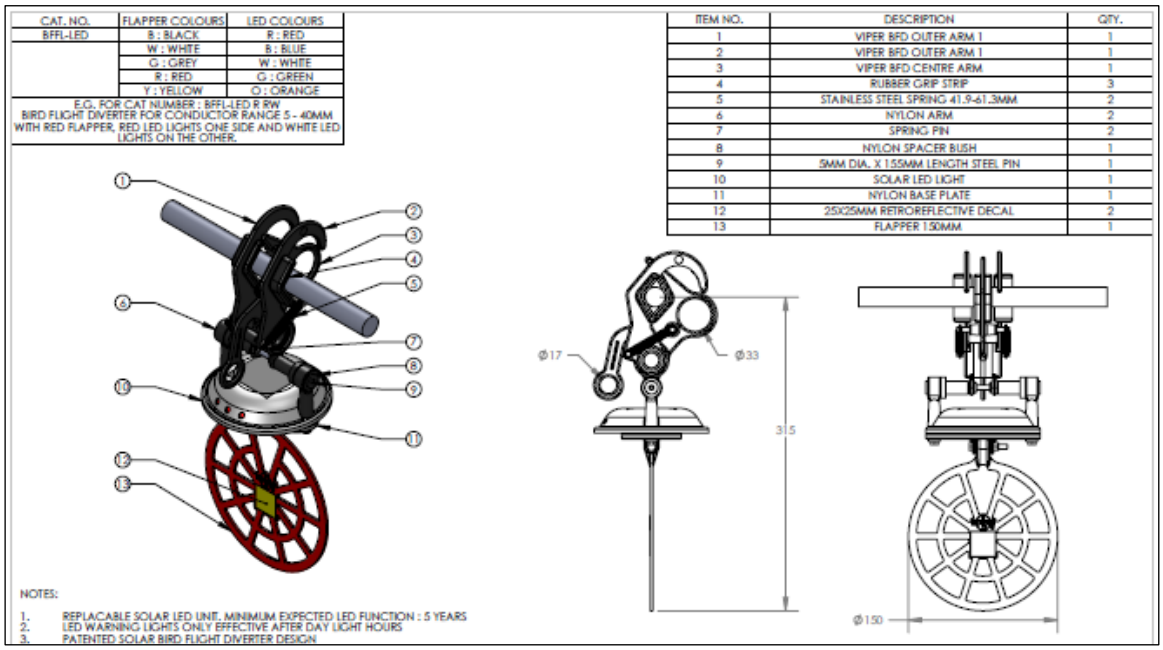
Material Used: Manufactured from rigid solid high impact polyvinyl chloride, possessing excellent chemical and strength properties and which will retain good physical characteristics within the range of extreme temperatures. Outdoor aging tests indicate that the material does not deteriorate in function or appearance from the effects of severe weather conditions. Industrial fumes and salt water cannot seriously degrade the properties of rigid PVC.

Colour: White or Black

Lay Direction: Bird Flight Diverters are supplied right hand lay for both right hand and left hand lay bare conductors and insulated cables.

CATALOGUE NO.	CONDUCTOR/ E/WIRE DIA. RANGE
BFD 0914/LD2*	9 mm – 14 mm





*Note – all the above bird flight diverter diagrams are for reference / illustration purposes only. Source of diagrams – Preformed Line Products – www.preformedsa.co.za

Appendix 1B: Chance Find Protocol

Monitoring Programme for Palaeontology – to commence once the excavations for power lines and access roads begin.

1. The following procedure is only required if fossils are seen on the surface and when excavations commence.
2. When excavations begin the rocks must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone, coal) should be put aside in a suitably protected place. This way the mining activities will not be interrupted.
3. Photographs of similar fossil plants must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones (for example see Figure 1.5 of Appendix 3.3. - Heritage Impact Assessment Report). This information must be built into the EMP's training and awareness plan and procedures.
4. Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
5. If there is any possible fossil material found by the developer/environmental officer/miners then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
6. Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
7. If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
8. If no fossils are found and the excavations have finished then no further monitoring is required.

Appendix 2: Mapping Report

Appendix 3: Specialist Reports

Appendix 3.1.: Socio-Economic Report

Appendix 3.1.1.: Social Impact Assessment Report

Appendix 3.1.2.: Economic Impact Assessment Report

Appendix 3.2.: Visual Impact Assessment Report

Appendix 3.3.: Heritage Impact Assessment Report

Appendix 3.4: Agricultural Impact Assessment Report

Appendix 3.5.: Desktop Geo-hydrological Impact Assessment Report

Appendix 3.6.: Botanical and Freshwater Impact Assessment Report

Appendix 3.7. Faunal Impact Assessment Report

Appendix 3.8.: Avifaunal Impact Assessment Report

Appendix 4: Public Participation Process (PPP) Report

Appendix 5: Spatial Maps of Impact Ratings