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1 INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

The Socio-Economic Impact Assessment has been undertaken to determine the potential social and economic impacts (both positive and negative) that may occur due to the development of the Kap Vley Wind Energy Facility (WEF) and associated transmission line proposed by juwi Renewable Energies (Pty) Ltd, close to Kleinzee and Komaggas in the Nama Khoi Local Municipality (LM) and the Namakwa District Municipality (DM), Northern Cape Province.

1.2 Terms of Reference

- Desktop data gathering for baseline report and Scoping-level input;
- Primary data collection via a site visit and telephonic interviews;
- Secondary data collection by reviewing relevant plans, frameworks and policies;
- Preparation of draft baseline report and scoping level input; and
- Preparation of Socio-Economic Assessment for inclusion in Environmental Impact Assessment (EIA) report which includes:
    - Determining the fit of the proposed development with local, regional and national economic development visions and plans that considers renewable energy planning;
    - Determining and assessing the impacts on overall economic development potential in the area;
    - Assess the impacts associated with project expenditure on direct and indirect employment and household incomes;
    - Analysing the benefits from development to Kleinzee and the Komaggas local communities.
- Address comments received on study during the Public Participation Processes undertaken for the Scoping and EIA Reports.

In addition to the above, the following ToR has been provided by the CSIR:

- Adhere to the requirements of specialist studies as outlined in Appendix 6 of the 2014 NEMA EIA Regulations, as amended;
- Assess the no-go alternative very explicitly in the impact assessment section. Please note that the DEA considers a ‘no-go’ area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads and internal cables is allowed in the ‘no-go' areas. Should your definition of the ‘no-go’ area differ from the DEA definition; this must be clearly indicated in your assessment. You are also requested to indicate the ‘no-go’ area’s buffer.
- Assess cumulative impacts by identifying other wind and solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, transmission or distribution facilities in the local area (i.e. within 50 km of the proposed Kap Vley WEF project) that have been approved (i.e. positive EA has been issued) or the EIA is currently underway. In addition, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following:
    - Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.

    - The cumulative impacts significance rating must also inform the need and desirability of the proposed development.
    - A cumulative impact environmental statement on whether the proposed development must proceed.
- Provide a detailed description of your methodology, as well as indicate the locations and descriptions of turbine positions, and all other associated infrastructures that you have assessed and are recommending for authorisations.
- Provide a detailed description of all limitations to your studies. Your specialist studies must be conducted in the appropriate season and providing that as a limitation, will not be accepted by DEA.
- A review of the current socio-economic conditions in sufficient detail so that there is a baseline description/status quo against which impacts can be identified and measured. Consult secondary data sources (published documentation) to obtain basic socio-economic baseline demographics;
- Obtain socio-economic information from the land owners to inform the study;
- Identify and assess all potential impacts (direct, indirect) of the construction, operational and decommissioning phases of the proposed development. Use the CSIR methodology to determine the significance of potential impacts;
- Assess all alternatives, including the no-go alternative;
- Assessment cumulative impacts by identifying other REFs such as wind and solar and other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area (i.e. within 50 km of the proposed WEF). These include projects that have been approved (i.e. positive EA has been issued), have been constructed or projects for which an Application for Environmental Authorisation has been lodged with the Competent Authority (see Table 6.1 in Chapter 6 of this report for a list of projects);
- Provide recommended mitigation measures, management actions and monitoring requirements, to reduce negative measures and to enhance positive socio-economic impacts to be included in the EMPr;
- Provide a description of any assumptions, uncertainties, limitations and gaps in knowledge; and
- Incorporate and address issues and concerns raised during the Scoping and EIA phases where they are relevant to the specialist's area of expertise.

1.3 Approach and Methodology

The socio-economic assessment was informed by undertaking primary and secondary data collection. Primary data collection refers to interviews with affected landowners, residents of the community and/or any adjacent landowners. Secondary data collection refers to the review of databases and documents to support the primary data collection findings.

1.3.1 Primary data collection

A site visit was undertaken on 14 and 15 August 2017 (during the Scoping phase) to Kleinzee and Komaggas. The site visit entailed the understanding of the current state of the two communities most likely to be affected (either positive or negative) by the development of the proposed Kap Vley WEF.

Several attempts were also made to engage with the relevant affected parties on their respective thoughts or concerns on the proposed development. The status of the engagement process is outlined in Table 1.

Table 1. Engagement with affected parties

Farm/institution	Contact Person	Position	Engagement status
Portion 3 of Platvley Farm 314	Albertus Johannes Roux	Landowner	Telephonic interview
Remaining Extent of Kap Vley number 315	Deon Kotze	Landowner	Telephonic interview
Neighbour	Danie and Meisie Engelbrecht	Adjacent landowner	Telephonic interview
Komaggas Clinic	Geraldine Marman	Clinic staff	Telephonic interview
Portion 0 of Farm 200 and Remaining Extent of Kourootjie Farm 316	S Titus	Komaggas Community	Was not reachable
Neighbour	Willem Engelbrecht	Adjacent Landowners	No response received to messages left
Neighbour	Bertus Brand	Adjacent Landowners	No response received to messages left
Ward 8 Municipal Councillor	Paulus van Reenen	Municipal councillor	Request for interview not granted

1.3.2 Secondary data collection

The observations made during the site visit and interviews were further informed by secondary data sources. These sources ranged from databases that included:

- StatisticsSA to provide a broad overview of the socio-economic setting of the area;
- National, provincial and local policy and plans to determine whether the proposed project is aligned with the planning objectives of the various spheres of government; and
- Relevant specialist studies undertaken for this project or similar renewable energy projects to determine the potential impact and linkages to this assessment.

The secondary data sources include:

Databases and national, provincial and local frameworks and plans:

- National Development Plan (2012).
- National Infrastructure Plan (2012).
- Integrated Resource Plan (2010).
- Statistics SA: Community Survey 2007 (2008).
- Statistics SA: Census 2011 (2013).
- Integrated Development Plan (IDP) of the Namakwa DM (2017-2022).
- IDP of the Nama Khoi LM (2014/2015), Second Revision.
- Strategic Development Framework (SDF) of the Nama Khoi LM (2014).
- Northern Cape Provincial SDF (2012).

Specialist studies relevant to the assessment:

- To understand the social issues experienced within small rural towns and the potential social impacts associated with introducing a renewable energy project into the areas, the Social Impact Assessment Report for the Nieuwehoop Solar Development Near Kenhardt (2014) was reviewed.
- In order to inform the impact assessment, the Scoping and Environmental Impact Assessment for the Proposed Development of the 300 MW Kleinzee Wind Energy Facility near Kleinzee, Northern Cape Province: EIA Final Report (2015) was reviewed to identify impacts to be considered as part of the cumulative impact assessment.
- The findings of Visual, Noise and Soils and Agriculture Potential Impact Assessments for the Proposed Development of the Kap Vley Wind Energy Facility near Kleinzee, Northern Cape Province and Basic Assessment for the Transmission Line (2018) was reviewed to inform the

impact identified within this assessment that relates to the visibility, operation and audibility of the development.

- To understand the economic opportunities and risks associated with introducing a wind energy facility into a rural area, the socio-economic specialist report for the proposed Ishwati Emoyeni Wind Energy Facility and Supporting Eskom Transmission and Eskom Distribution Grid Connection Infrastructure near Murraysburg, Western Cape (2012) was reviewed.
- To determine the potential consequences of the socio-economic impacts of a wind farm, Loeriesfontein was considered a good case study, since two wind farms, namely Loeriesfontein 2 and Khobab, have recently become operational in the area. A recent Socio-Economic Impact Assessment for an additional wind farm proposed in Loeriesfontein ("Graskoppies") undertaken by Urban-Econ (Urban-Econ, 2017) was reviewed since this study provides insight into the socio-economic setting of a town, following the introduction of wind farms, and therefore provides a good overview of the realities of introducing a wind farm into an area and the associated socio-economic impacts.

Newspaper articles:

- Diamond mines are not forever (2012) published in the Mail and Guardian.

1.3.3 Assumptions and Limitations

The following assumptions or limitations apply:

- All technical, financial and other information provided by the Applicant, other official sources and specialists involved in the EIA is assumed to be correct unless there is a clear reason to suspect incorrect information;
- The results from the primary data collection for this assessment are minimal, due to a lack of contactable parties. However, based on the feedback from the parties interviewed and the information sourced from the secondary data collection, it is the opinion of the author that the primary data collected is sufficient to inform the study;
- The secondary data sources provide an overview of the baseline socio-economic environment and should be viewed as providing an overall indication of the trends present within this setting. It should not be considered to be an exhaustive source;
- The assessment uses information from other economic and social specialist studies for EIAs of other similar renewable energy projects. This was done in order to avoid unnecessary duplication of effort;
- This study assumes that both the WEF and associated 132 kV transmission line will be constructed and that one will not be constructed without the other. Therefore, this study assesses the socio-economic impact of the full project i.e. the development of the WEF and transmission line;
- Given the relatively new nature of this form of energy production, there is very limited actual data in South Africa (i.e. after the commissioning of a WEF) on the efficiency of mitigation measures to manage factors such as the impact on tourist visits, land prices and business value.

Considering the information obtained during this study, it can be concluded that the level of risk associated with gaps in knowledge/data is low.

2 KEY GUIDING LEGISLATION

2.1 National Development Plan

The National Development Plan (NDP) was officially adopted in 2012 and sets targets for eliminating poverty and reducing inequality in South Africa by 2030. The strategic perspective of the NDP is based on the New Growth Path for South Africa with the objectives, by 2020, of creating five million new jobs, resolving structural problems in the economy, and identifying opportunities in specific sectors and markets which may serve as job drivers. The first job driver was identified as infrastructure development. The lack of adequate infrastructure is considered an obstacle to the development of the wider South African economy and to Government achieving its social, economic and political goals.

2.2 National Infrastructure Plan

The National Infrastructure Plan (NIP) is fully aligned with the NDP and sets goals for improving South Africa's economic landscape, creating job opportunities, and improving the delivery of basic services through infrastructure development. In order to address the challenges identified by the NIP, Cabinet established the Presidential Infrastructure Coordinating Committee (PICC). Under the guidance of the PICC 18 Strategic Integrated Projects (SIPs) have been developed to promote fast-tracked development and growth of social and economic infrastructure across all nine provinces. Among the 18 SIPs, three target the energy sector. The three energy related SIPs are: SIP 8 – Green energy in support of the South African economy; SIP 9 – Electricity generation to support socio-economic development; and SIP 10 – Electricity transmission and distribution for all. SIP 8 in particular aims at facilitating the implementation of sustainable green energy initiatives as envisaged in the NDP and Integrated Resource Plan (discussed below).

2.3 Integrated Resource Plan

The Integrated Resource Plan (IRP) for South Africa for the period 2010 to 2030 (referred to as "IRP2010") and the IRP Updated Report (2013) proposes to secure 17 800 MW of renewable energy capacity by 2030. The Department of Energy (DOE) has subsequently entered into a bidding process for the procurement of 3 725 MW of renewable energy from Independent Power Producers (IPPs) by 2016 and beyond to enable the Department to meet this target. On 18 August 2015, an additional procurement target of 6 300 MW to be generated from renewable energy sources was added to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) for the years 2021 - 2025, as published in Government Gazette 39111. The additional target allocated for wind energy, solar PV energy, and solar CSP energy is 3 040 MW, 2 200 MW, and 600 MW respectively.

2.4 The Northern Cape Provincial Spatial Development Framework (2012)

As noted in the Northern Cape Provincial Spatial Development Framework (PSDF), published in 2012, the strong winds along the coastline of the Province provide a potential comparative economic advantage and could provide an alternative source of energy. Coupled with this, the PSDF aims in Section C8 under Energy Objectives to "(a) Promote the development of renewable energy supply schemes. Large-scale renewable energy supply schemes are strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimizing detrimental environmental impacts…. There is a national electricity supply shortage and the country is now in a position where it needs to commission additional plants urgently. Consequently, renewable energy projects are a high priority".

2.5 District and local planning documents

Economic development requirements inform spatial planning and related planning interventions. It is therefore important for a proposed development to be in line with the spatial planning of the municipality, albeit on a provincial or local level. IDPs and SDFs are the guiding documents in this regard. The SDF guides development to areas where municipalities have identified it as desirable. If a development it not in line with an IDP and SDF, there would need to be a clear motivation as to why the deviation from these plans should be approved. The following provincial and regional planning documents were found to be of relevance and are reviewed in more detail in the study:

- IDP of the Namakwa DM (2017-2022);
- IDP of the Nama Khoi LM (2014/2015), Second Revision; and
- SDF of the Nama Khoi LM (May 2014).

Considered as a whole, these documents recognise the importance of integrated and diversified economic development that makes optimal use of each area's comparative advantages. According to the Nama Khoi SDF, there is a proposal for a Wind Energy Corridor (Figure 1). The proposed Kap Vley WEF overlaps with this corridor (shown with the red star below) and is therefore in line with the spatial planning of the local municipality. In addition, the SDF notes that for Kleinzee, key focus areas should be on "*industries that support mari-culture; small-scale fishing; biofuels (seaweed) and wind energy projects. In addition to this, it is proposed that the linkage with the Kannikwa Vlakte wind farm to the north of Kleinzee be supported*" (page 118).

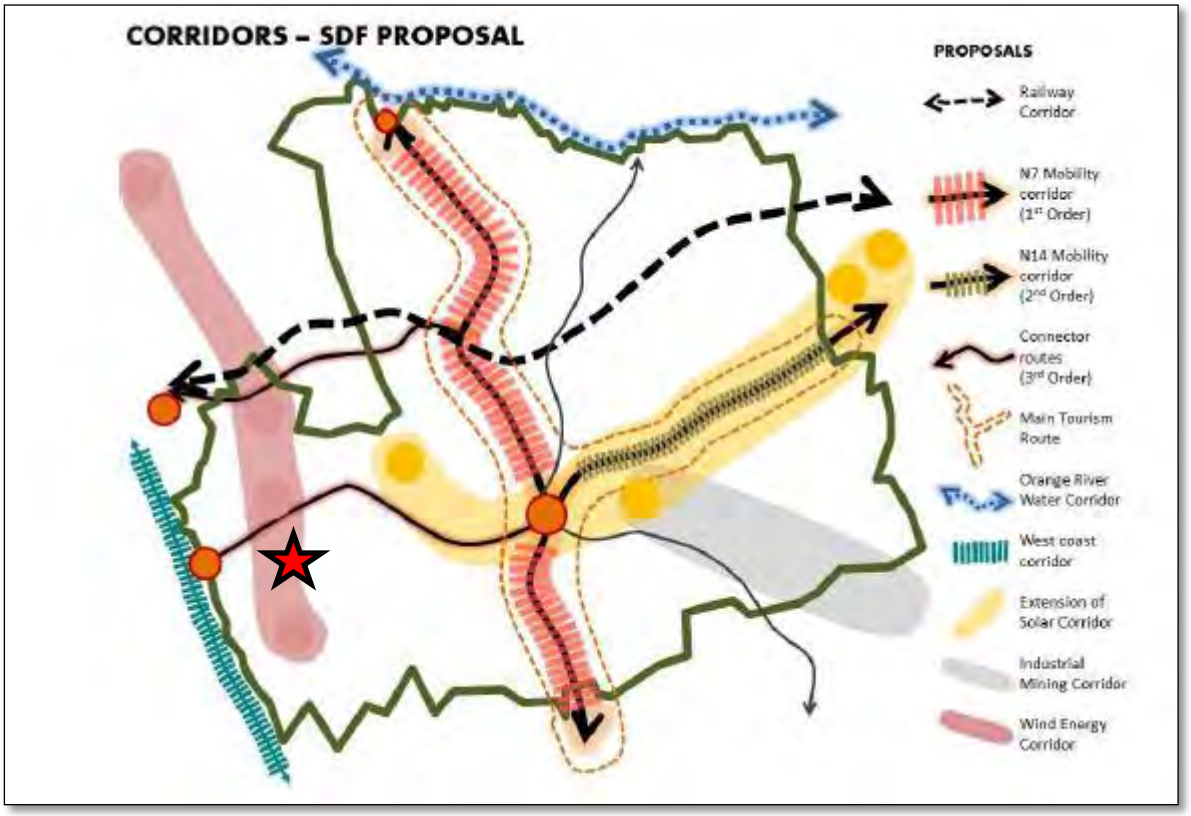


Figure 1. Nama Khoi SDF corridor proposal showing the proposed Kap Vley WEF being located in the identified Wind Energy Corridor.

3 DESCRIPTION OF THE AFFECTED SOCIO-ECONOMIC ENVIRONMENT

Socio-economic impacts and the respective significance of these impacts are highly dependent on the receiving social and economic environment or context in which the impacts occur. For example, a small community with high unemployment rates and a declining economy would experience impacts differently compared to a community where everyone is fully employed and there is a growing economy with various economic drivers.

Figure 2 shows the proposed Kap Vley WEF in relation to the closest towns or communities. As shown in the figure, the closest towns are Komaggas and Kleinzee. Both these towns fall within the Nama Khoi LM and the Namakwa DM, Northern Cape Province.

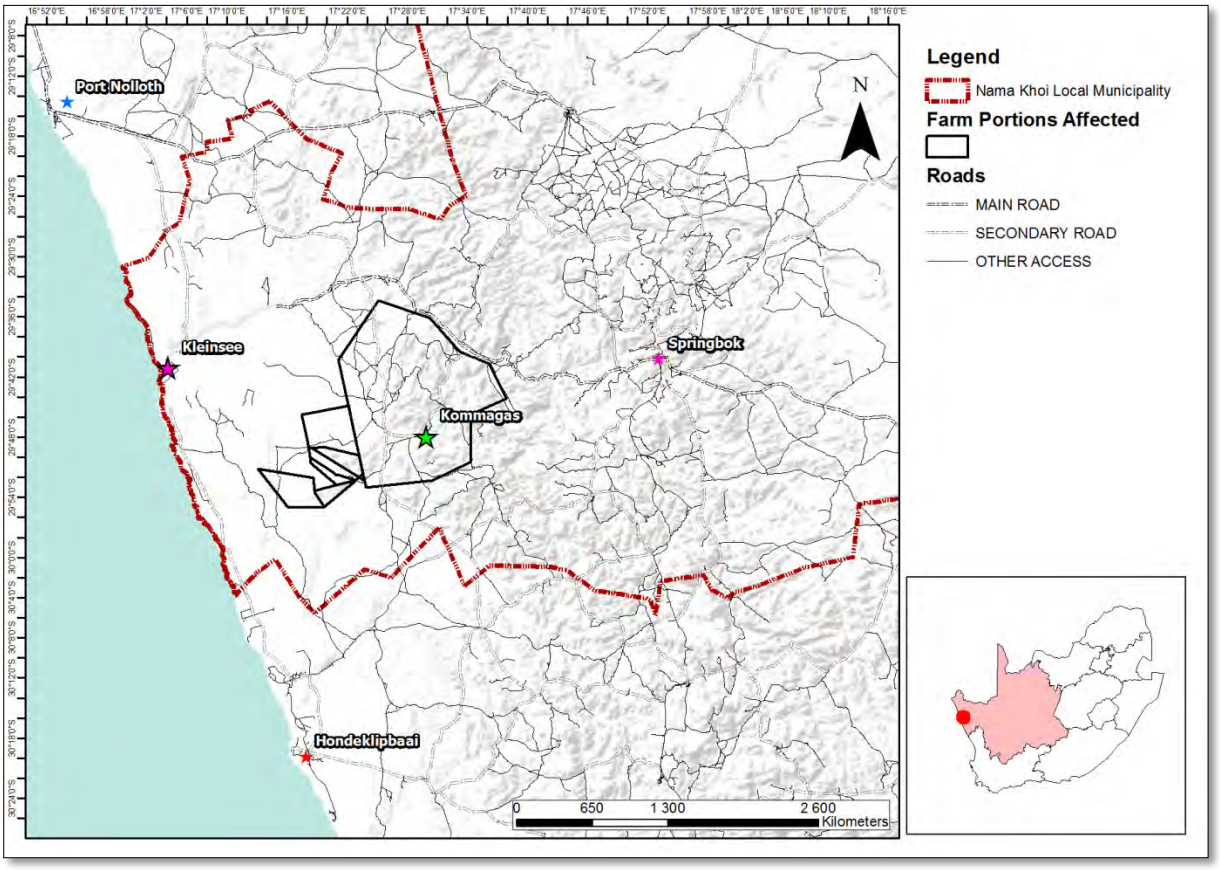


Figure 2. Location of the land portions affected by the proposed Kap Vley WEF and closest towns to the WEF

3.1 Results of engagement with affected parties

From the interviews, the overall consensus was that the proposed wind farm would be a welcome economic injection into an agricultural area that is very dependent on external factors, such as rainfall. The on-going drought of the last four years has put additional pressure on the farmers and it is reported that more than half of their sheep had to be sold to ensure that enough money is available to support the on-going farming practices.

A brief summary of the interviews are provided below:

Mr Deon Kotze (land owner)

Currently farms with sheep (Dorpers) and Meat Masters. He lives on the farm and goes to Springbok twice a month to purchase goods and for other services. Two workers reside permanently on the farm but their families do not live with them. Should the wind farm development realise, Mr Kotze will continue with his farming practices on site and indicated that the revenue from the wind farm will provide much needed support to making his farming enterprise more resilient.

Mr Albertus Roux (land owner)

Mr Roux farms with Dorpers and goats. He lives in Kammieskroon and drives to his farm once a week. He has no permanent workers on his farm. Should the wind farm realise, he will most likely consider introducing game to his farm that would require a lower carrying capacity and thereby reduce the pressure on his veld. This will ensure that his veld has time to recover from the current drought.

Mr and Mrs Engelbrecht (adjacent land owner)

Farms predominantly with Dorpers and Damara sheep. Mr and Mrs Engelbrecht live permanently on the farm and drive to Springbok to buy groceries, although Kleinzee has a couple of smaller shops that do sufficiently support the local residents. No workers live permanently on the farm. Mrs Engelbrecht indicated that the introduction of new development, specifically wind, would be a welcome economic injection to the area.

3.2 Surrounding land-uses

According to the Soils and Agricultural Potential Assessment low intensity grazing is the only agriculture activity undertaken in the area (Lanz, 2018). Subsistence farming is also undertaken where irrigation is available, particularly in the Komaggas settlement. Grazing farms tend to be large and farmsteads far apart in the semi-arid landscape. According to the Visual Imapact Assessment diamond mining took place in the past but appears to have largely ceased (Oberholzer and Lawson, 2018).

3.3 Tourism profile

Tourism impacts are often driven by changes to the Sense of Place of an area. The Nama Khoi SDF states that “the conservation areas and natural heritage wonders in the municipal area should be strengthened and marketed in order to create a unique ‘Sense of Place” for the Nama Khoi Local Municipality. The recreational and tourism potential of these places of interest should also be further exploited”. Furthermore, the SDF states that tourism is seen as the potential new contributor to economic development. These statements show that the LM has tourism orientated goals that should be considered as part of this project but also that currently, tourism is not the most important economic sector in the local and regional economy.

The proposed WEF is located 22 km from the Namaqua National Park. The park’s main tourist attraction is the spring bloom of brightly coloured flowers and it is estimated that 100 000 visitors come to the park on an annual basis. As shown in Figure 1 of this assessment, the LM identified the N7 and road from Springbok to Upington as main tourism corridors. The proposed Kap Vley WEF and associated infrastructure do not fall within this corridor.

Currently, the Kleinzee tourism activities include:

- 4x4 and Mine Tours;
- Kleinzee Museum;
- Kleinzee Nature Reserve; and
- Seal Colony.

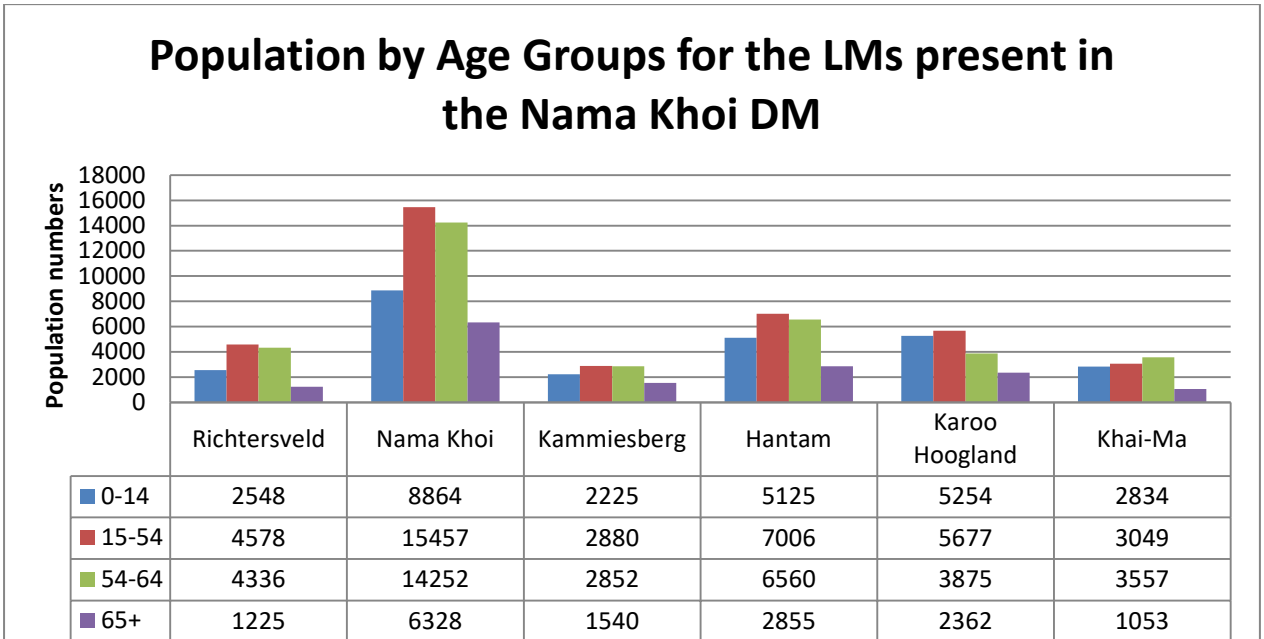
3.4 Demographic profile

The **Namakwa DM** is one of five district municipalities within the Northern Cape Province. The main seat of the DM is located in Springbok. According to the Namakwa DM's IDP (2017-2022), the DM is the least populated DM in the Northern Cape Province. The DM consists of seven LMs, including the **Nama Khoi LM** in which the proposed development occurs.

The Nama Khoi LM is divided into nine wards:

- Ward 1: Concordia, Gamoep
- Ward 2: Steinkopf, Rooiwal, Goodhouse, Vioolsdrift
- Ward 3: Steinkopf South, Bulletrap
- Ward 4: Carolusberg, Springbok, Fonteintjie, and part of Bergsig
- Ward 5: Bergsig
- Ward 6: Okiep, Rooiwinkel, Kouroep
- Ward 7: Bergsig Vaalwater, Matjieskloof
- Ward 8: Komaggas, Kleinzee, Buffelsrivier
- Ward 9: Nababeep

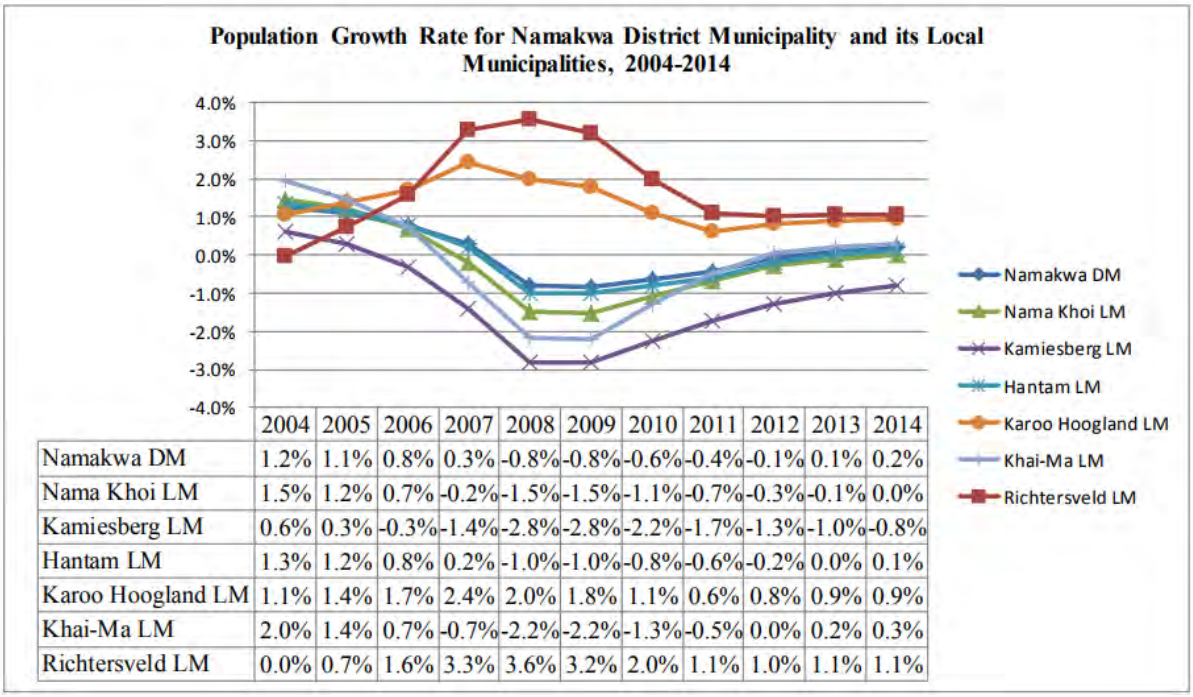
Figure 3 shows the age group distribution of the population present within each LM forming part of the Namakwa DM. The Nama Khoi LM has the highest population group within the 15-54 and 54-64 age groups. The overall dominant age group within the DM is the 15-54 age group, which, according to the Namakwa DM IDP, shows that within the DM there is need for job creation and new employment opportunities.



	Richtersveld	Nama Khoi	Kammiesberg	Hantam	Karoo Hoogland	Khai-Ma
0-14	2548	8864	2225	5125	5254	2834
15-54	4578	15457	2880	7006	5677	3049
54-64	4336	14252	2852	6560	3875	3557
65+	1225	6328	1540	2855	2362	1053

Figure 3. Population by age groups for the LMs present within the Nama Khoi DM (Nama Khoi DM IDP, 2017)

Within the DM, the population growth rate declined during 2008 to 2012 and then increased slightly in 2013 and 2014. Within the period from 2004 to 2014, the overall population growth within the DM has declined (Figure 4). The only LM that has shown a constant growth rate is the Richtersveld and Karoo Hoogland LMs. The Nama Khoi LM showed a steady decline in population growth rates in the period 2007 to 2013 and a zero percent growth rate in 2014.



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Namakwa DM	1.2%	1.1%	0.8%	0.3%	-0.8%	-0.8%	-0.6%	-0.4%	-0.1%	0.1%	0.2%
Nama Khoi LM	1.5%	1.2%	0.7%	-0.2%	-1.5%	-1.5%	-1.1%	-0.7%	-0.3%	-0.1%	0.0%
Kamiesberg LM	0.6%	0.3%	-0.3%	-1.4%	-2.8%	-2.8%	-2.2%	-1.7%	-1.3%	-1.0%	-0.8%
Hantam LM	1.3%	1.2%	0.8%	0.2%	-1.0%	-1.0%	-0.8%	-0.6%	-0.2%	0.0%	0.1%
Karoo Hoogland LM	1.1%	1.4%	1.7%	2.4%	2.0%	1.8%	1.1%	0.6%	0.8%	0.9%	0.9%
Khai-Ma LM	2.0%	1.4%	0.7%	-0.7%	-2.2%	-2.2%	-1.3%	-0.5%	0.0%	0.2%	0.3%
Richtersveld LM	0.0%	0.7%	1.6%	3.3%	3.6%	3.2%	2.0%	1.1%	1.0%	1.1%	1.1%

Figure 4. Population growth rate of the DM as well as the LMs (Nama Khoi DM IDP, 2017).

3.5 Economy

Within the DM, several sectors contribute to the municipality's economy and the Gross Domestic Product (GDP). The Nama Khoi LM is the largest contributor to the Namakwa DM's GDP. Figure 5 shows the various sectors that contributed to each LM's economy. The contributing sectors include agriculture, mining, electricity, construction and trade.

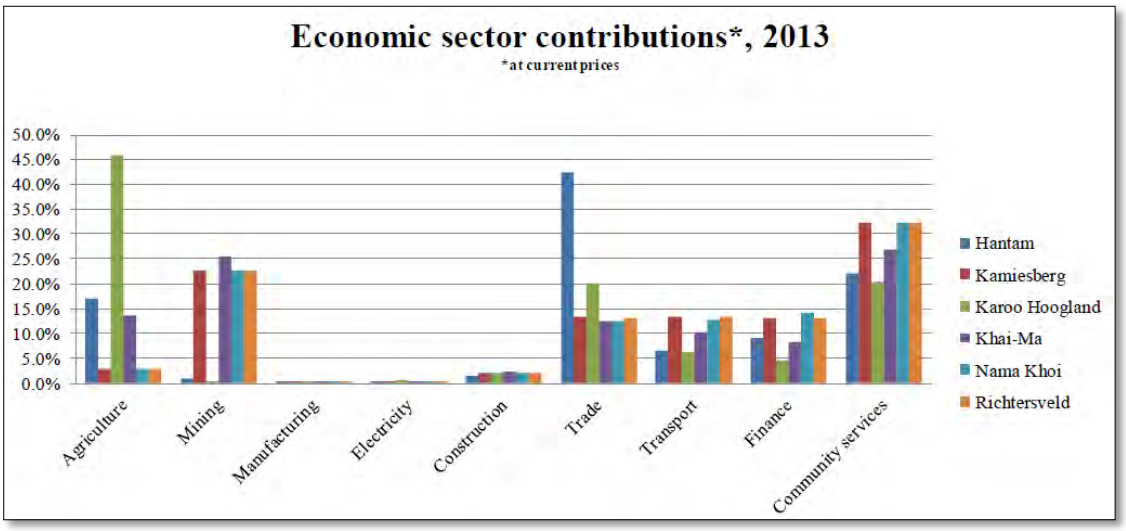


Figure 5. Sectors contributing to the LM's local economies in 2013

The largest sector within the LM is community services. When comparing the growth rates of the Nama Khoi LM in 2004 and 2014, most of the sectors have seen growth with the exception of the finance sector (Table 2).

Table 2. Sector growth rates for the Namakwa DM and associated LMs (2004 and 2014).

	Agriculture		Mining		Manufacturing		Electricity		Construction		Trade		Transport		Finance		Community services		Total Industries	
	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014	2004	2014
Richtersveld LM	-12.5%	6.1%	0.8%	-2.4%	-6.4%	-1.2%	-5.5%	-3.5%	-8.1%	0.4%	-6.0%	0.7%	-5.1%	1.3%	11.3%	0.0%	-8.7%	1.1%	-0.2%	-1.4%
Nama Khoi LM	-11.7%	4.5%	-2.2%	-2.4%	-4.1%	-1.2%	-5.4%	-2.6%	-6.0%	1.0%	-3.5%	-0.4%	-3.0%	2.0%	20.1%	-0.4%	-6.9%	1.4%	-1.3%	-2.5%
Kamiesberg LM	-12.9%	3.7%	0.9%	-2.4%	-4.9%	-1.5%	15.6%	-3.1%	-6.9%	0.2%	-4.7%	-0.9%	-3.9%	1.2%	16.9%	-0.6%	-7.7%	0.8%	0.0%	-1.4%
Hantam LM	2.3%	4.6%	16.9%	-2.4%	11.6%	0.3%	23.7%	-1.8%	9.9%	1.9%	12.2%	0.6%	13.4%	2.7%	26.0%	1.5%	9.1%	2.4%	10.7%	2.2%
Karoo Hoogland LM	5.4%	5.7%	11.5%	-2.4%	15.1%	1.8%	23.9%	-0.8%	13.2%	2.9%	15.0%	1.8%	17.1%	3.3%	27.8%	3.5%	12.3%	3.2%	12.0%	3.7%
Khai-Ma LM	-8.4%	4.4%	0.7%	-4.1%	-0.2%	-1.1%	5.0%	-2.1%	-2.2%	1.2%	0.4%	0.2%	1.0%	2.0%	20.7%	-0.2%	-3.1%	1.8%	1.0%	-2.3%
Namakwa DM	5.1%	0.5%	-3.9%	-0.7%	-0.2%	1.1%	-2.2%	4.1%	1.7%	-0.6%	0.5%	3.5%	2.5%	2.9%	0.7%	20.8%	2.2%	-0.9%	-0.2%	1.5%

Source: Global Insight, 2015 [Version 832(2.5q)]

3.5.1 Labour force and Employment Structure

In 2011, in the dominant age group (15-64), the employment status of the majority of the people are "not economically active", while the second highest employment status shows that people are "employed". The unemployment rate in 2011 was 22,9%, which is slightly lower than the national (26,6%) and provincial (27,1%) percentages.

The average household in the Nama Khoi LM earns between R 19 601- R 38 200 per annum (Figure 6). Even though the majority of the population is "not economically active", the average household income shown in the figure may be attributed to the grants used within the LM. According to the Nama Khoi IDP, approximately 48.6 % of the population receives a "child support grant" and 18.4% receives a "disability grant".

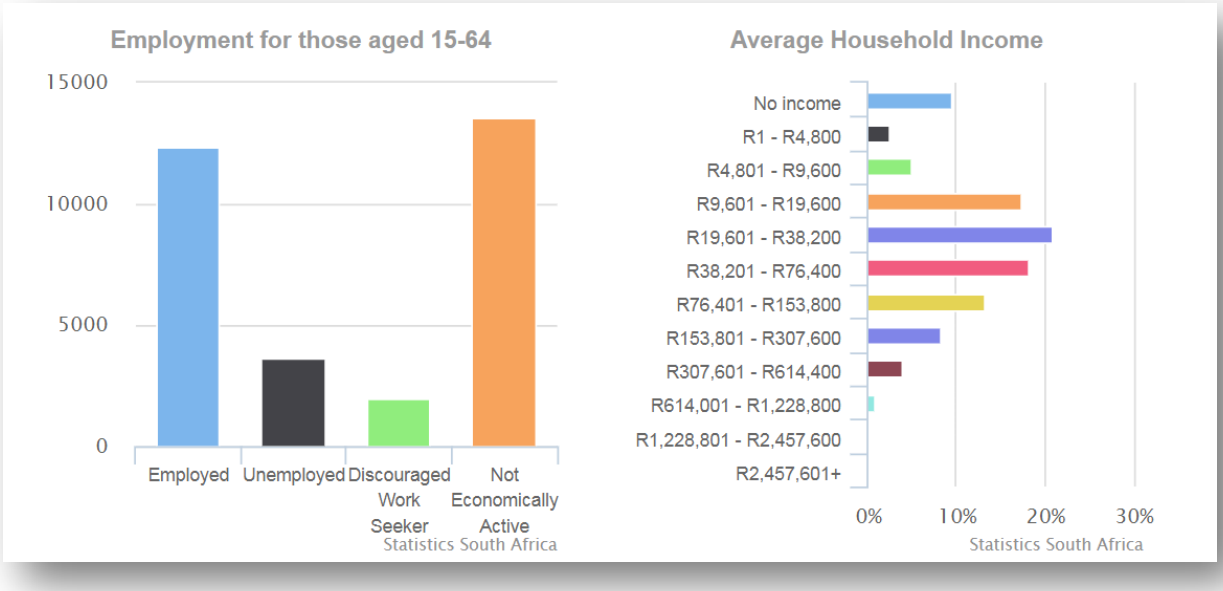


Figure 6. Economic figures for the Nama Khoi LM. Employment figures (left) and average household incomes (right) (StatsSA, 2013)

In terms of the main sectors that contribute to employment opportunities within the LM, the majority of the residents are employed in General Government (21,7%), Community, Social and Personal Services (17,3%), Wholesale and Retail Trade, Catering and Accommodation (17,3%) and Mining (16%). The majority of the LM's population is employed in the following occupations: elementary occupations (21,4%), craft and related trade workers (11,9%) and service workers, shop and market sales workers (11,4%). According to the Nama Khoi LM, this shows that there is limited professional skills in the area.

3.5.2 Access to services and state of local built environment

Access to services (water, electricity, sanitation) show the standard of living of the people in the area. The availability or access to roads, educational facilities, hospitals or clinics further show the state of the living conditions.

Access to water and sanitation

Within the LM, 74,9% of households have access to piped water inside their dwelling, while 21 % have access to piped water inside their yard. In terms of access to sanitation, 63,5 % of the LM's population has access to a flush toilet system (connected to a sewerage system), with 10,9 % has access to a flush toilet with a septic tank and 10,4% a pit toilet with ventilation.

Housing

The majority of the population (80,2%) of the LM lives in a house or brick structure on a separate stand or yard, while the second highest percentage (5,5%) live in a traditional dwelling/structure made of traditional materials. This is in-line with the DM and province's percentages.

The Nama Khoi IDP notes that even though the majority of the households have access to basic services, rural areas are experiencing an increase in backlogs in electricity provision, housing, access to water and sanitation. This can mostly be attributed to the increase in the number of households within the LM and the lack of capacity of the LM to keep up with the demand for basic services.

3.5.3 Health

The HIV/AIDS prevalence in the Nama Khoi LM has nearly doubled during 2001 to 2010, with a growth rate of 62,8 %. In 2010, the estimated percentage of the LM's population that was infected was 6%. The infection rate within the LM is higher than the DM (60,8%) and the province (46,2%). The Nama Khoi IDP notes that the rate and real percentage of the population that are infected may be higher due to not all the cases being reported. Ms Marman form Komaggas Clinic confirmed that there is a stigma associated with the virus which in turn means some infected community members do not seek treatment and/or tell people that they are infected. In terms of tuberculosis (TB), Ms Marman indicated that of the more or less 5000 people living in Komaggas, only 5 are currently being treated for TB. She also noted that the rate of teenage pregnancies is high within the community.

3.5.4 Kleinzee and Komaggas

According to a Mail and Guardian article in 2011, Kleinzee was established as a mining town in 1926. The town was supported by the mining company, De Beers, through the supply of free services such as water and electricity as well as 25 recreational clubs including a golf course, tennis courts and a swimming pool. At the peak of the mine, it was estimated that a million carats of diamonds were mined in the area per year. In the 1980's it was estimated that 3 000 people were employed in Kleinzee and the population was close to 6 000 people. In 2007, De Beers significantly scaled down their operations in the town and linked to this, residents lost their jobs and moved away. De Beers has subsequently sold their Namaqualand Mines to Transhex in 2011 and only a small amount of mining is still occurring in the area, approximately 100 000 carats a year. Rehabilitation efforts by Transhex are however still providing jobs to a limited number of residents. Within the town, most of the houses are empty and limited services are still available (Stilwell, 2011).

During the site visit in August 2017, a resident indicated that recently the pharmacy and the butchery closed. The Cape Times noted in 2013 that only 10 children were enrolled at the town's preprimary school and 50 children in the primary school. Kleinzee does not have a high school or hospital

(Dolley, 2012). According to the census data of 2011, Kleinzee had a total population of 728, with an average household size of 1,9 (StatsSA, 2013).

Komaggas is named after a tributary of the Buffelsrivier. Historically the area was established as a station of the London Missionary Society in 1829. According to the census data of 2011, Komaggas has a population size of 3116 with an average household size of 3,7 (StatsSA, 2013). According to the Nama Khoi SDF, because of the low population threshold and isolation of Komaggas, development strategies should be focused on developing human capital. For instance, it would not be feasible to develop schools and hospitals in Komaggas and as such mobile services such as clinics and libraries should be the main focus for investment. Learners should be transported to Springbok's schools.

Based on the demographic profiles of the two towns, the following comparisons can be made (as shown in the figures below). The majority of the residents in both towns are coloured (Figure 7). As shown in Figure 8 below, the majority of the people living in Kleinzee are in the age group between 45 - 49, with the second largest group of age 20 - 24. Compared to Kleinzee, the majority of the Komaggas population is aged between 0 – 29 years which shows a much younger population group. The lowest percentage of people in Komaggas is in the 35 – 39 age group. In terms of the highest education level reached by individuals within Kleinzee and Komaggas; the majority of the population in Kleinzee has completed secondary school, while the majority of residents in Komaggas has some secondary school grades completed (Figure 9).

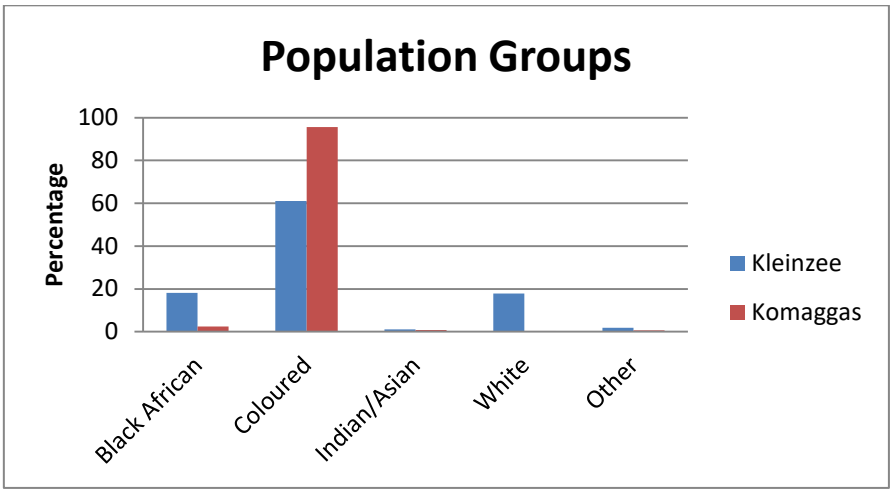
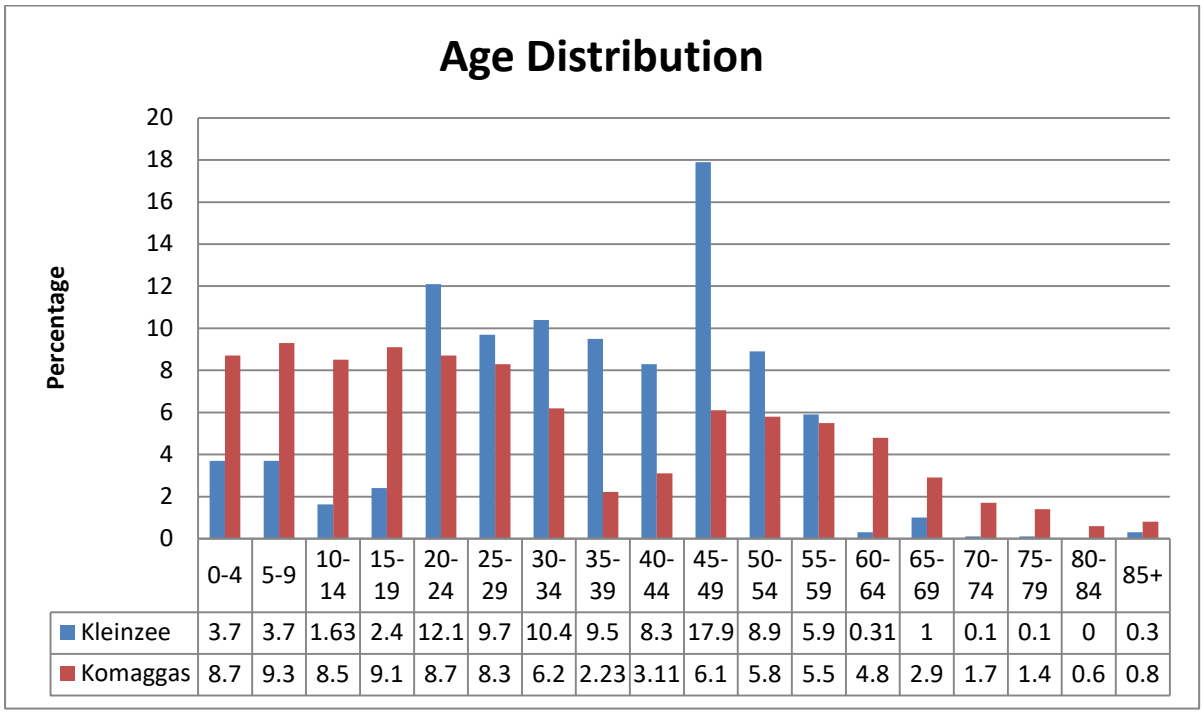


Figure 7. Population groups residing within Kleinzee and Komaggas (2011) (StatsSA, 2013).



	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Kleinzee	3.7	3.7	1.63	2.4	12.1	9.7	10.4	9.5	8.3	17.9	8.9	5.9	0.31	1	0.1	0.1	0	0.3
Komaggas	8.7	9.3	8.5	9.1	8.7	8.3	6.2	2.23	3.11	6.1	5.8	5.5	4.8	2.9	1.7	1.4	0.6	0.8

Figure 8. Age distribution within Kleinzee and Komaggas (2011) (StatsSA, 2013)

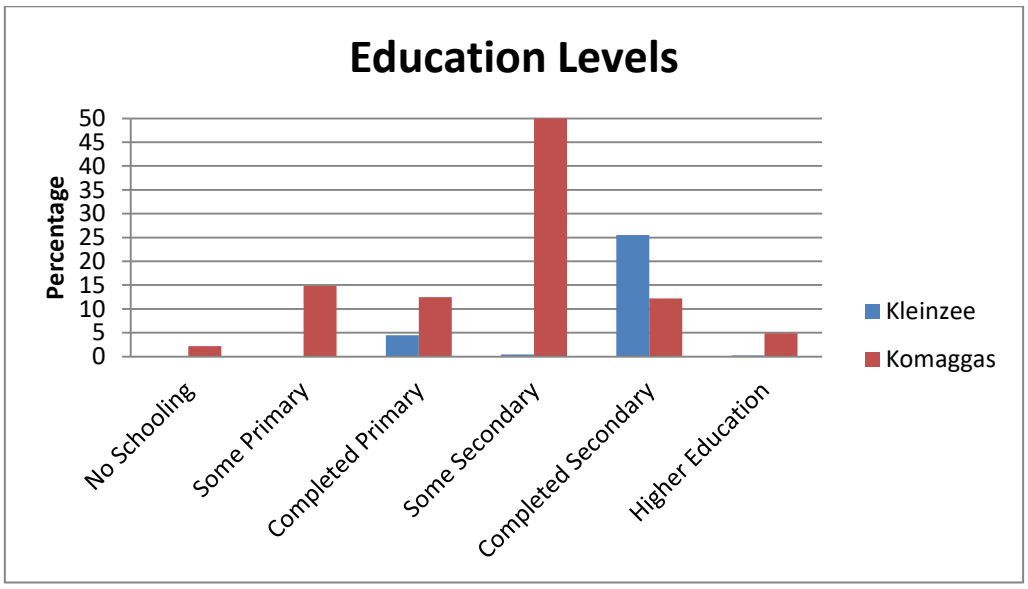


Figure 9. Highest education levels achieved by population in Kleinzee and Komaggas (2011) (StatsSA, 2013)

According to the Community Survey (2007) included in the Nama Khoi IDP in 2001, the unemployment rate in Kleinzee was 5% and 41% for Komaggas. The Labour Participation Rate, which refers to the measure of the economy's labour force who is either employed or actively looking for work, was 89% and 68% for Kleinzee and Komaggas, respectively (StatsSA, 2008).

4 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO SOCIO-ECONOMIC IMPACTS

In terms of a WEF and associated electrical infrastructure development, there are normally three key phases which have a potential to impact on the socio-economic context of the area. The key phases and the project aspects related to the socio-economic assessment are outlined below:

Construction phase

- Construction staff required to construct the WEF and associated infrastructure on site;
- Visibility of construction and WEF infrastructure; and
- Project expenditure.

Operational phase

- Operational staff required to maintain and manage the WEF;
- Visibility of WEF and associated infrastructure; and
- Project expenditure.

Decommissioning phase

- Decommissioning staff required to decommission the WEF and associated infrastructure;
- Visibility of structures to decommission WEF infrastructure; and
- Loss of project expenditure.

5 IDENTIFICATION OF KEY ISSUES

5.1 Key Issues Identified During the Scoping Phase

The following key issues, based on the project aspects (as discussed within in Section 4 of the report) have been identified:

- Staff required to construct, operate and decommission the WEF and associated infrastructure on site, will cause an **influx of people and impact on surrounding landowners associated with the presence of workers**;
- The WEF and associated infrastructure will be visible which may have an impact on **tourism** and **surrounding property values**;
- The landowner will have an alternative land-use for his property, which will **diversify his income stream**;
- The project owner would need to employ people to work on the project and potentially source materials from local businesses, thereby **creating local employment opportunities** and **income for other sectors**; and
- The project owner would need to spend their Social and Economic Development (SED) budget in the local area, potentially **providing benefits to the local communities**.

5.2 Identification of Potential Impacts for all phases of the development

To note, the identification of impacts and their respective significance have been grouped together in certain instances. This has been undertaken to ensure that double counting of impacts do not occur. Based on the key issues identified above, the following key impacts have been determined and are discussed in the section below:

- Impact 1: Influx of people
- Impact 2: Impact of employment opportunities
- Impact 3: Impact on surrounding landowners associated with the presence of workers
- Impact 4: Project expenditure
- Impact 5: Visibility, operation and audibility of the development

6 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

6.1 Construction Phase

6.1.1 Influx of people

Nature of the impact

A socio-economic assessment undertaken by Urban-Econ noted that due to the WEF developments within the Loeriesfontein area, the town experienced an influx of people who want to benefit from the WEF development through either employment or other economic opportunities indirectly offered by the WEF (Urban-Econ, 2017). Therefore, with the development of the proposed Kap Vley WEF and associated electrical infrastructure it is likely that job seekers will be attracted to the towns of Kleinzee and Komaggas. Such an influx generally causes a disturbance in the existing social order as prevailing leadership, kinship and social control mechanisms are challenged by new and alternative values, beliefs and practices. Disturbance of the existing social order commonly results in the deterioration of social capital and general disorientation of affected communities (du Toit, 2014).

Furthermore, in-migration is likely to place additional strain on formal housing and bulk services. This can lead to a growth in housing needs which may place additional pressure on the LM that already notes within the IDP that there is a backlog in delivering these services due to the increase in people coming into area.

On a community level, there may be concerns that the influx of people will be associated with a negative impact on social structures and increased crime levels. These types of impacts usually stem from people coming to the area, hoping to get work without success but can also occur when they do find work (Van Zyl, 2012).

Significance of impact without mitigation measures

The impact is rated as having a high significance (negative) rating before mitigation.

Proposed mitigation measures

- Initiating the education campaign among the local community (in partnership with the community members already active in the area) focusing on alcohol abuse, drug abuse, HIV/AIDS, Sexually Transmitted Diseases etc. prior the start of construction and maintaining these throughout the project's duration.

- The applicant and the contractor should implement an HIV/AIDS awareness programme for all workers at the outset of the construction phase.
- Arrangements must be made to enable workers from outside the area to return home over the weekends/at regular intervals. This would reduce the risk posed by non-local construction workers to local family structures and social networks.
- Make condoms freely available to employees and all contractor workers.
- Introduce alcohol testing on a weekly basis for construction workers.
- Developing a Code of Conduct for all employees related to the project, which includes no tolerance of activities such as alcohol and drug abuse.
- Recruitment should be done following a transparent approach and adequately communicated in the area to limit the chances of people staying for longer period in hope of finding a job.

Significance of impact with mitigation measures

The impact is rated as having a moderate significance (negative) rating after mitigation.

6.1.2 Impact on employment during the construction phase

Nature of the impact

Based on the information supplied by juwi, during the construction phase, it is expected that approximately 323 job opportunities, of which 140 opportunities will be provided to residents within the local area, will be created during the 24 month construction period. It is anticipated that of the total job opportunities, 12 % will be of medium to highly skilled and 31 % of low skilled people from the local workforce (within the local municipality) (Table 3). In addition, it is anticipated that skills development of those employed as part of the WEF development will occur.

As discussed within this assessment, the majority of the people living in Kleinzee are in the age group between 45 - 49, with the second largest group of age 20 - 24. Comparatively, the majority of the Komaggas population is aged between 0 – 29 years which shows a much younger population group. In terms of the highest education level reached by individuals within Kleinzee and Komaggas; the majority of the population in Kleinzee has completed secondary school, while the majority of residents in Komaggas have some secondary school grades completed. Specifically for Komaggas, an opportunity therefore exists to employ the community for the low skilled activities required.

Table 3. Employment opportunities and source of employees during the construction phase

	Construction job opportunties		
	Medium to highly skilled	Low skill	Total
Anticipated % of total workers to be sourced from local municipal area	12%	31%	
Number of workers from the local area	40	100	140
Anticipated % of total workers to be sourced from the province	12%	31%	
Number of workers from the province	40	100	140
Anticipated % of total workers to be sourced from South Africa	13%	0%	
Number of workers from the rest of South Africa	41	0	41
Anticipated % of total workers to be sourced from overseas	1%	0	
Number of workers from overseas	2	0	2
Total anticipated employment opportunities			**323**

Significance of impact without mitigation measures

The impact is rated as having a moderate significance (positive) rating before mitigation.

Proposed mitigation measures

- Implement a 'locals first' policy with regard to labour needs. This can be incorporated into a Workforce Recruitment Policy. The Workforce Recruitment Policy should include:
  - A clear definition of who is considered to be local residents; known as the Project Affected People (PAP). The purpose of demarcating the PAP is to develop a criterion of characteristics considered to identify a given job seeker as a PAP. Once this criterion is known; all subsequent job seekers can be screened against it in order to determine whether they receive preference for employment;
  - A database of local residents and their relevant skills and experience;
  - The selection criteria for allocating jobs;
  - Reserve employment, where practically possible, for local residents; and
  - Should be contractually binding.
- Where possible, subcontract to local construction companies
- Consultation with local authorities is essential so as to manage job creation expectations and ensure that all eligible workers in the primary study area are informed of the opportunities.
- Contracts ensuring that on-the-job training is included and enforced as a condition for the development of this project.
- To improve the chances of skills development during the construction phase, contractors are encouraged to provide learner-ships and encourage further knowledge sharing.
- To ensure that skills are adequately acquired, additional training programmes need to be held during the construction phase to prepare the identified community members to be employed at the next phase, i.e. the operational phase.
- Developers should be open to local recruitment processes and be willing to offer some skills transfer during this phase of the project to ensure the maximum utilisation local labour.
- Employ labour intensive construction methods, where economically feasible and technically possible.
- Establish a local skills desk to identify the skills set of the local residents available for the construction and operational phases of the WEF and the associated electrical infrastructure;

Significance of impact with mitigation measures

The impact is rated as having a high significance (positive) rating.

6.1.3 Impact on surrounding land owners associated with the presence of workers

Nature of the impact

As is often the case with large projects, there are concerns that due to the presence of workers there would be a risk of stock theft, poaching, increased veld fires and damage to farm infrastructure associated with the presence of workers on the site particularly during construction (Van Zyl, 2012).

Significance of impact without mitigation measures

The impact is rated as having a moderate significance (negative) rating before mitigation.

Proposed mitigation measures

Construction phase:

- No fires should be allowed onsite.
- No construction workers, with the exception of security personnel, will be allowed to stay on the site overnight.
- A complaints register must be available on site at all time to any individual who may have a complaint. These complaints must be noted and suitable action taken to address the complaint.
- The movement of workers on and off the site should be closely managed and monitored by the contractors. In this regard the contractors should be responsible for making the necessary arrangements for transporting workers to and from site on a daily basis;
- The Environmental Management Programme (EMPr) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested.
- The project owner is responsible to compensate neighboring land owners for losses incurred, if losses occurred are proven to be due to the development of the WEF and associated electrical infrastructure.

Significance of impact with mitigation measures

Should the mitigation measures be implemented, as outlined above, the impact significance would be reduced to low (negative) rating.

6.1.4 Impact of project expenditure and new economic opportunities

Nature of the impact

During the construction phase of the project, the WEF will provide an injection into the local economy via project expenditure. The positive impact of project expenditure during the construction phase can be measured by looking at increased income via employment opportunities. Direct household income would come from the wages paid during the construction phase of the project. These estimates were calculated by using an assumed average monthly salary for each skill category (R 4000 for low skilled and R 30 000 for medium and highly skilled employees) multiplied by the amount of direct jobs to potentially be created, as shown in Table 3. For these estimates the total income during the construction phase was based on a 24 month period. To note: these estimates should be treated as indicators and are not absolute. As shown in Table 4, total income to be created during the construction phase is estimated to be R 83 160 000. As noted in Section 3.5.1 of this assessment, the average household in the Nama Khoi LM earns between R 19 601- R 38 200 per annum (between R1633 – R 3183 per month). The additional income into the area will therefore also lead to an increased expenditure on local goods and services.

Table 4. Total household income during the construction phase (2017 Rands)

	Income during the construction phase		
	Medium to highly skilled	Low skill	Total
Number of workers from the local area	R 28 800 000.00	R 9 600 000.00	R 38 400 000.00
Number of workers from the province	R 28 800 000.00	R 9 600 000.00	R 38 400 000.00
Number of workers from the rest of South Africa	R 4 920 000.00	R -	R 4 920 000.00
Number of workers from overseas	R 1 440 000.00	R -	R 1 440 000.00
Total			**R 83 160 000.00**

The is also the potential for an increase on other economic opportunities that can be created due to the development of the Kap Vley WEF and associated electrical infrastructure. An Urban-Econ report noted that in Loeriesfontein "Subsequent to the establishment of wind farms in the area, new economic opportunities in Loeriesfontein town have emerged. Public transport has benefitted as a result of the increased demand for the transportation of workers to and from construction sites. Cleaning services have also provided work opportunities for unemployed individuals whilst informal trading amongst residents has also increased and has stimulated further income and job creation in the town. Wind farm construction companies either pay their workers once a month or every fortnight; this has resulted in more money in circulation as the purchasing power of local residents also increased. This is important as it may assist in reducing the number of people living below the poverty line. Upon consultation, one farmer went to the extent of sharing that poverty levels have been slightly alleviated in the Loeriesfontein town" (Urban-Econ, 2017).

Significance of impact without mitigation measures

The impact is rated as having a high significance (positive) rating before mitigation.

Proposed mitigation measures

- Engage with local communities (Kleinzee and Komaggas) with respect to their possible involvement during construction in providing supporting services such as catering, temporary housing of workers, transportation, etc.
- The proponent must procure goods and services, as far as practically possible, from within the project area. Only if required goods and services are not affordably and readily available in the study area should the proponent seek to obtain it elsewhere. It is also suggested that regularly required goods and services (e.g. food and accommodation) be obtained from as large a selection of service providers as possible to ensure distribution of project benefits.

Significance of impact with mitigation measures

The impact is rated as having a high significance (positive) rating after mitigation.

6.2 Operational Phase

6.2.1 Creation of long-term employment during operation and maintenance

Nature of the impact

For the operational phase, which is expected to be 20 years, a total of 35 job opportunities will be created. It is estimated that 29 % of medium to highly skilled workers and 71 % of the low skilled workers will be locally sourced (Table 5). The remaining job opportunities will be sourced from outside the local area. From the primary and secondary data sources it can be concluded that the economy of the LM requires integrated and diversified economic development. The long-term job opportunities

may provide income resilience to some community members employed by the WEF. This supported by the observations noted in an Urban-Econ report, whereby the Loeriesfontein community depends on income from farming activities and the introduction of WEFs into the area created a source of alternative income to the community (Urban-Econ, 2017).

In terms of skills development during the operational phase to those that are permanently employed; it is anticipated, the low skilled workers will benefit from the skills transfer and knowledge development. This will contribute to building on or expanding their skills set.

Table 5. Employment opportunities and source of employees during the operational phase

	Operational job opportunties		
	Medium to highly skilled	Low skill	Total
Anticipated % of total workers to be sourced from local municipal area	29%	71%	
Number of workers from the local area	5	12	17
Anticipated % of total workers to be sourced from the province	29%	71%	
Number of workers from the province	5	12	17
Anticipated % of total workers to be sourced from South Africa	100%	100%	
Number of workers from the rest of South Africa	1	0	1
Anticipated % of total workers to be sourced from overseas	0%	0%	
Number of workers from overseas	0	0	0
Total anticipated employment opportunities			**35**

Significance of impact without mitigation measures

The impact is rated as having a moderate significance (positive) rating before mitigation.

Proposed mitigation measures

- Where possible, ensure that the local community members are prioritised for the allocation of the created jobs.
- Contracts ensuring that knowledge sharing and on-the-job training should be enforced as a condition for the development of the project.

Significance of impact with mitigation measures

The impact is rated as having a high significance (positive) rating.

6.2.2 Impact of project expenditure and long-term diversification of the economy

Nature of the impact

During the operational phase of the project, the project will provide an injection into the local economy via project expenditure. The positive impact of the project expenditure can be measured by looking at increased income via employment opportunities. The estimates were calculated by using an assumed average monthly salary for each skill category (R 4000 for low skilled and R 30 000 for medium and highly skilled employees) multiplied by the amount of direct jobs to potentially be created, as shown in Table 5. For these estimates the total income during the operational phase was based on a 20 year period. To note: these estimates should be treated as indicators and are not absolute. In addition, no incremental increase because of inflation (i.e. wages are constant) was assumed for the income generated during operational phase. As shown in Table 6, total income to be created during the operational phase is estimated to be R 102 240 000.

Most of the employment opportunities will be created during the construction phase. While temporary employment opportunities are not ideal, it would still provide an income to people who would not

necessarily have access to other forms of income. This would indirectly contribute to the overall well-being of families and the community.

Table 6. Total household income during the operational phase (2017 Rands)

	Income during the operational phase		
	Medium to highly skilled	Low skill	Total
Total income of workers from local area	R 36 000 000.00	R 11 520 000.00	R 47 520 000.00
Total income of workers from province	R 36 000 000.00	R 11 520 000.00	R 47 520 000.00
Total income of workers from the rest of South Africa	R 7 2000 000.00	-	R 7 2000 000.00
Total income of workers from overseas	-	-	-
Total			**R 102 240 000.00**

The Nama Khoi SDF indicates that due to the declining mining sector, the LM must diversify its economy. The increased economic activity that will most likely occur due to the development of the Kap Vley WEF will diversify the local economy. The diversification could enhance the resilience of the local economy by making it less vulnerable to external shocks that may affect the economic sectors that the economy it currently dependent on.

Procurement of goods and services within the LM during the operational phase of the proposed project is likely to hold socio-economic benefits as a result of the multiplier effect (i.e. the increase in total income resulting from a new injection of spending). A secondary indirect impact might result from entrepreneurial development in the project area, whereby niche and/or supporting goods and service industries are developed in response to the demand created for such services in the area (Van Zyl, 2012).

In addition, feedback from the developer indicates that local communities will benefit in two ways from the project. The first will be through the SED commitments associated with the project, the scope of which is dependent on the requirements at the time, but currently approximately 2 % of project revenue would need to be allocated to the local communities. Secondly, the local Komaggas community is also a landowner through the municipality and will thus receive compensation in this regard to the value of approximately 1 % of project revenue. These findings are supported by the observations included within the Urban-Econ report which state that “due to the influx of people in the town, the economic impact has been positive for the town as a result of this; food and fuel sales have spiralled increasing businesses’ gross revenues and profits in an unprecedented manner.” (Urban-Econ, 2017)

Significance of impact without mitigation measures

The significance of the impact of project expenditure is considered to be high (positive) during the operational phase.

Proposed mitigation measures

- The economic development plans to be developed must be prepared by socio-economic experts, to ensure that they can be effectively implemented and managed, bringing maximum benefit to the community.
- Support local businesses as far as possible.
- Liaise closely with the local municipality and other stakeholders involved in socio-economic development in order to ensure that any projects are integrated into wider strategies and plans with regard to socio-economic development.
- Proponent/project owner needs to establish a relationship with the local authorities such as the Nama Khoi LM and local community leaders to ensure that the SED initiatives that are implemented during the pre-operational stage are aligned with the relevant needs of the Kleinzee and Komaggas communities.

- The fair and transparent application of the Department of Energy's (DoE) requirements for local benefit enhancement will require extensive interactions and engagement with the local community and its representatives. The applicant should therefore ensure that adequate time and resources are devoted to these activities.

Significance of impact with mitigation measures

The project expenditure will have a very high (positive) impact for the operational phase.

6.2.3 Impact of the visibility, operation and audibility of the development

Nature of the impact

As concluded by Dr Hugo van Zyl based on a literature review included in the socio-economic assessment undertaken for a proposed wind farm close to Murraysburg in 2015 (Van Zyl, 2013), the majority of the relatively limited evidence literature tends to indicate that overall significant negative property value from wind farms are uncommon. However, where negative impacts have been noted, were for cases where the turbines affected the Sense of Place of an area due its proximity to or alteration of natural features. As highlighted within the Visual Impact Assessment for the Kap Vley WEF, even though the turbines will be seen from various viewpoints, the significance of this on the Sense of Place is deemed to be moderate (Oberholzer and Lawson, 2018).

In addition, property values in the area may be impacted on if the current land-use is negatively impacted on. As indicated in Lanz (2018), it is unlikely that the agricultural potential or current agricultural activities on site will be threatened or impeded on by the WEF and associated infrastructure. The noise impact assessment undertaken by De Jager (2018) confirms that the significance of the noise impact from the Kap Vley WEF would be considered to be low.

Significance of impact without mitigation measures

Given that it is expected that the visibility, operation and audibility of the development will not affect the Sense of Place, future tourism plans (as outlined in the SDF), or the current land-use, the impact is considered to be of very low (negative) significance.

Proposed mitigation measures

- The mitigation measures proposed by the visual, agricultural and noise specialists should be adhered to.

Significance of impact with mitigation measures

The impact is considered to be very low (negative) following the implementation of the mitigation measures.

6.3 Decommissioning Phase

6.3.1 Impact of the loss of project expenditure

Should the WEF discontinue operations, following the 20 year operational period, it is expected that the project expenditure (as outlined within Section 6.2.2) will no longer exist. Potentially, the community would have become to reply on the economic opportunities associated with project expenditure.

Significance of impact without mitigation measures

This significance of this impact is expected to be moderate (negative).

Proposed mitigation measures

- When devising enterprise development initiatives, the focus should be on creating sustainable and self-sufficient enterprises. This would mean that following the operational phase, these enterprises may be able to continue to operate.

Significance of impact with mitigation measures

The impact is considered to be low (negative) following the implementation of the mitigation measures.

6.3.2 Loss of employment opportunities

If the WEF is decommissioned, the operational staff that were employed will not be required. The will mean that 35 permanent jobs will be lost, with 17 from the local area.

Significance of impact without mitigation measures

This significance of this impact is expected to be moderate (negative).

Proposed mitigation measures

Contracts ensuring that knowledge sharing and on-the-job training should be enforced as a condition for the development of the project. This will ensure that all employees will have acquired a skills set that will potentially enable them to find other work at similar developments.

Significance of impact with mitigation measures

The impact is considered to be low (negative) following the implementation of the mitigation measures.

6.4 Cumulative Impacts

Cumulative impacts must be considered for any development because individually a project may not have a significant impact but collectively similar projects may have significant impacts. The projects that form part of the cumulative assessment have been included in the Environmental Assessment Report. In total, four wind farms and three solar PV projects are proposed within 50 km from the proposed Kap Vley WEF. In addition, a 400 kV transmission line proposed by Eskom has also been approved within the area. The projects within the immediate surroundings are shown in Figure 10.

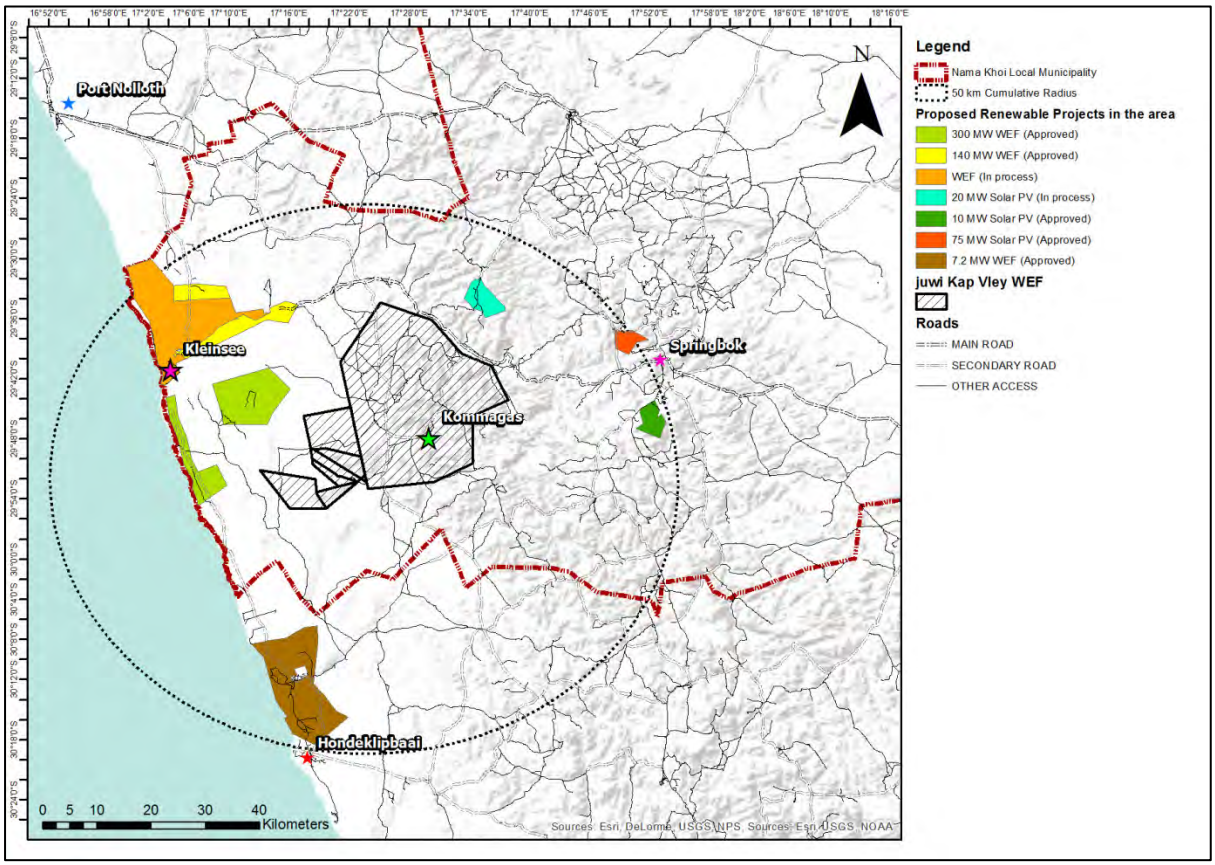


Figure 10. Renewable projects (wind and solar PV) approved or in process

For the cumulative assessment it should be noted that Kleinzee and Komaggas may not be the closest towns to the project and therefore any positive or negative cumulative impacts may not necessarily occur only within these towns. This is particular true for employment opportunities and project expenditure. However, cumulative impacts are considered on a regional level and therefore the towns that may be impacted on due to the development of the renewable projects and electrical infrastructure are Kleinzee, Komaggas, Springbok and Hondeklipbaai.

The EIA for the proposed Kleinzee 300 MW WEF, proposed by Eskom (Savannah Environmental, 2015) (shown in green in the figure above) concluded that the following cumulative impacts may apply: degradation of access roads, traffic congestion, nuisance impact to adjacent landowners, impact on farming practices, security issues and labour unrest. Overall, the study concluded that the negative cumulative socio-economic impact is considered medium and the positive cumulative socio-economic impact is considered to be high.

Based on the above and the impacts identified above, the following cumulative impacts may occur:

6.4.1 Influx of people

Should all the projects proceed within the region, there will be an influx of people and an increase of workers at the renewable energy projects. Given that there may be a higher expectancy of employment opportunities, this will facilitate a larger influx of people from outside the region which will in turn create other social problems. The impact would be manageable with the proposed mitigation measures outlined within Section 6.1.1. and will be spread across the towns of Kleinzee, Komaggas, Springbok and Hondeklipbaai. The significance of the cumulative impact will be moderate (negative).

6.4.2 Project expenditure

Positive project expenditure within the region may show other potential investors that the area is worth investing in, which will potentially create other investment opportunities within the region. This would be considered to have a high (positive) cumulative impact.

6.4.3 Visibility, operation and audibility of the development

A key concern, should all the projects be constructed within the region is that the Sense of Place of the region will be significantly impacted on and the property values will be negatively impacted on. Based on the findings of the Visual Impact Assessment, the cumulative impact is considered to be medium (Oberholzer and Lawson, 2018). Impact to tourism and property values will however be reduced due to the distances between the projects. The significance of the cumulative impact is therefore considered to low (negative).

7 IMPACT ASSESSMENT SUMMARY

Table 7. Impact assessment summary table

Impact pathway	Nature of potential impact/risk	Status[1]	Extent[2]	Duration[3]	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Significance of risk/opportunity = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk or opportunity (after mitigation)	Ranking of impact/ risk	Confidence level
CONSTRUCTION PHASE															
Influx of people	Influx of people causes a disturbance in the existing social order Additional strain on municipal services	Negative	Regional	Long-term	Severe	Very Likely	Low	Moderate	High	No	Yes	See Section .6.1.1	Moderate	3	Medium
Employment opportunities	Employment opportunities and skills development	Positive	Regional	Medium term	Substantial	Likely	Low	Moderate	Moderate	No	Yes	See Section 6.1.2	High	2	Medium
Impact on surrounding land owners associated with the presence of workers	The presence of workers presence of workers could increase the risk of stock theft, poaching, increased veld fires and damage to farm infrastructure	Negative	Local	Medium terms	Substantial	Likely	Low	Moderate	Moderate	No	Yes	See Section 6.1.3	Low	4	Medium
Project expenditure and new economic opportunities	Increased income via employment New economic opportunities	Positive	Regional	Medium term	Major	Likely	High	Low	High	No	Yes	See Section .6.1.4	High	2	Medium
OPERATIONAL PHASE															
Creation of long-term employment through operation and maintenance operations	Employment opportunities and skills development Alternative form of income	Positive	Regional	Long term	Substantial	Likely	Low	Moderate	Moderate	No	Yes	See Section .6.2.1	High	2	Medium
Project expenditure and long-term diversification of the economy	Increased income via employment New economic opportunities SED spending	Positive	Regional	Long term	Outstanding	Likely	High	Low	High	No	Yes	See Section 6.2.2	Very High	1	Medium
Impact of the visibility, operation and audibility of the development	The visibility, operation and audibility of the development make affect the Sense of Place	Negative	Regional	Long term	Slight	Not likely	High	Low	Very Low	No	Yes	See Section. 6.2.3	Very low	5	Medium
DECOMMISSIONING PHASE															

1 Status: Positive (+) ; Negative (-)

[2] Site; Local (<10 km); Regional (<100); National; International
[3] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 yrs); Long-term (project duration); Permanent (beyond project decommissioning)

Impact of the loss of project expenditure	Loss of Increased income via employment Loss of new economic opportunities Loss of SED spending	Negative	Regional	Long term	Substantial	Likely	High	Low	Moderate	No	Yes	See Section .6.3.1	Low	5	Medium
Loss of employment opportunities	Loss of employment	Negative	Regional	Long term	Substantial	Likely	High	Low	Moderate	No	Yes	See Section 6.3.2	Very low	5	Medium
CUMULATIVE IMPACTS															
Influx of people	Influx of people causes a disturbance in the existing social order Additional strain on municipal services	Negative	Regional	Long term	Substantial	Likely	Low	Moderate	High	No	Yes	See Section 6.4.1	Moderate	2	Medium
Project expenditure and long-term diversification of the economy	Increased income via employment New economic opportunities SED spending	Positive	Regional	Long term	Major	Very Likely	High	Low	High	No	Yes	See Section .6.4.2	High	2	Medium
Impact of the visibility, operation and audibility of the development	The visibility, operation and audibility of the development make affect the Sense of Place	Negative	Regional	Long term	Moderate	Not likely	High	Low	Low	No	Yes	See Section .6.4.3	Very low	5	Medium

8 CONCLUSION AND RECOMMENDATIONS

The study found that the two key towns that will be affected by the proposed Kap Vley WEF and associated electrical infrastructure are Kleinzee and Komaggas. These two towns' socio-economic structures do differ significantly (as outlined within Section 3.5.4) and potentially, the identified impacts may manifest differently or with a higher or lower impact significance within these two towns.

During the construction phase, it is anticipated that negative impacts may occur due the influx of people and the presence of workers on site. Positive impacts during this phase may occur due to the employment opportunities that will be created the project expenditure as part of the development of the WEF and associated electrical infrastructure. The influx of people seeking employment opportunities will have a moderate negative impact, following mitigation. On a cumulative level, this impact is still considered to be a moderate negative impact. In terms of the economic opportunities, these are expected to be high (positive), should the recommended mitigation measures be implemented.

During the operational phase, long term employment opportunities will be created and the WEF ownership will spend SED within the area. These are considered to be positive impacts and will have a high and very high, respectively, impact significance following mitigation. In terms of the negative impacts, the presence of the WEF may affect the Sense of Place. However, based on other specialist studies undertaken for this proposed development this impact is considered to be of very low negative significance. The loss of project expenditure and employment opportunities are the two negative impacts associated with the decommissioning phase. The loss of project expenditure is expected to have a low rating and the loss of employment opportunities, a very low significance following mitigation.

On a cumulative level, the impact of project expenditure and the diversification of the local economy are considered to be of a high positive significance and the negative impact on the Sense of Place is considered to be very low.

The measures included within Section 6 above should be considered to be included within the Environmental Authorisations, should it be granted by the DEA. Based on the current socio-economic context of the area and the impacts identified, it is the opinion of the specialist that the project can go ahead, provided that the mitigation measures proposed are adopted and adhered to by the EA holder.

9 REFERENCES

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APPENDIX A: EXTERNAL REVIEW LETTER

A1: REVIEW LETTER OF ACCEPTANCE FROM REVIEWER (MS ELENA BROUGHTON)

Note: The revised Socio-Economic Impact Assessment was accepted after the comments from the reviewer (in the first review letter was addressed)

URBAN-ECON
Development Economists

Celebrate Development Diversity

P.O. Box 13554, HATFIELD 0028
Tel: (012) 342-8686
Fax: (012) 342 8688
e-mail: pta@urban-econ.com

27 February 2018

To whom it may concern

RE: REVIEW OF THE SOCIO-ECONOMIC IMPACT ASSESSMENT STUDY THAT WAS UNDERTAKEN BY THE COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR) FOR THE PROPOSED KAP VLEY WIND ENERGY FACILITY NEAR KLEINZEE IN THE NORTHERN CAPE

This document was compiled in response to a request by the CSIR to provide a peer review of the socio-economic impact study undertaken for the above-mentioned project and completed by the CSIR. The peer review is provided for the socio-economic impact assessment report compiled by the CSIR's Surina Laurie dated February 2018 and submitted for the peer review on 23 February 2018.

1. Terms of reference for the review

The assessment was completed in line with the following Terms of Reference prescribed by the Department of Environmental Affairs for peer review and included in the scope of work for the peer reviewer:

a) Acceptability of the terms of reference;
b) Is the methodology clearly explained and acceptable;
c) Evaluate the validity of the findings (review data evidence);
d) Discuss the suitability of the mitigation measures and recommendations;
e) Identify any short comings and mitigation measures to address the short comings;
f) Evaluate the appropriateness of the reference literature;
g) Indicate whether a site-inspection was carried out as part of the peer review; and
h) Indicate whether the article is well-written and easy to understand.
i) Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPR, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated;
j) Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input;
k) Indicate if the studies being referred to covers the preferred site; and
l) Provide an indication on the cumulative impacts of these studies in relation to the proposed development.

2. Assessment

The following sections comment on each aspect of the Terms of Reference separately.

a) Acceptability of the terms of reference

The Terms of Reference for the socio-economic study included in the report are acceptable.

b) Is the methodology clearly explained and acceptable?

The methodology included in the report focused on the primary data gathering activities and is incomplete and cannot be accepted as it stands. The major gaps are related to the absence of the following:

- The overall approach to the socio-economic impact assessment
- Complete list of primary and secondary sources utilised in the assessment (the list in the report is incomplete)
- Explanation of how secondary sources, such as literature review and other studies completed in the area, were used in the report and the implications thereof on the assessment
- A clear description of the consultation process followed, the response rate among the targeted parties, and linked to that the confidence level of the assessment (some of that information is provided later in the document; however, it should be included earlier and should have a clear indication of whether the primary data gathered represent a complete information concerning directly and indirectly affected parties or is only partially complete)
- Indication of the assumptions, limitation, and gaps in knowledge acquired during the study and how it affected the assessment of the impacts
- Comment on the level of risk associated with the gaps in knowledge

c) Evaluate the validity of the findings (review data evidence)

The report is well written, and it is clear that the specialist attempted to investigate the socio-economic issues and the potential effects of the proposed project to the best of her knowledge and ability. Having said this, some of the findings and assessments included in the report are not supported by relevant secondary or primary data.

The baseline information is relevant; however it lacks the assessment of local community dynamics, the socio-economic priorities for the municipality and nearby communities where the project is to be located, the property dynamics, the tourism profile and dynamics, the labour force and unemployment situation in the nearby communities. It is my opinion that the incomplete knowledge of the socio-economic dynamics at the local level and at the community level compromised the assessment, as it limited the baseline knowledge and as a result influenced the assessment of potential impacts and their significance ratings.

Furthermore, there seems to be a misinterpretation of what is considered to be a socio-economic impact and what is the enabler or a cause thereof. The report refers to project expenditure, influx of people, and visual aspects as impacts, while at the same acknowledging that these are "social disruptors". As a result, the report does not provide a clear differentiation among the socio-economic impacts that could be exerted by the above-mentioned processes or activities. For example, potential stock theft and social ills in the surrounding communities are combined under the analysis of the effect of influx of people and rated as one impact. The significance of these impacts and a range of mitigation measures that need to be introduced though are completely different, therefore these impacts should be analysed separately from each other.

The overall approach to the analysis of impacts, where the focus is on the processes that cause potential positive or negative effects resulted in the unsubstantiated assessment of the potential effects and compromised the validity of findings. Experience shows that the developments of such nature in rural remote areas have a significant negative effect on the economies of the nearby towns, health of the community members, social relations, community structures and safety. One of the example of these is the town of Loeriesfontein, which is located in the same Province.

d) Discuss the suitability of the mitigation measures and recommendations

The provided mitigation measures are sound, but some could be considered impractical - either difficult to implement or difficult to monitor, if implemented. For example:

> "Arrangements should be made to ensure all non-local workers are transported back to their area of residence, following the construction phase." (CSIR, 2018, p15)

The fact that the impacts were not assessed separately also means that some of the mitigations measures that should be proposed to address or eliminate potential socio-economic effects in the local communities were missing.

e) Identify any short comings and mitigation measures to address the short comings

The report needs to:

- Expand on the methodology and clearly outline the gaps in the data and implications of these gaps on the assessment

- Expand on the socio-economic profile focusing on the socio-economic dynamics within the nearest towns to have a more comprehensive view of the current challenges experienced by the local communities, the labour force profile, the key economic activities, etc.
- Provide a description of the project in terms of the socio-economic parameters
- Provide a map of the other projects planned in the area to have a clear understanding on how far or how close these projects are located relative to the proposed site, as well as to the nearby communities under analysis
- Review and analyse potential socio-economic impacts caused by the influx of people, project expenditure, and visual effects separately from each other, rate them accordingly, and provide mitigation measures

f) Evaluate the appropriateness of the reference literature

The referenced literature is appropriate. Some data may be considered outdated (for example the use of Census 2011), but this could be easily mitigated by supporting the secondary information with observations and data gathered from interviews and other primary data sources. Unfortunately, though, the report provided limited information on the dynamics and socio-economic profiles of the local communities gathered from interviews with community members.

g) Indicate whether a site-inspection was carried out as part of the peer review

No site inspection was carried out as part of the peer review.

h) Indicate whether the article is well-written and easy to understand

The report is well written, and the specialist's command of English is commendable.

i) Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated

It is advisable to firstly separate the socio-economic impacts and provide mitigation measures for these separately too. The impacts on the nearby communities should be particularly emphasised and mitigation measures to address these should be clearly stated. It would be beneficial if the specialist used case studies to identify potential effects, i.e. identified and experienced impacts in rural remote communities where wind farms have already been constructed.

j) Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input

The details of the site inspection, or rather primary data gathering comprising engagements with Interested and Affected Parties need to be expanded on. A clear indication of which farm portions to be affected, who are the owners of these farm portions, and who were possible to engage with should be provided and commented on to indicate whether the assessment of the impacts on the directly and adjacent farms is based on the complete information or not. Engagement with the local authorities, community members in the nearby towns (i.e. local church leaders, police, clinics) would also be highly insightful and would be able to provide information on the local socio-economic dynamics, which could in turn be used to assess potential effects of influx of people into these towns during construction.

k) Indicate if the studies being referred to covers the preferred site

The report makes reference to the other studies that were completed for similar projects in the area, however, it did not provide references to these studies and it is unclear how relevant these studies were for this assessment.

l) Provide an indication on the cumulative impacts of these studies in relation to the proposed development

The report provided the assessment of cumulative effects, but it was not clear what impacts were determined to be significant in the other studies and how these relate to the proposed project.

3. Concluding remarks

In conclusion, the report was well written, but the assessment of socio-economic impacts was done in the context of incomplete knowledge of the local socio-economic dynamics in the area and as a result failed to comprehensively assess potential socio-economic impacts with a specific reference to the possible effects on the local communities considering the remoteness of the project location from economic hubs and development nodes.

While no red flags can be identified that may prevent the project from being developed from a socio-economic impact perspective, the incomplete assessment of potential socio-economic impacts means that the proposed mitigation measures were also partial and had gaps. It would be advisable to amend the report to ensure that the mitigations measures included in the EMPr are comprehensive and address all possible socio-economic implications of the project.

Yours sincerely,

Elena Broughton
For URBAN-ECON Development Economists (Pty) Ltd
Manager Innovation and Sustainable Development
Cell: 082 463 2325
elena@urban-econ.com

A2: REVIEW COMMENTS ADDRESSED BY THE SPECIALIST

Socio-economic Impact Assessment
Kap Vley Wind Energy Facility and associated electrical infrastructure
Author Response Sheet: 06 March 2018

Reviewer comment	Author Response
a) Acceptability of the terms of reference The Terms of Reference for the socio-economic study included in the report are acceptable.	Noted.
b) Is the methodology clearly explained and acceptable? The methodology included in the report focused on the primary data gathering activities and is incomplete and cannot be accepted as it stands. The major gaps are related to the absence of the following: • The overall approach to the socio-economic impact assessment	Please refer to an amended Section 1.1.3 for an updated approach and methodology section which better outlines the methodology followed and the sources utilised as part of the assessment.
• Complete list of primary and secondary sources utilised in the assessment (the list in the report is incomplete)	Please refer to Section 1.1.3 (approach and methodology) and Section 1.9 (the references list)
• Explanation of how secondary sources, such as literature review and other studies completed in the area, were used in the report and the implications thereof on the assessment	Please refer to Section 1.1.3.2
• A clear description of the consultation process followed, the response rate among the targeted parties, and linked to that the confidence level of the assessment (some of that information is provided later in the document; however, it should be included earlier and should have a clear indication of whether the primary data gathered represent a complete information concerning directly and indirectly affected parties or is only partially complete)	Please refer to Section 1.1.3.1
• Indication of the assumptions, limitation, and gaps in knowledge acquired during the study and how it affected the assessment of the impacts	Please refer to Section 1.1.4
• Comment on the level of risk associated with the gaps in knowledge	Please refer to Section 1.1.4
c) Evaluate the validity of the findings (review data evidence) The report is well written, and it is clear that the specialist attempted to investigate the socio-economic issues and the potential effects of the proposed project to the best of her knowledge and ability. Having said this, some of the findings and assessments included in the report are not supported by relevant secondary or primary data. The baseline information is relevant; however it lacks the assessment of local community dynamics, the socio-economic priorities for the municipality and nearby communities where the project is to be located, the property dynamics, the tourism profile and dynamics, the labour force and unemployment situation in the nearby communities. It is my opinion that the incomplete knowledge of the socio-economic dynamics at the local level and at the community level compromised the assessment, as it limited the baseline knowledge and as a	The approach and methodology section was updated to provide the reviewer (and subsequent readers of the report) with a better understanding of the methodology undertaken for this assessment. The impacts identified where also updated with the information sourced from the primary and secondary data sources. This was undertaken when the report was compiled but not explicitly stated as such. This has been rectified. Section 1.3 (Description of the receiving socio-economic environment) has also been updated with labour force and employment structures, health, access to services and a clearer outline of the results of the engagement with affected parties. It is the opinion of the author that the issues highlighted within this section have been appropriately addressed and considered.

Socio-economic Impact Assessment
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result influenced the assessment of potential impacts and their significance ratings.	
Furthermore, there seems to be a misinterpretation of what is considered to be a socio-economic impact and what is the enabler or a cause thereof. The report refers to project expenditure, influx of people, and visual aspects as impacts, while at the same acknowledging that these are "social disruptors". As a result, the report does not provide a clear differentiation among the socio-economic impacts that could be exerted by the above-mentioned processes or activities. For example, potential stock theft and social ills in the surrounding communities are combined under the analysis of the effect of influx of people and rated as one impact. The significance of these impacts and a range of mitigation measures that need to be introduced though are completely different, therefore these impacts should be analysed separately from each other.	Noted and thank you for the comment. The impacts have been split to clearly show the social impacts/risks versus the economic opportunities. Please refer to Section 1.6. In addition, additional mitigation measures were sourced from an assessment undertaken by Urban-Econ (2017) to ensure alignment with recent socio-economic studies undertaken.
The overall approach to the analysis of impacts, where the focus is on the processes that cause potential positive or negative effects resulted in the unsubstantiated assessment of the potential effects and compromised the validity of findings. Experience shows that the developments of such nature in rural remote areas have a significant negative effect on the economies of the nearby towns, health of the community members, social relations, community structures and safety. One of the example of these is the town of Loeriesfontein, which is located in the same Province.	The impacts have been split to clearly show the social impacts/risks versus the economic opportunities. Please refer to Section 1.6. As noted in the assessment (following the review), to determine the potential consequences of the socio-economic impacts of a wind farm, Loeriesfontein was considered a good case study, since two wind farms, namely Loeriesfontein 2 and Khobab, have recently become operational in the area. A recent Socio-Economic Impact Assessment for an additional wind farm proposed in Loeriesfontein ("Graskoppies") undertaken by Urban-Econ (Urban-Econ, 2017) was reviewed since this study provides insight into the socio-economic setting of a town, following the introduction of wind farms, and therefore provides a good overview of the realities of introducing a wind farm into an area and the associated socio-economic impacts
d) Discuss the suitability of the mitigation measures and recommendations The provided mitigation measures are sound, but some could be considered impractical - either difficult to implement or difficult to monitor, if implemented. For example: *"Arrangements should be made to ensure all non-local workers are transported back to their area of residence, following the construction phase." (CSIR, 2018, p15)* The fact that the impacts were not assessed separately also means that some of the mitigations measures that should be proposed to address or eliminate potential socio-economic effects in the local communities were missing.	The impacts have been split to clearly show the social impacts/risks versus the economic opportunities. Please refer to Section 1.6. In addition, additional mitigation measures were sourced from an assessment undertaken by Urban-Econ (2017) to ensure alignment with recent socio-economic studies undertaken.
e) Identify any short comings and mitigation measures to address the short comings The report needs to: • Expand on the methodology and clearly outline the gaps in the data and implications of these gaps on the assessment	The approach and methodology section was updated to provide the reviewer (and subsequent readers of the report) with a better understanding of the methodology undertaken for this assessment. The impacts identified where also updated

Socio-economic Impact Assessment
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	with the information sourced from the primary and secondary data sources. This was initially undertaken when the report was compiled but not explicitly stated as such. This has been rectified. The Assumption and Limitations section (Section 1.1.4) has also been updated.
• Expand on the socio-economic profile focusing on the socio-economic dynamics within the nearest towns to have a more comprehensive view of the current challenges experienced by the local communities, the labour force profile, the key economic activities, etc.	Section 1.3 has been updated to address the reviewer's comments.
• Provide a description of the project in terms of the socio-economic parameters	Section 1.3 has been updated to address the reviewer's comments.
• Provide a map of the other projects planned in the area to have a clear understanding on how far or how close these projects are located relative to the proposed site, as well as to the nearby communities under analysis	Please refer to Figures 2 and 10 included within the report.
• Review and analyse potential socio-economic impacts caused by the influx of people, project expenditure, and visual effects separately from each other, rate them accordingly, and provide mitigation measures	Please refer to an updated Section 1.6.
f) Evaluate the appropriateness of the reference literature **The referenced literature is appropriate** Some data may be considered outdated (for example the use of Census 2011), but this could be easily mitigated by supporting the secondary information with observations and data gathered from interviews and other primary data sources. Unfortunately, though, the report provided limited information on the dynamics and socio-economic profiles of the local communities gathered from interviews with community members.	Please refer to an updated Section 1.1.3 (approach and methodology), it is the opinion of the author that the comment has been addressed and that the process undertaken is sufficient to inform the impacts.
g) Indicate whether a site-inspection was carried out as part of the peer review No site inspection was carried out as part of the peer review.	Noted.
h) Indicate whether the article is well-written and easy to understand The report is well written, and the specialist's command of English is commendable.	Noted.
i)Discuss the suitability of the proposed mitigation measures and recommendations, if any. Further, provide input to the EMPr, including additional mitigation and monitoring requirements to ensure that identified impacts are eliminated It is advisable to firstly separate the socio-economic impacts and provide mitigation measures for these separately too. The impacts on the nearby communities should be particularly emphasised and mitigation measures to	This comment has been addressed by separating the economic and social impacts from each other. This ensured that economic opportunities and social risks are not intertwined in one impact and to ensure that clear mitigation measures are

Socio-economic Impact Assessment
Kap Vley Wind Energy Facility and associated electrical infrastructure
Author Response Sheet: 06 March 2018

address these should be clearly stated. It would be beneficial if the specialist used case studies to identify potential effects, i.e. identified and experienced impacts in rural remote communities where wind farms have already been constructed.	provided to manage each impact/opportunity appropriately. In addition to the studies already reviewed to inform the assessment, a study undertaken by Urban-Econ was also reviewed and used to identify impacts and appropriate mitigation measures. This provided further insight into the impacts associated with the development of wind energy facilities in rural communities, specifically where there are already operational wind farms present in the area.
j) Indicate details and conclusions of the site-inspection if one was carried out as part of the specialist input The details of the site inspection, or rather primary data gathering comprising engagements with Interested and Affected Parties need to be expanded on. A clear indication of which farm portions to be affected, who are the owners of these farm portions, and who were possible to engage with should be provided and commented on to indicate whether the assessment of the impacts on the directly and adjacent farms is based on the complete information or not. Engagement with the local authorities, community members in the nearby towns (i.e. local church leaders, police, clinics) would also be highly insightful and would be able to provide information on the local socio-economic dynamics, which could in turn be used to assess potential effects of influx of people into these towns during construction.	Please refer to Section 1.1.3 (approach and methodology).
k) Indicate if the studies being referred to covers the preferred site The report makes reference to the other studies that were completed for similar projects in the area, however, it did not provide references to these studies and it is unclear how relevant these studies were for this assessment.	Please see the list included in Section 1.1.3 and Section 1.9.
l) Provide an indication on the cumulative impacts of these studies in relation to the proposed development The report provided the assessment of cumulative effects, but it was not clear what impacts were determined to be significant in the other studies and how these relate to the proposed project.	Only one Environmental Impact Assessment Report was available within the public domain for review. This study does assess socio-economic impacts but based on the data, no primary research was undertaken and the impacts and mitigation measures identified, very generic.
3. Concluding remarks In conclusion, the report was well written, but the assessment of socio-economic impacts was done in the context of incomplete knowledge of the local socio-economic dynamics in the area and as a result failed to comprehensively assess potential socio-economic impacts with a specific reference to the possible effects on the local communities considering the remoteness of the project location from economic hubs and development nodes. While no red flags can be identified that may prevent the project from being developed from a socio-economic	We welcomed Urban-Econ's review of this socio-economic assessment and for the constructive comments. The author has addressed all comments/concerns raised as part of the external review (as outlined above) and trust that the amended report will meet the expectations of the reviewer.

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impact perspective, the incomplete assessment of potential socio-economic impacts means that the proposed mitigation measures were also partial and had gaps. It would be advisable to amend the report to ensure that the mitigations measures included in the EMPr are comprehensive and address all possible socio-economic implications of the project.	

A3: FOLLOW-UP REVIEW LETTER FROM THE REVIEWER

URBAN-ECON
Development Economists

Celebrate Development Diversity

P.O. Box 13554, HATFIELD 0028
Tel: (012) 342-8686
Fax: (012) 342 8688
e-mail: pta@urban-econ.com

14 March 2018

To whom it may concern

RE: FOLLOW-UP ON THE REVIEW OF THE SOCIO-ECONOMIC IMPACT ASSESSMENT STUDY THAT WAS UNDERTAKEN BY THE COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH (CSIR) FOR THE PROPOSED KAP VLEY WIND ENERGY FACILITY NEAR KLEINZEE IN THE NORTHERN CAPE

The review undertaken on 27 February 2018 has reference. I have received the updated socio-economic impact assessment report for the above-mentioned project dated March 2018 and have gone through the changes made to the specialist study based on the comments made by me and submitted on 27 February 2018.

I hereby acknowledge that I am satisfied with the changes made to the assessment, as well as the updates made to the report in general, and believe that they adequately address the comments and recommendations provided by me in my original review letter. I have no further comments on the report. I also support the revised assessments of potential socio-economic impacts that are expected to ensue from the proposed project as well as the suggested recommendations to mitigate the negative effects.

Yours sincerely,

Elena Broughton
For URBAN-ECON Development Economists (Pty) Ltd
Manager Innovation and Sustainable Development
Cell: 082 463 2325
elena@urban-econ.com

A4: CV OF THE REVIEWER: MS ELENA BROUGHTON

Elena Broughton

Date of Birth:	11 September 1980
Designation:	Manager: Innovation & Sustainable Development
Profession:	Senior Development Economist
Specialisation:	Sustainable Development Specialist
Years within Firm:	12 Years
Nationality:	Russian/SA Citizen
Years of Experience:	12 Years
HDI Status:	White Female

Education:			
University of Pretoria - 2011		MSc (Technology Management)	
University of Pretoria - 2007		BScHons (Technology Management)	
Parkland College, USA - 2004		Computer Integrated Accounting	
Parkland College, USA - 2004		Independent Business	
Parkland College, USA - 2003		Intermediate Accounting	
Parkland College, USA - 2003		Records Management	
Parkland College, USA - 2003		Financial Accounting	
Parkland College, USA - 2003		Managerial Accounting	
Nizhny Novgorod University, Russia - 2002		BComHons (Economics)	
Professional Membership:			
SAPOA - Urban-Econ Development Economists (Pty) Ltd			
Language Proficiency:	**Reading**	**Writing**	**Speaking**
English	Excellent	Excellent	Excellent
Russian	Excellent	Excellent	Excellent

Key Qualification:

Elena Broughton completed her BComHons in Economics in Russia, at Nizhny Novgorod State University in 2002 specialising in regional economics. At the same time, she completed an additional degree as Translator/Interpreter in Professional Orientated Communication. After completion of her Honours degree in Economics, Elena moved to the USA and stayed there for 1.5 years. During her stay in the USA, she completed a number of Accounting and Business courses at Parkland College, Illinois. In 2007, she obtained her BScHons in Technology Management (Cum Laude) at the University of Pretoria and later received her MSc in Technology Management (2011) from the same university.

Elena Broughton is a senior professional at Urban-Econ and a manager of the Innovation & Sustainable Development Unit. She has an extensive knowledge in various fields of economic development, including policy evaluation, feasibility studies, impact assessments, investment strategy formulation, strategic decision analysis, and monitoring and evaluation. She is experienced in developing input-output and SAM-based models, as well as development and application of other econometric techniques. Elena has a proven track record of managing complex multidisciplinary projects and a team of sub-consultants.

Employment History:

2004 - current	Urban-Econ: Development Economist

Relevant experience:

- West Rand Tailings Retreatment Project Economic Impact Assessment
- Palmietkuilen Mining Project near Springs Economic Impact Assessment
- Thabametsi IPP Coal-fired Power Station near Lephalale Socio-Economic Impact Assessment
- Thabametsi Coal Mine Sustainable Development Investigation and Economic Impact Assessment
- Doornhoek Fluorspar Project, near Zeerust Socio-Economic Impact Assessment

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URBAN-ECON Development Economists

Elena Broughton

- Colenso Coal Mine and Coal-Fired Power Station Socio-Economic Impact Assessment. Kwazulu-Natal
- Waterberg Coal-Powered Power Stations Economic Impact Study, Limpopo
- Socio-Economic Impact Assessment for the Construction of an Attenuation Pond in Louwlardia, the Tshwane Metro
- West Rand Tailings Retreatment Project Economic Impact Assessment
- Biotherm Eureka and Aleta Wind Energy Facilities Socio-Economic Impact Assessment
- Mafube Coal Mine Expansion Sustainable Development Investigation and Economic Impact Assessment
- Sishen Mine Waste Dumps Macro-Economic and Economic Impact Assessment
- Eskom Coal 1 and Coal 2 Economic Impact Assessments, Mpumalanga
- Eskom: Ariadne-Eros Transmission Line Economic Impact Assessment
- Eskom CSP Macro-Economic Impact Assessment
- Eskom Ingula Pumped Storage Scheme Regional Economic Impact Assessment
- Eskom Wind Energy Facility 1 (WEF1) Macroeconomic and Regional Impact Assessment
- Eskom Sere Wind (WEF1) Macro-Economic Impact Assessment
- Eskom Kendal And Lethaba EIA: Economic Impact Assessments
- BRMO Gloria Mine Sinter Plant and Mine Expansion Economic Impact Assessment
- Volspuit Mine Socio-Economic Impact Assessment
- Wag'nbiekiespan PV Solar Energy Facility near Boshof, the Free State Province (75 MW PV solar facility)
- Braamhoek Pumped Storage Scheme Impact Analysis
- Saldanha Bay Separation Plant Economic Impact Assessment
- Zandkopsdrift Rare Earth Elements (REE) Project Economic Impact Assessment
- Balmoral Economic Impact Assessment
- Mafube Nooitgedacht and Wildfontein EIA/EMP Sustainable Development Investigation Study
- De Hoop Dam Economic Impact Monitoring Framework
- N3 Highway Economic Impact Assessment
- The Mandela Bay Precinct Economic Impact Assessment
- Harrismith Logistics Hub Impact Assessment
- Megamall Economic Impact Assessment
- Coega Ridge Economic and Social Impact Assessments
- Amanzi Economic & Social Impact Assessment
- Socio-Economic Impact Assessment of the Proposed New Eskom Power Stations in the Witbank Area and Northern Free State
- Arriesfontein Solar Energy Park near Danielskuil in the Northern Cape
- Humansrus Solar Energy Facility near Postmasburg in the Northern Cape (100 MW CSP-Tower facility)
- Rooipunt Solar Energy Park near Upington in the Northern Cape (100 MW CSP-Tower facility and 215 MW PV solar facility)
- Farm 198 PV Solar Energy Facility north of Kimberley in the Northern Cape (210 MW PV solar facility)
- Wag'nbiekiespan PV Solar Energy Facility near Boshof, the Free State Province (75 MW PV solar facility)

Countries of Work Experience:

- South Africa
- Russia
- Zambia
- Namibia

References:

- Dr. JL Oberholzer Email: judex@urban-econ.com Cell Phone: +27 (0) 82 770 8770

Contact Details:

- Elena Broughton Email: elena@urban-econ.com Cell Phone: +27 (0) 82 4632325

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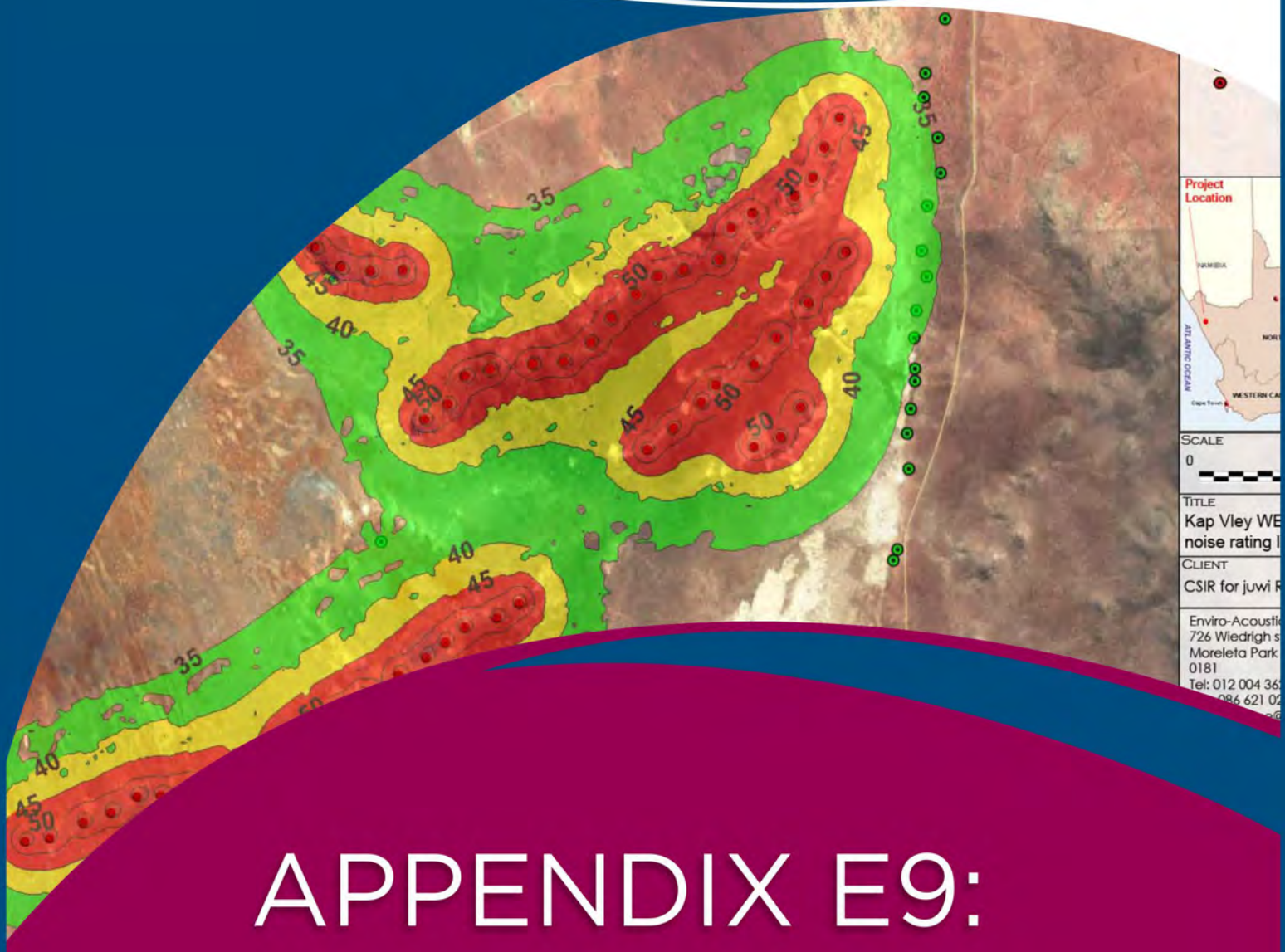
URBAN-ECON

juwi

DRAFT BASIC ASSESSMENT REPORT



APPENDIX E9:

Noise Impact Assessment Report

juwi Renewable Energies (Pty) Ltd

SPECIALIST INPUTS:
ENVIRONMENTAL NOISE IMPACT ASSESSMENT

As part of EIA for Kap Vley Wind Energy Facility; and BA for associated Powerline Corridor near Kleinzee, Northern Cape Province

Study done for:

CSIR
our future through science

Prepared by:

EAR
Enviro Acoustic Research

P.O. Box 2047, Garsfontein East, 0060
Tel: 012 – 004 0362, Fax: 086 – 621 0292, E-mail: info@eares.co.za

EXECUTIVE SUMMARY

INTRODUCTION AND PURPOSE

Enviro-Acoustic Research (EARES) was contracted by the juwi Renewable Energies (Pty) Ltd ('juwi') to determine the potential noise impact on the surrounding environment due to the proposed development of the Kap Vley Wind Energy Facility (WEF) and its associated Powerline to be constructed within a 200 m corridor. This facility with its associated infrastructure will be located on various farms south west of Komaggas in the Northern Cape Province.

This report describes ambient sound levels in the area, potential worst-case noise rating levels and the potential noise impacts that the facility and its associated infrastructure may have on the surrounding environment, highlighting the methods used, potential issues identified, findings and recommendations. This report did not investigate vibrations and only briefly considers blasting.

This study considered local regulations and both local and international guidelines, using the terms of reference (ToR) as proposed by SANS 10328:2008 to allow for a comprehensive Environmental Noise Impact Assessment report.

PROJECT DESCRIPTION

juwi Renewable Energies (Pty) Ltd propose the development of a commercial wind farm with its associated Powerline Corridor on various properties south-west of the town of Komaggas in the Northern Cape Province. The proposed Kap Vley WEF may have up to 45 wind turbines, each with a maximum hub height (hh) of 150 m and a rotor diameter of up to 160 m. A maximum of 40 km overhead powerline corridor which will connect the on-site substation to either the Gromis Substation or the new Eskom substation, for which the location still needs to be determined, is also associated with the WEF.

The developer has been evaluating several turbine models, however the selection will only be finalised at a later stage once the most optimal wind turbine is identified (pending factors such as meteorological data, price and financing options, guarantees and maintenance costs, etc.). As the noise propagation modelling requires the specifications of a wind turbine, the Acciona AW125/3000 was selected as a reference turbine. It is widely used and known to have a high noise emission level, and thus serves as a worse-case scenario for impact assessment.

The powerline corridor has been found not to have any notable noise impacts, and no impacts have thus been assessed or mitigation recommendations or EMPr requirements have thus been identified for this component of the proposed development.

BASELINE ASSESSMENT

Ambient sound levels were measured at one location over two (2) night-time periods. Sound measurements indicated an area with a potential to become very quiet, with wind-induced noise impacting on the ambient sound levels at times.

Measurements illustrate the rural character of the area during periods, with mainly natural sounds defining the acoustic character. The area is considered **Rural** in terms of the SANS 10103:2008 Rating Level.

NOISE IMPACT DETERMINATION AND FINDINGS

Based on sound measurements, the audible character of the soundscape as well as developmental character the area is naturally quiet. The acceptable noise rating level would be typical of a rural noise district (as per SANS 10103:2008). This allows daytime noise limits of 52 dBA with night-time noise limits of 42 dBA (during lower wind conditions as increased wind speeds would increase ambient sound levels).

The potential noise impact for the WEF was evaluated using a sound propagation model. Conceptual scenarios were developed for the construction and operational phases. With the modelled input data as used, this assessment indicated that:

- A potential noise impact of a **low** significance during the construction of the wind turbines;
- A potential noise impact of a **low** significance during the construction of the power line (preferred corridor). There is no risk of a noise impact for the other two power line corridors;
- A potential noise impact of a **low** significance for construction traffic;
- A potential noise impact of a **low** significance during the operational phase. The addition of the proposed Kap Vley WEF will not increase the cumulative noise levels at the Noise Sensitive Development (NSD) and the significance of the cumulative noise impact will also be **low**.

No mitigation in terms of the WEF or Powerline Corridor is critically required but measures are included for the WEF for the developer to note. The developer however must investigate any reasonable and valid noise complaint if registered by a receptor

staying within 2,000 m from location where construction or operational activities are taking place.

NEED AND DESIRABILITY OF PROJECT

The proposed WEF (worst-case scenario evaluated) will slightly raise the noise levels at a number of potential noise-sensitive developments. There is no alternative location where the wind farm can be developed as the presence of a viable wind resource determines the viability of a commercial WEF. While the location cannot be moved, the wind turbines within the WEF can be moved around, although this layout is the result of numerous evaluations and modelling to identify the most economically feasible and environmentally friendly layout.

The proposed layout will result in increased noise levels in the area, but the noise levels will be low and is unlikely to impact on the quality of living for the surrounding receptors. In terms of acoustics, there is no benefit to the surrounding environment (closest receptors). The predicted noise impacts are low and the significance will be very low.

The project however, will greatly assist in the provision of energy, which will allow further economic growth and development in South Africa and locally. The project will generate short and long-term employment and other business opportunities and promote renewable energy in South Africa and locally. People in the area that are not directly affected by increased noise will have a positive perception of the project and will see the need and desirability of the project.

With its promise for environmental and economic advantages, wind power generation has significant potential to become a large industry in South Africa. However, when wind farms are near to potential sensitive receptors, consideration must be given to ensuring a compatible co-existence. The potential sensitive receptors should not be adversely affected and yet, at the same time, wind farms need to reach an optimal scale in terms of layout and number of units.

Wind turbines produce sound, primarily due to mechanical operations and aerodynamic effects at the blades. Modern wind turbine manufacturers have virtually eliminated the noise impact caused by mechanical sources and instituted measures to reduce the aerodynamic effects. But, as with many other activities, the wind turbines emit sound power levels at a level that can impact on areas at some distance away. When potentially sensitive receptors are nearby, care must be taken to ensure that the operations at the

wind farm do not cause undue annoyance or otherwise interfere with the quality of life of the receptors.

It should be noted that this does not suggest that the sound from the wind turbines should not be audible under all circumstances, this is an unrealistic expectation that is not required or expected from any other agricultural, commercial, industrial or transportation related noise source. Rather, that the sound due to the wind turbines should be at a reasonable level in relation to the ambient sound levels.

MANAGEMENT AND MITIGATION OF NOISE IMPACT

This study uses the noise emission characteristics of the Acciona AW125 3000 wind turbine, resulting in a worst-case scenario in terms of noise emissions from the WEF being evaluated. With the input data as used, this assessment indicated that the potential noise impact from the WEF would be of a **low** significance during both the construction and operational phases (construction and operation of the Wind Turbines).

For the Powerline Corridor no notable impacts have been identified during any of the phases. No mitigation measures are thus recommended or required for either the WEF or Powerline Corridor.

RECOMMENDATIONS AND CONCLUSIONS

This study determined the significance of the potential noise impact from the construction and operation of the WEF and associated Powerline. While there is a potential noise impact due to increased traffic during the construction of the WEF, the significance is **low** and the noise impacts do not constitute a fatal flaw. With mitigation is critically required and no additional work or assessment is required or recommended.

The developer however should investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from the location where construction or operational activities are taking place.

The potential noise impact for the WEF must again be evaluated should the layout be changed where any wind turbines are located closer than 1,000 m from a confirmed NSD or if the developer decides to use a different wind turbine that has a sound power emission level higher than the Acciona WTG used in this report (sound power emission level exceeding 108.4 dBA re 1 pW).

Considering the **low** significance of the noise impacts (inclusive of cumulative impacts) for the WEF and neglible impacts for the associated Powerline , there is no reason that the proposed Kap Vley Wind Energy Facility with its associated Powerline Corridor should not be authorised.

CONTENTS OF THE SPECIALIST REPORT – CHECKLISTS

Contents of this report in terms of Regulation GNR 982 of 2014, Appendix 6 (as amended 7 April 2017)	**Cross-reference in this report**
(a) details of— the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a curriculum vitae;	**Section 12**
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	*(page ix)*
(c) an indication of the scope of, and the purpose for which, the report was prepared;	**Section 1.1**
(cA) an indication of the quality and age of base data used for the specialist report;	**Section 3.2**
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	**Section 3.2 and Section 8**
(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	**Section 1.3 and 3.2**
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	**Section 1.4, 2.2, and 3.2**
(f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	**Section 1.3, 2.3 and 3.2**
(g) an identification of any areas to be avoided, including buffers;	**Section 1.3, 2.3 and 3.2**
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	**Figure 1.1** **Buffers not required**.
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	**Section 6**
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	**Sections 7** and **Sections 8**
(k) any mitigation measures for inclusion in the EMPr;	**Sections 9.4**
(l) any conditions for inclusion in the environmental authorisation;	**Sections 9.4**
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	**Section 10**
(n) a reasoned opinion— i. as to whether the proposed activity or portions thereof should be authorised; and ii. if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	i. **Section 11** ii. **Sections 9.4**
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	No comments received
(p) any other information requested by the competent authority	N/A
2. Where a government notice gazetted by the Minister provides for any protocol of minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply	N?A

This report should be sited as:

De Jager, M. (2017): "*Environmental Noise Impact Assessment for the Proposed Kap Vley Wind Energy Facility near Komaggas, Northern Cape: Summary Report*". Enviro-Acoustic Research CC, Pretoria

Client:

CSIR for
juwi Renewable Energies (Pty) Ltd

PO Box 320
Stellenbosch
7599

Report no:

CSIR-JKVWEF/ENIA/201709-Rev 3/Short

Author:

M. de Jager *(B. Ing (Chem))*

Review:

Shaun Weinberg *(B.Sc. Applied Mathematics in Physics Stream – in process)*

Date:

March 2018

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for environmental authorization:-
(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

PROJECT TITLE

Kap Vley Wind Energy Facility near Kleinzee, Northern Cape Province

Specialist:	Noise		
Contact person:	Morné de Jager		
Postal address:	PO Box 2047, Garsfontein East		
Postal code:	0060	Cell:	082 565 4059
Telephone:	012 004 0362	Fax:	086 621 0292
E-mail:	morne@eares.co.za		
Professional affiliation(s) (if any)			

Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

4.2 The specialist appointed in terms of the Regulations_

I, **Morné de Jager** , declare that –

General declaration:

I act as the independent specialist in this application,
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Enviro Acoustic Research cc

Name of company (if applicable):

2018 – 04 - 08

Date:

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LIST OF ABBREVIATIONS

DEA	Department of Environmental Affairs
DoE	Department of Energy
EA	Environmental Authorisation
EARES	Enviro Acoustic Research cc
EP	Equator Principles
EPFI	Equator Principles Financial Institution
FEL	Front end loader
hh	Hub height
i.e.	that is
i.t.o	in terms of
IFC	International Finance Corporation
km	kilometres (measurement of distance)
LDV	Light delivery vehicle
mamsl	Meters above mean sea level
m/s	meters per second
MW	Megawatt
NCR	Noise Control Regulations (under Section 25 of the ECA)
NSD	Noise Sensitive Development
SANS	South African National Standards (from South African Bureau of Standards)
ToR	Terms of Reference
UTM	Universal Transverse Mercator
WHO	World Health Organisation
WEF	Wind Energy Facility
WTG	Wind Turbine Generator

1 INTRODUCTION

1.1 INTRODUCTION AND PURPOSE

Enviro-Acoustic Research CC was contracted by juwi Renewable Energies (Pty) Ltd ("juwi') to conduct an Environmental Noise Impact Assessment (ENIA) to determine the potential noise impact on the surrounding environment due to the proposed development of the Kap Vley commercial Wind Energy Facility (WEF) with its associated Powerline Corridor near Komaggas in the Northern Cape Province.

This report describes ambient sound levels in the area, potential worst-case noise rating levels and the potential noise impact that the facility, may have on the surrounding environment, highlighting the methods used, potential issues identified, findings and recommendations. This report did not investigate vibrations and only briefly considers blasting.

This study considered local regulations and both local and international guidelines, using the terms of reference (ToR) as proposed by SANS 10328:2008 to allow for a comprehensive Noise Report.

1.2 BRIEF PROJECT DESCRIPTION

juwi propose the development of a commercial wind farm with its supporting powerline corridor on various properties south-west of the town of Komaggas in the Northern Cape Province.

The proposed Kap Vley WEF may have between 20 and 45 wind turbines, each with a maximum hub height (hh) of between 80 and 150 m and a rotor diameter of 100 to 160 m.

Other infrastructure associated with the proposed WEF may include:

- Internal access roads between the different wind turbines;
- A temporary contractor's camp and construction compound;
- A laydown area next to the locations of the proposed wind turbines;
- Foundations to support the wind turbines;
- One or more onsite substations;
- Cabling between the turbines, to be laid underground where practical, which will connect to one or more on-site substations;

- Site offices and a workshop area for operations and maintenance purposes.

Associated with the proposed Kap Vley WEF there will also be a powerline corridor connecting the WEF to the Gromis Substation located on the remainder of the Farm Dikgat 195 or closer to the new Eskom substation (the location still needs to be determined) via a 132 kV overhead transmission line.

Depending on the location of the substation on-site, a maximum of 40 km will be accommodated for overhead line, connecting the on-site substation to the Gromis Substation (or the new Eskom substation for which the location still needs to be determined), inside the 200m wide assessed corridor.

1.3 POTENTIAL NOISE-SENSITIVE RECEPTORS (DEVELOPMENTS) AND NO-GO AREAS

Potential sensitive receptors, also known as NSD's, located within or close to the WEF, were identified using Google Earth® (green dots, see **Figure 1-1**). This was followed with a site visit (August 2017) to confirm the status of the identified structures. The following should be noted:

- NSD01 (2 dwellings): The farmhouse is occasionally used while the smaller dwelling is accommodated by a farm employee. The farm employee stays permanently on the farm.; and
- NSDs 02 – 18: This is a number of dwellings that are occasionally (a few months a year) used by migrating sheep herders. The employee at NSD01 confirmed that the dwelling at NSD11 was occupied at the time of the site visit.

1.4 TERMS OF REFERENCE (TOR)

A noise impact assessment must be completed for the following reasons:

- If there are potential noise-sensitive receptors staying within 1,000 m from industrial activities (SANS 10328:2008);
- If there are potential noise-sensitive receptors staying within 2,000 m from any wind turbine (SANS 10328:2008);
- It is a controlled activity in terms of the NEMA regulations and a ENIA is required, because:
    - It may cause a disturbing noise that is prohibited in terms of section 18(1) of the Government Notice 579 of 2010; and
- It is generally required by the local or district authority as part of the environmental authorization or planning approval in terms of Regulation 2(d) of GN R154 of 1992.

In addition, Appendix 6 of GN 982 of December 2014 (as amended in Gov. Gaz. 40772, 7 April 2017), issued in terms of the National Environmental Management Act, No. 107 of 1998 also defines minimum information requirements for specialist reports. As such this report was drafted considering the requirements of this Appendix as well as the guidelines set by SANS 10103:2008 and SANS 10328:2008.

In addition to the above, the following ToR has been provided by the CSIR:

- Adhere to the requirements of specialist studies as outlined in Appendix 6 of the 2014 NEMA EIA Regulations, as amended;
- Assess the no-go alternative very explicitly in the impact assessment section. Please note that the DEA considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads and internal cables is allowed in the 'no-go' areas. Should your definition of the 'no-go' area differ from the DEA definition; this must be clearly indicated in your assessment. You are also requested to indicate the 'no-go' area's buffer.
- Assess cumulative impacts by identifying other wind and solar energy project proposals and other applicable projects, such as construction and upgrade of electricity generation, transmission or distribution facilities in the local area (i.e. within 50 km of the proposed Kap Vley WEF project) that have been approved (i.e. positive EA has been issued) or the EIA is currently underway. In addition, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following:
- Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e. hectares of cumulatively transformed land.
- The cumulative impacts significance rating must also inform the need and desirability of the proposed development.
- A cumulative impact environmental statement on whether the proposed development must proceed.
- Provide a detailed description of your methodology, as well as indicate the locations and descriptions of turbine positions, and all other associated infrastructures that you have assessed and are recommending for authorisations.
- Provide a detailed description of all limitations to your studies. Your specialist studies must be conducted in the appropriate season and providing that as a limitation, will not be accepted by DEA.

- Undertake a preliminary (scoping) study mainly in accordance with Section 7 of the South African National Standard (SANS) 10328:2008 ("Methods for environmental noise impact assessments in terms of NEMA"). This will include:
- Identification and description of the noise sources associated with the proposed development;
- Identification of potential noise sensitive areas or receptors that could be impacted upon by noise emanating from the proposed development;
- Estimation of the acceptable rating level of noise on identified noise sensitive areas;
- Estimation of the noise emissions from the identified noise sources and estimation of the expected rating level of noise at the identified noise sensitive areas;
- Estimation and assessment of the noise impacts on identified noise sensitive areas or receptors in accordance with SANS 10103:2008 and the National Noise Control Regulations;
- Consideration of possible alternative noise mitigation procedures;
- Determine whether the proposed development has significant acoustical implications;
- A description of the current environmental conditions from a noise perspective in sufficient detail so that there is a baseline description/status quo against which impacts can be identified and measured i.e. sensitive noise receptors etc;
- A review of detailed information relating to the project description in order to precisely define the environmental risks in terms of noise emissions;
- Identification of issues and potential impacts related to noise emissions, which are to be considered in combination with any additional relevant issues that may be raised through the PPP;
- Identification of relevant legislation and legal requirements;
- A description of the regional and local features;
- Calculation of baseline noise measurements (i.e. of the existing ambient noise (day and night time));
- Modelling of the future potential noise impacts during all phases of the proposed development taking into consideration sensitive receptors;
- Identification of buffer zones and no-go areas to inform the turbine layout (if relevant);
- Identify and assess all potential impacts (direct, indirect) of the construction, operational and decommissioning phases of the proposed development. Use the CSIR methodology to determine the significance of potential impacts;
- Assess all alternatives, including the no-go alternative;
- Assessment cumulative impacts by identifying other REFs such as wind energy facilities in the local area (i.e. within 50 km of the proposed WEF). These include projects that have been approved (i.e. positive EA has been issued), have been

constructed or projects for which an Application for Environmental Authorisation has been lodged with the Competent Authority (see Table 6.1 in Chapter 6 of this report for a list of projects);

- Provide recommended mitigation measures, management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts to be included in the EMPr;
- Provide a description of any assumptions, uncertainties, limitations and gaps in knowledge; and
- Incorporate and address issues and concerns raised during the Scoping and EIA phases where they are relevant to the specialist's area of expertise.

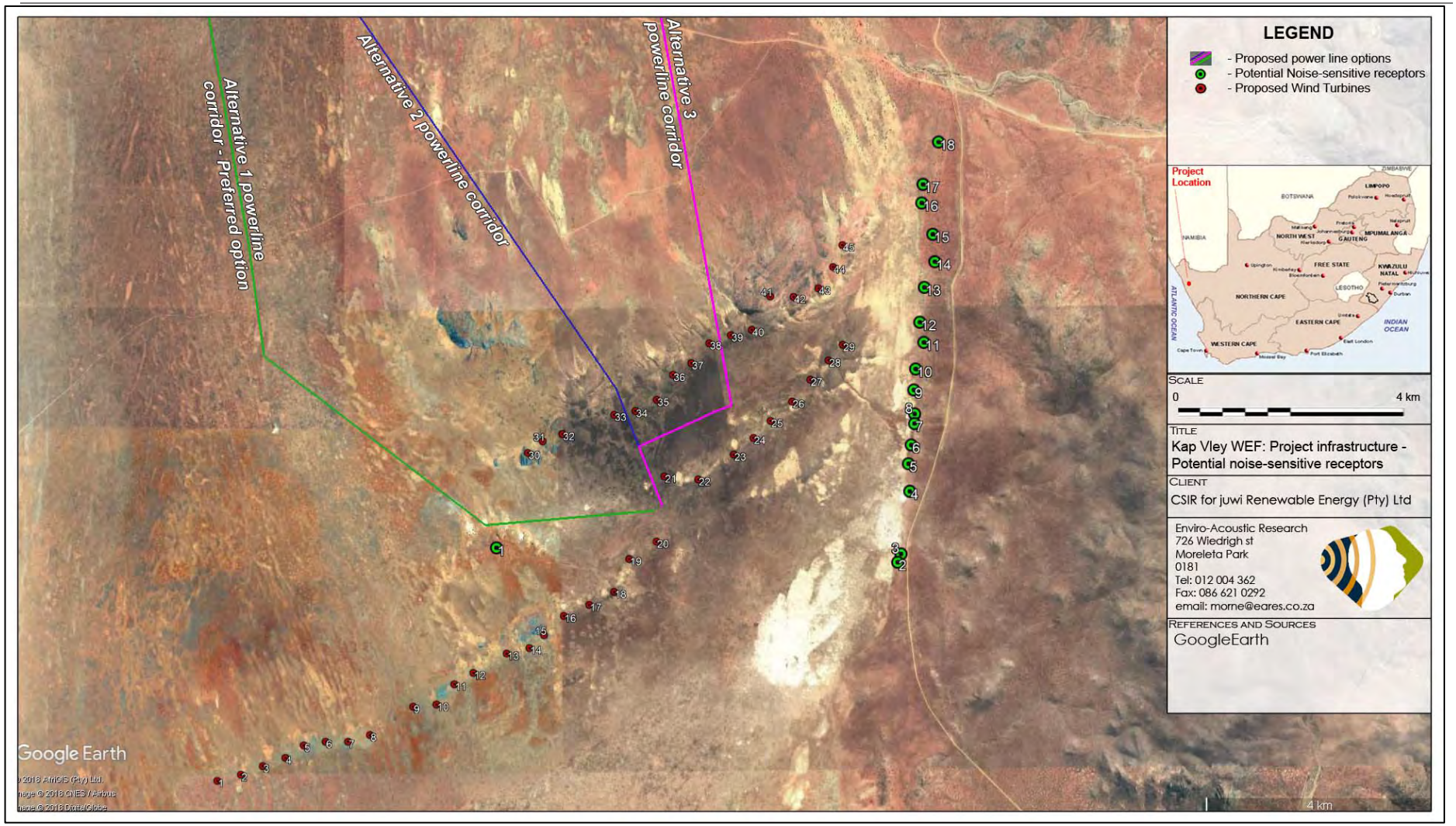

Figure 1-1: Aerial image indicating potentially noise-sensitive developments (green dots)

2 LEGAL CONTEXT, POLICIES AND GUIDELINES

2.1 THE ENVIRONMENT CONSERVATION ACT (ACT 73 OF 1989)

The Environment Conservation Act ("ECA") allows the Minister of Environmental Affairs and Tourism ("now the Ministry of Water and Environmental Affairs") to make regulations regarding noise, among other concerns. See also **section 2.1.1**.

2.1.1 Noise Control Regulations (GN R154 of 1992)

In terms of section 25 of the ECA, the national Noise Control Regulations (GN R154 in *Government Gazette* No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under Government Notice Number R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.

Subsequently, in terms of Schedule 5 of the Constitution of South Africa of 1996 legislative responsibility for administering the noise control regulations was devolved to provincial and local authorities. The National Regulations will be in effect in the Northern Cape Province.

"**disturbing noise**" as:
Noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

"**zone sound level**" as:
A derived dBA value determined indirectly by means of a series of measurements, calculations or table readings and designated by a local authority for an area. *This is the same as the Rating Level as defined in SANS 10103:2008.*

In terms of Regulation 4 of the Noise Control Regulations:
"No person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof".

2.2 NOISE STANDARDS

There are a few South African scientific standards (SABS) relevant to noise from mines, industry and roads. They are:

- SANS 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication';
- SANS 10210:2004. 'Calculating and predicting road traffic noise';
- SANS 10328:2008. 'Methods for environmental noise impact assessments'.
- SANS 10357:2004. 'The calculation of sound propagation by the Concave method'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful *per se.*

2.3 INTERNATIONAL GUIDELINES

While a number of international guidelines and standards exist, those selected below are used by numerous countries for environmental noise management.

2.3.1 Guidelines for Community Noise (WHO, 1999)

The World Health Organization's (WHO) document on the *Guidelines for Community Noise* is the outcome of the WHO- expert task force meeting held in London, United Kingdom, in April 1999. It is based on the document entitled "Community Noise" that was prepared for the WHO and published in 1995 by the Stockholm University and Karolinska Institute.

The scope of WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments.

Guidance on the health effects of noise exposure of the population has already been given in an early publication of the series of Environmental Health Criteria. The health risk to humans from exposure to environmental noise was evaluated and guidelines values derived. The issue of noise control and health protection was briefly addressed.

The document uses the L_{Aeq} and L_{AMax} noise descriptors to define noise levels. It should be noted that a follow-up document focusing on Night-time Noise Guidelines for Europe (WHO, 2009) was published.

2.3.2 The Assessment and Rating of Noise from Wind Farms (ETSU, 1997)

This report describes the findings of a Working Group on Wind Turbine Noise, facilitated by the United Kingdom Department of Trade and Industry. It was developed as an Energy Technology Support Unit [1] (ETSU) project. The aim of the project was to provide information and advice to developers and planners on noise from wind turbines. The report represents the consensus view of a number of experts (experienced in assessing and controlling the environmental impact of noise from wind farms). Their findings can be summarised as follow:

1. Absolute noise limits applied at all wind speeds are not suited to wind farms; limits set relative to the background noise (including wind as seen in **Figure 5-2**) are more appropriate;
2. $L_{A90,10mins}$ is a much more accurate descriptor when monitoring ambient and turbine noise levels;
3. The effects of other wind turbines in a given area should be added to the effect of any proposed wind energy facility, to calculate the cumulative effect;
4. Noise from a wind energy facility should be restricted to no more than 5 dBA above the current ambient noise level at a NSD. Ambient noise levels are measured onsite in terms of the $L_{A90,10min}$ descriptor for a period sufficiently long enough for a set period;
5. Wind farms should be limited to within the range of 35 dBA to 40 dBA (day-time) in a low noise environment. A fixed limit of 43 dBA should be implemented during all night time noise environments. This should increase to 45 dBA (day and night) if the NSD has financial investments in the wind energy facility; and
6. A penalty system should be implemented for wind turbine/s that operates with a tonal characteristic.

This is likely the guideline used in the most international countries to estimate the potential noise impact stemming from the operation of a Wind Energy Facility. It also recommends an improved methodology (compared to a fixed upper noise level) on

[1] ETSU was set up in 1974 as an agency by the United Kingdom Atomic Energy Authority to manage research programmes on renewable energy and energy conservation. The majority of projects managed by ETSU were carried out by external organizations in academia and industry. In 1996, ETSU became part of AEA Technology plc which was separated from the UKAEA by privatisation.

determining ambient sound levels in periods of higher wind speeds, critical for the development of a wind energy facility. Because of its international importance, the methodologies used in the ETSU R97 document will be considered.

The document uses the $L_{Aeq,f}$ and L_{A90} descriptors to define noise levels using the "Fast"-time weighting.

2.3.3 Noise Guidelines for Wind Farms (MoE, 2008)

This document establishes the sound level limits for land-based wind energy generating facilities and describes the information required for noise assessments and submissions under the Environmental Assessment Act and the Environmental Protection Act, Canada.

The document defines:

- Sound Level Limits for different areas (similar to rural and urban areas), defining limits for different wind speeds at 10 m height, refer also **Table 2-1**[2]
- The Noise Assessment Report, including;
    - Information that must be part of the report
    - Full description of noise sources
    - Adjustments, such as due to the wind speed profile (wind shear)
    - The identification and defining of potential sensitive receptors
    - Prediction methods to be used (ISO 9613-2)
    - Cumulative impact assessment requirements
    - It also defines specific model input parameters
    - Methods on how the results must be presented
    - Assessment of Compliance (defining magnitude of noise levels)

Table 2-1: Summary of Sound Level Limits for Wind Farms (MoE)

Wind speed (m/s) at 10 m height	4	5	6	7	8	9	10
Wind Turbine Sound Level Limits, Class 3 Area, dBA	40	40	40	43	45	49	51
Wind Turbine Sound Level Limits, Class 1 & 2 Areas, dBA	45	45	45	45	45	49	51

The document used the $L_{Aeq,1hr}$ noise descriptor to define noise levels. It is not clear whether the instrument must be set to the "Fast" or "Impulse" time weighing setting, but, as the "Fast" setting is used in most international countries it is assumed that the instrument will be set to the "Fast" setting.

[2]The measurement of wind induced background sound level is not required to establish the applicable limit. The wind induced background sound level reference curve was determined by correlating the A-weighted ninetieth percentile sound level (L90) with the average wind speed measured at a particularly quiet site. The applicable Leq sound level limits at higher wind speeds are given by adding 7 dB to the wind induced background L90 sound level reference values

It should be noted that these Sound Level Limits are included for the reader to illustrate the criteria used internationally. Due to the lack of local regulations specifically relevant to wind energy facilities this criteria will also be considered during the determination of the significance of the noise impact.

2.3.4 Equator Principles

The **Equator Principles** (EPs) are a voluntary set of standards for determining, assessing and managing social and environmental risk in project financing. Equator Principles Financial Institutions (EPFIs) commit to not providing loans to projects where the borrower will not or is unable to comply with their respective social and environmental policies and procedures that implement the EPs.

The Equator Principles were developed by private sector banks and were launched in June 2003. Revision III of the EPs has been in place since June 2013. The participating banks chose to model the Equator Principles on the environmental standards of the World Bank (1999) and the social policies of the International Finance Corporation (IFC). Eighty-three financial institutions (2016) have adopted the Equator Principles, which have become the de facto standard for banks and investors on how to assess major development projects around the world.

The environmental standards of the World Bank have been integrated into the social policies of the IFC since April 2007 as the International Finance Corporation Environmental, Health and Safety (EHS) Guidelines.

3 CURRENT ENVIRONMENTAL SOUND CHARACTER

3.1 INFLUENCE OF WIND ON NOISE LIMITS

Current local regulations and standards do not consider changing ambient (background) sound levels due to natural events such as can be found near the coast or areas where wind-induced noise are prevalent. This is unfeasible with wind energy facilities as these facilities will only operate when the wind is blowing. It is therefore important that the contribution of wind-induced noise be considered when determining the potential noise impact from such a facility. Care should be taken when taking this approach due to other factors that complicate noise propagation from wind turbines.

While the total ambient sound levels are of importance, the spectral characteristics also determine the likelihood that someone will hear external noise that may or may not be similar in spectral characteristics to that of the vegetation that created the noise. Bolin (2006) investigated spectral characteristics and determined that annoyance might occur at levels where noise generated by wind turbine noise exceeds natural ambient sounds with 3 dB or more.

Low frequency noise can also be associated with some wind turbines. Separating the potential low frequency noise from wind turbines from that generated by natural sources as well as other anthropogenic sources can and will be a challenge.

There are a number of factors that determine how ambient sound levels close to a dwelling (or the low-frequency noise levels inside the house) might differ from the ambient sound levels further away (or even at another dwelling in the area), including:

- Type of activities taking place in the vicinity of the dwelling;
- Equipment being used near the dwelling, especially equipment such as water pumps, compressors and air conditioners;
- Whether there are any windmills (*"windpompe"*) close to the dwelling as well as their general maintenance condition;
- Type of trees around dwelling (conifers vs. broad-leaved trees, habitat that it provides to birds, food that it may provide to birds);
- The number, type and distance between the dwelling (measuring point) and trees. This is especially relevant when the trees are directly against the house (where the branches can touch the roof);
- Distance to large infrastructural developments, including roads, railroads and even large diameter pipelines;

- Distances to other noise sources, whether anthropogenic or natural (such as the ocean or running water);
- The material used in the construction of the dwelling;
- The design of the building, including layout and number of openings;
- How well the dwelling is maintained; and
- The type and number of farm animals in the vicinity of the dwelling.

3.2 AMBIENT SOUND MEASUREMENTS

The measurement locations are illustrated in **Figure 3-1** as blue squares.

Because wind induced noise are a significant source of noise during periods when wind turbines operate, it cannot be excluded. It however, complicates ambient sound measurements, as a few singular measurements will provide insufficient data to allow any confidence in the subsequent information obtained. As a result ambient sound measurements were collected over a period of two night-time periods to ensure sufficient sound level measurement data. This data can then be analysed with the wind speed data that will provide a sound level versus wind speed curve as illustrated in **Figure 5-2**.

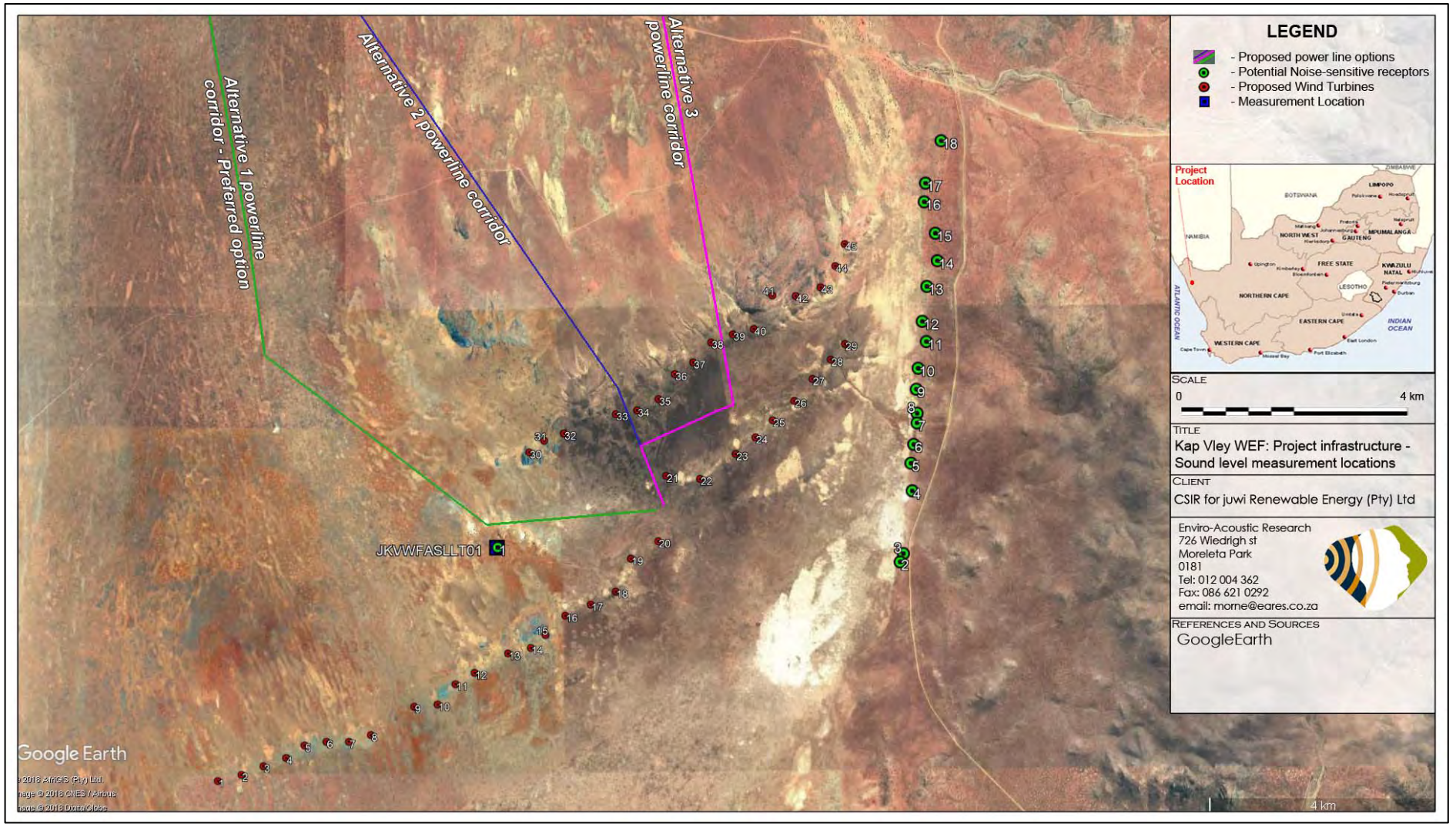

Figure 3-1: Localities where ambient sound levels were measured (green dots -potential noise-sensitive receptors)

3.2.1 Measurement location JKVWFASLLT01

The measurement location was located in front of the main dwelling of the farm. The dwelling is only used on occasion, with an employee living in a second dwelling around 50m from the microphone. There were a number of chickens around his dwelling, but they were generally not audible. It was reported that the sheep stay close to the dwelling at night. The equipment defined in **Table 3-1** was used for gathering data. Measured sound levels are presented in **Figure 3-2** and **Figure 3-3** and described in **Table 3-2**. It should be noted that the wind speed data is from a wind mast on the hill and not at the house. Wind speeds at the house would be significantly less than the wind speeds on the top of the hill.

Table 3-1: Equipment used to measure sound levels at JKVWFASLLT01

Equipment	Model	Serial no	Calibration Date
SLM	Svan 977	34849	June 2016
Microphone	ACO Pacific 7052E	55974	June 2016
Calibrator	Quest CA-22	J 2080094	July 2017

* Microphone fitted with the RION WS-03 outdoor all-weather windshield.

Sounds heard during the period the instrument was deployed and collected (approximately 60 – 80 minutes) are defined in **Table 3-2**.

Table 3-2: Noise/sounds heard during site visits at receptor JKVWFASLLT01

		During Deployment	During Collection
Magnitude Scale Code: • **Barely Audible** • **Audible** • **Dominating or clearly audible**	**Faunal and natural**	Wind induced noise at times and birds dominating.	Birds dominating. Sheep bleating in area.
	Residential	Dog barking for a while at arrival, but reported that dog is normally quiet. Radio playing but employee said that he will turn it down.	Dog barking for a short while.
	Industrial & transportation	Nothing	Nothing

Impulse equivalent sound levels (South African legislation): Figure 3-2 illustrates how the impulse-weighted 10-minute equivalent values change over time with **Table 3-3** defining the average values for the time period. This sound descriptor is mainly used in South Africa to define sound and noise levels. The instrument is set to measure the impulse time-weighted sound levels.

Fast equivalent sound levels (International guidelines): Fast-weighted 10-minute equivalent (average) sound levels for the day and night-time periods are shown on **Figure 3-2** with **Table 3-3** defining the average values for the time period. Fast-weighted equivalent sound levels are included in this report as this is the sound descriptor used in most international countries to define the Ambient Sound Level.

Statistical sound levels ($L_{A90,f}$): The L_{A90} level is presented in this report as it is used to define the "background ambient sound level", or the sound level that can be expected if there were little single events (loud transient noise) that impact on the average sound level. **L_{A90}** is a statistical indicator that describes the noise level that is exceeded 90% of the time and frequently used to define the background sound level internationally. The instrument is set to fast time-weighting. It is illustrated against time on **Figure 3-3** and defined in **Table 3-3**.

Measured maximum and minimum sound levels: These are statistical sound descriptors that can be used to characterise the sound levels in an area along with the other sound descriptors. These sound level descriptors are defined in **Table 3-3** and illustrated in **Figure 3-3**.

Table 3-3: Sound levels considering various sound level descriptors at JKVWFASLLT01

	$L_{Amax,i}$ (dBA)	$L_{Aeq,i}$ (dBA)	$L_{Aeq,f}$ (dBA)	$L_{A90,f}$ (dBA90)	$L_{Amin,f}$ (dBA)	Comments
Day arithmetic average	-	40	35	24	-	-
Night arithmetic average	-	27	25	20	-	-
Day minimum	-	17	18	-	16	-
Day maximum	78	56	48	-	-	-
Night minimum	-	16	18	-	15	-
Night maximum	68	43	38	-	-	-
Day 1 equivalent	-	39	34	-	-	Late afternoon and evening only
Night 1 Equivalent	-	33	30	-	-	8 hour night equivalent average
Day 2 equivalent	-	46	40	-	-	16 hour day equivalent average
Night 2 Equivalent	-	31	27	-	-	8 hour night equivalent average
Day 3 equivalent	-	48	41	-	-	Early morning only

The data indicate a very quiet area with mainly sounds of natural origin dominating. It should be noted that the employee switched off the radio during the measurement. The sound from the radio was only audible during very quiet periods at the microphone (lull in both winds and bird calls).

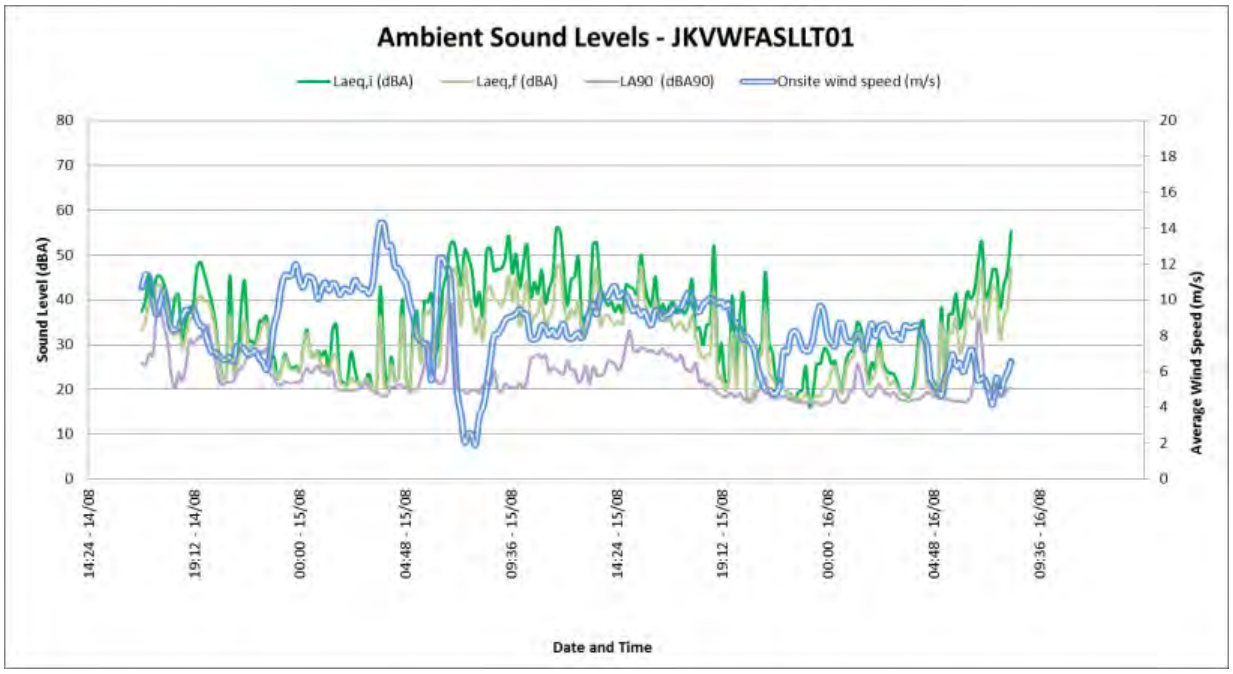

Figure 3-2: Ambient Sound Levels at JKVWFASLLT01

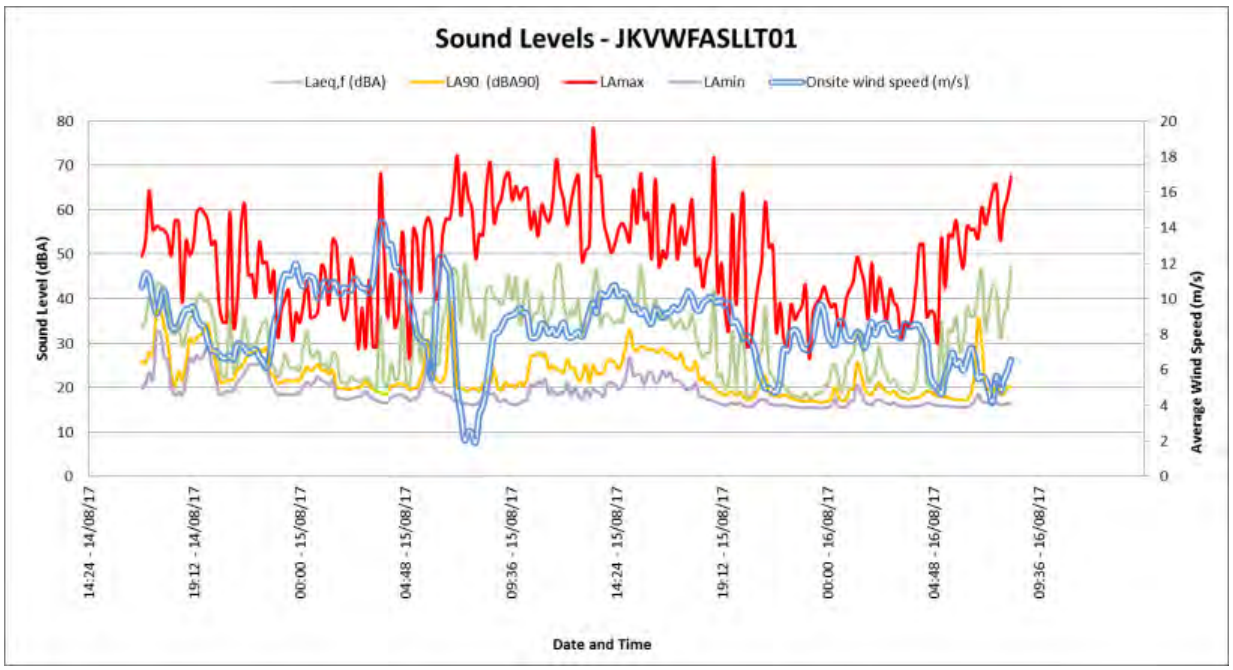

Figure 3-3: Maximum, minimum and statistical values at JKVWFASLLT01

4 POTENTIAL NOISE SOURCES

Increased noise levels are directly linked with the various activities associated with the construction of the WEF and related infrastructure, as well as the operational phase of the WEF. The most significant stage relating to noise is generally the operational phase, and not the construction phase. This normally is due to the relatively short duration of construction activities.

4.1 POTENTIAL NOISE SOURCES: CONSTRUCTION PHASE

4.1.1 Construction equipment

It is estimated that construction will take approximately 18 - 24 months subject to the final design of the WEF, weather and ground conditions, including time for testing and commissioning. There are numerous activities that can take place simultaneously during the construction phase, such as:

- Site survey and preparation;
- Site clearing (for the WEF components as well as for the associated powerline corridor)
- Transport of components & equipment to site;
- Establishment of site entrance, internal access roads, contractors compound and passing places;
- Establishment of laydown & hard standing areas;
- Civil works to sections of the public roads to facilitate with turbine delivery;
- Site preparation activities;
- Construct turbine foundations;
- Erecting the wind turbines;
- Establishment of ancillary infrastructure;
- Construct powerline foundations; and
- Site rehabilitation.

There are a number of factors that determine the audibility as well as the potential of a noise impact on receptors. Maximum noise generated can be audible over a large distance; however, it is generally of very short duration.

Average or equivalent sound levels is another factor that impacts on the ambient sound levels and is the constant sound level that the receptor can experience. Typical sound

power levels associated with various activities that may be found at a construction site are presented **Table 4-1**.

Table 4-1: Potential equivalent noise levels generated by various equipment

Equipment Description	Equivalent (average) Sound Levels (dBA)	Operational Noise Level at given distance considering equivalent (average) sound power emission levels (Cumulative as well as the mitigatory effect of potential barriers or other mitigation not included – simple noise propagation modelling only considering distance) (dBA)											
		5 m	10 m	20 m	50 m	100 m	150 m	200 m	300 m	500 m	750 m	1000 m	2000 m
Bulldozer CAT D10	111.9	86.9	80.9	74.9	66.9	60.9	57.4	54.9	51.3	46.9	43.4	40.9	34.9
Bulldozer CAT D11	113.3	88.4	82.3	76.3	68.4	62.3	58.8	56.3	52.8	48.4	44.8	42.3	36.3
Bulldozer CAT D9	111.9	86.9	80.9	74.9	66.9	60.9	57.4	54.9	51.3	46.9	43.4	40.9	34.9
Bulldozer CAT D6	108.2	83.3	77.3	71.2	63.3	57.3	53.7	51.2	47.7	43.3	39.8	37.3	31.2
Bulldozer CAT D5	107.4	82.4	76.4	70.4	62.4	56.4	52.9	50.4	46.9	42.4	38.9	36.4	30.4
Bulldozer Komatsu 375	114.0	89.0	83.0	77.0	69.0	63.0	59.5	57.0	53.4	49.0	45.5	43.0	37.0
Bulldozer Komatsu 65	109.5	84.5	78.5	72.4	64.5	58.5	54.9	52.4	48.9	44.5	41.0	38.5	32.4
Diesel Generator (Large - mobile)	106.1	81.2	75.1	69.1	61.2	55.1	51.6	49.1	45.6	41.2	37.6	35.1	29.1
Dumper/Haul truck - CAT 700	115.9	91.0	85.0	78.9	71.0	65.0	61.4	58.9	55.4	51.0	47.5	45.0	38.9
Dumper/Haul truck - Terex 30 ton	112.2	87.2	81.2	75.2	67.2	61.2	57.7	55.2	51.7	47.2	43.7	41.2	35.2
Dumper/Haul truck - Bell 25 ton (B25D)	108.4	83.5	77.5	71.4	63.5	57.5	53.9	51.4	47.9	43.5	40.0	37.5	31.4
Excavator - Cat 416D	103.9	78.9	72.9	66.8	58.9	52.9	49.3	46.8	43.3	38.9	35.4	32.9	26.8
Excavator - Hitachi EX1200	113.1	88.1	82.1	76.1	68.1	62.1	58.6	56.1	52.6	48.1	44.6	42.1	36.1
Excavator - Hitachi 870 (80 t)	108.1	83.1	77.1	71.1	63.1	57.1	53.6	51.1	47.5	43.1	39.6	37.1	31.1
Excavator - Hitachi 270 (30 t)	104.5	79.6	73.5	67.5	59.6	53.5	50.0	47.5	44.0	39.6	36.0	33.5	27.5
FEL - CAT 950G	102.1	77.2	71.2	65.1	57.2	51.2	47.6	45.1	41.6	37.2	33.7	31.2	25.1
FEL - Komatsu WA380	100.7	75.7	69.7	63.7	55.7	49.7	46.2	43.7	40.1	35.7	32.2	29.7	23.7
General noise	108.8	83.8	77.8	71.8	63.8	57.8	54.2	51.8	48.2	43.8	40.3	37.8	31.8
Grader - Operational Hitachi	108.9	83.9	77.9	71.9	63.9	57.9	54.4	51.9	48.4	43.9	40.4	37.9	31.9
Grader	110.9	85.9	79.9	73.9	65.9	59.9	56.4	53.9	50.3	45.9	42.4	39.9	33.9
JBL TLB	108.8	83.8	77.8	71.8	63.8	57.8	54.3	51.8	48.3	43.8	40.3	37.8	31.8
Road Transport Reversing/Idling	108.2	83.3	77.2	71.2	63.3	57.2	53.7	51.2	47.7	43.3	39.7	37.2	31.2
Road Truck average	109.6	84.7	78.7	72.6	64.7	58.7	55.1	52.6	49.1	44.7	41.1	38.7	32.6
Vibrating roller	106.3	81.3	75.3	69.3	61.3	55.3	51.8	49.3	45.8	41.3	37.8	35.3	29.3
Water Dozer, CAT	113.8	88.8	82.8	76.8	68.8	62.8	59.3	56.8	53.3	48.8	45.3	42.8	36.8

4.2 POTENTIAL NOISE SOURCES: OPERATIONAL PHASE

The operational life of the wind turbine facility is expected to be approximately 20 years which could be extended through regular maintenance and/or upgrades in technology. During the operational phase of the WEF, the majority of the WEF turbine sites will continue with its current agricultural use. The only development related activities on-site will be routine servicing and unscheduled maintenance. The noise impact from maintenance activities is insignificant, with the main noise source being the wind turbine blades and the nacelle (components inside).

Noise emitted by wind turbines can be divided in two types of noise sources. Firstly, aerodynamic sources, due to the passage of air over the wind turbine blades. Secondly, mechanical sources that are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment for yaw, blade pitch, etc. These sources generally have different characteristics and can be considered separately. In addition there are other lesser noise sources, such as the substations themselves, traffic (maintenance), as well as transmission line noise.

5 NOISE IMPACT AND SIGNIFICANCE

5.1 WHY NOISE CONCERNS COMMUNITIES[3]

Noise can be defined as "unwanted sound", and an audible acoustic energy that adversely affects the physiological and/or psychological well-being of people, or which disturbs or impairs the convenience or peace of any person. One can generalise by saying that sound becomes unwanted when it:

- Hinders speech communication;
- Impedes the thinking process;
- Interferes with concentration;
- Obstructs activities (work, leisure and sleeping); and
- Presents a health risk due to hearing damage.

Severity of the annoyance depends on factors such as:

- Background sound levels, and the background sound levels the receptor are used to;
- The manner in which the receptor can control the noise (helplessness);
- The time, unpredictability, frequency distribution, duration, and intensity of the noise;
- The physiological state of the receptor; and
- The attitude of the receptor about the emitter (noise source).

5.2 IMPACT ASSESSMENT CRITERIA

5.2.1 Noise criteria of concern

The criteria used in this report were drawn from the criteria for the description and assessment of environmental impacts considering the latest EIA Regulations and DEAT (2002) guideline, SANS 10103:2008 as well as guidelines from the World Health Organization.

There are a number of criteria that are of concern for the assessment of noise impacts. These can be summarised in the following manner:

- *Increase in noise levels:* People or communities often react to an increase in the ambient noise level they are used to, which is caused by a new source of noise. With regards to the Noise Control Regulations (promulgated in terms of the ECA), an increase of more than 7 dBA is considered a disturbing noise. See also **Figure 5-1**.

[3]World Health Organization, 1999; Noise quest, 2010; Journal of Acoustical Society of America, 2009

- *Zone Sound Levels:* Previously referred to as the acceptable rating levels, it sets acceptable noise levels for various areas. See also **Table 5-1**.
- *Absolute or total noise levels:* Depending on their activities, people generally are tolerant to noise up to a certain absolute level, e.g. 65 dBA. Anything above this level will be considered unacceptable.

In South Africa, the document that addresses the issues concerning environmental noise is SANS 10103:2008 (See also **Table 5-1**). It provides the equivalent ambient noise levels (referred to as Rating Levels), $L_{Req,d}$ and $L_{Req,n}$, during the day and night respectively to which different types of developments may be exposed.

While acoustical measurements indicated an area where the ambient sound levels are slightly higher than typically associated for a rural area, the potential noise impact will be evaluated in terms of (i.t.o.) the rural acceptable rating level as well as the IFC noise-limits as defined below:

- "Rural Noise Districts" (45 and 35 dBA day/night-time Rating i.t.o. SANS 10103:2008); and
- "Equator principles" (55 and 45 dBA day/night-time limits i.t.o. IFC Noise Limits).

SANS 10103:2008 also provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise. If Δ is the increase in sound level, the following criteria are of relevance (see also **Figure 5-1**):

- **Δ ≤ 3 dBA:** An increase of 3 dBA or less will not cause any response from a community. It should be noted that for a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level would not be noticeable.
- **3 < Δ ≤ 5 dBA:** An increase of between 3 dBA and 5 dBA will elicit 'little' community response with 'sporadic complaints'. People will just be able to notice a change in the sound character in the area.
- **5 < Δ ≤ 15 dBA:** An increase of between 5 dBA and 15 dBA will elicit a 'medium' community response with 'widespread complaints'. In addition, an increase of 10 dBA is subjectively perceived as a doubling in the loudness of a noise. For an increase of more than 15 dBA the community reaction will be 'strong' with 'threats of community action'.

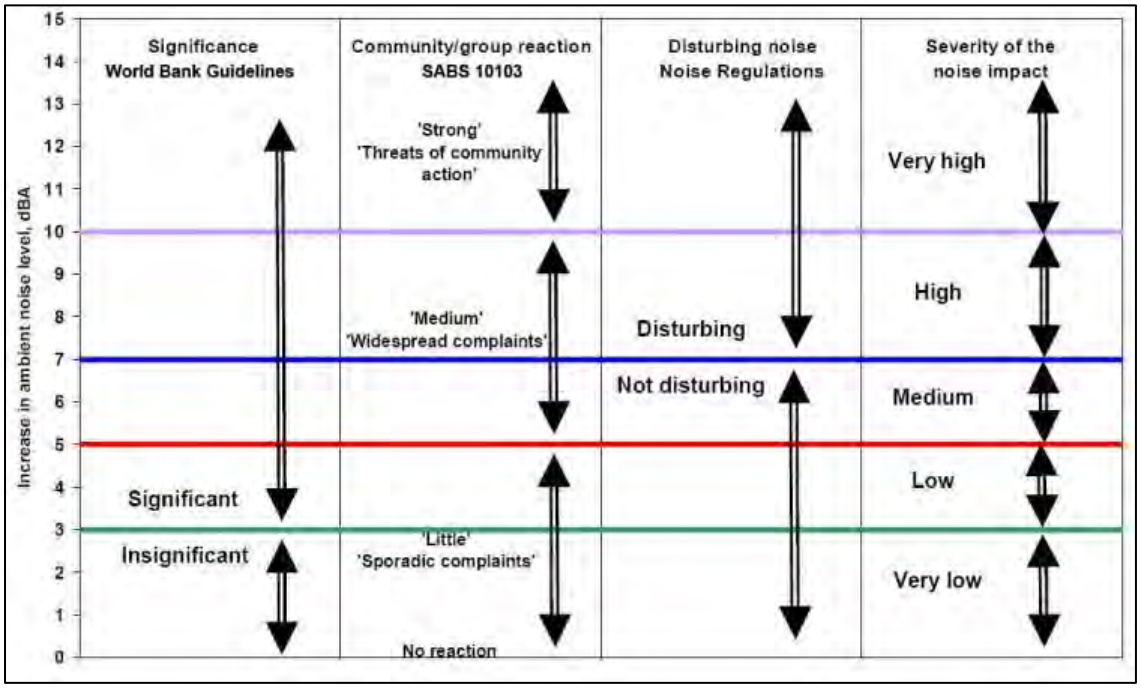

Figure 5-1: Criteria to assess the significance of impacts stemming from noise

Table 5-1: Acceptable Zone Sound Levels for noise in districts (SANS 10103:2008)

1	2	3	4	5	6	7
Type of district	**Equivalent continuous rating level ($L_{Req.T}$) for noise** dBA					
	Outdoors			**Indoors, with open windows**		
	Day/night $L_{R,dn}$ [a]	**Daytime $L_{Req,d}$** [b]	**Night-time $L_{Req,n}$** [b]	**Day/night $L_{R,dn}$** [a]	**Daytime $L_{Req,d}$** [b]	**Night-time $L_{Req,n}$** [b]
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with one or more of the following: workshops; business premises; and main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

Note that an increase of more than 7 dBA is defined as a disturbing noise and prohibited (National and Provincial Noise Control Regulations).

5.2.2 Determining appropriate Zone Sound Levels

SANS 10103:2008 does not cater for instances when background ambient sound levels change due to the impact of external forces. Locations close (closer than 500 meters from coastline) from the sea for instance always have an ambient sound level exceeding 35

dBA, and, in cases where the sea is rather turbulent, it can easily exceed 45 dBA. Similarly, noise induced by high winds is not considered in the SANS standard.

Setting noise limits relative to the ambient sound level is relatively straightforward when the prevailing ambient sound level and source level are constant. However, wind turbines only start to operate when wind speeds exceed 3 m/s. Noise emissions therefore relate to the wind speed and similarly, the environment in which they are heard also depends upon the strength of the wind and the noise associated with its effects. It is therefore necessary to derive an ambient sound level that is indicative of the noise environment at the receiving property for different wind speeds so that the turbine noise level at any particular wind speed can be compared with the ambient sound level in the same wind conditions.

5.2.2.1 Using International Guidelines to set Noise Limits

When assessing the overall noise levels emitted by a Wind Energy Facility, it is necessary to consider the full range of operating wind speeds of the wind turbines. This covers the wind speed range from around 3-5 m/s (the turbine cut-in wind speed) up to a wind speed range of 25-35 m/s measured at the hub height of a wind turbine. However, ETSU-R97 (1996) proposes that noise limits only be placed up to a wind speed of 12 m/s for the following reasons:

1. Wind speeds are not often measured at wind speeds greater than 12 m/s at 10 m height;
2. Reliable measurements of background ambient sound levels and turbine noise will be difficult to make in high winds due to the effects of wind noise on the microphone and the fact that one could have to wait several months before such winds were experienced;
3. Turbine manufacturers are unlikely to be able to provide information on sound power levels at such high wind speeds for similar reasons; and
4. If a wind farm meets noise limits at wind speeds lower than 12m/s, it is most unlikely to cause any greater loss of amenity at higher wind speeds. Turbine noise levels increase only slightly as wind speeds increase; however, background ambient sound levels increase significantly with increasing wind speeds due to the force of the wind.

Ambient sound vs. wind speed data is presented in **Figure 5-2**[4]. This is a quiet (as per the opinion of the author) location[5] where there were no apparent or observable sounds

[4] The sound level measuring instruments were located at a quiet location in the garden of the various houses. Data was measured in 10-minute bins and then co-ordinated with the 10 m wind speed derived from the wind mast of the developer. This wind mast normally was not close to the dwelling, at times being further than 5,000

that would have impacted on the measurements, presenting the A-Weighted sound levels at an inland area. The figures clearly indicate a trend where sound levels increase if the wind speed increases. This has been found at all locations where measurements have been done for a sufficiently long enough period of time (more than 30 locations – more than 38,000 measurements).

It should be noted that there are few sheep in the area due to the drought and the receptor at NSD01 confirmed that the dwellings in the area (NSD02 – NSD18) are mainly used during summer periods when field conditions are ideal for feeding sheep. These sheep are frequently gathered in pens close to these dwellings at night to protect them from caracal and other predators. The proximity of the sheep to the dwellings would also raise ambient sound levels.

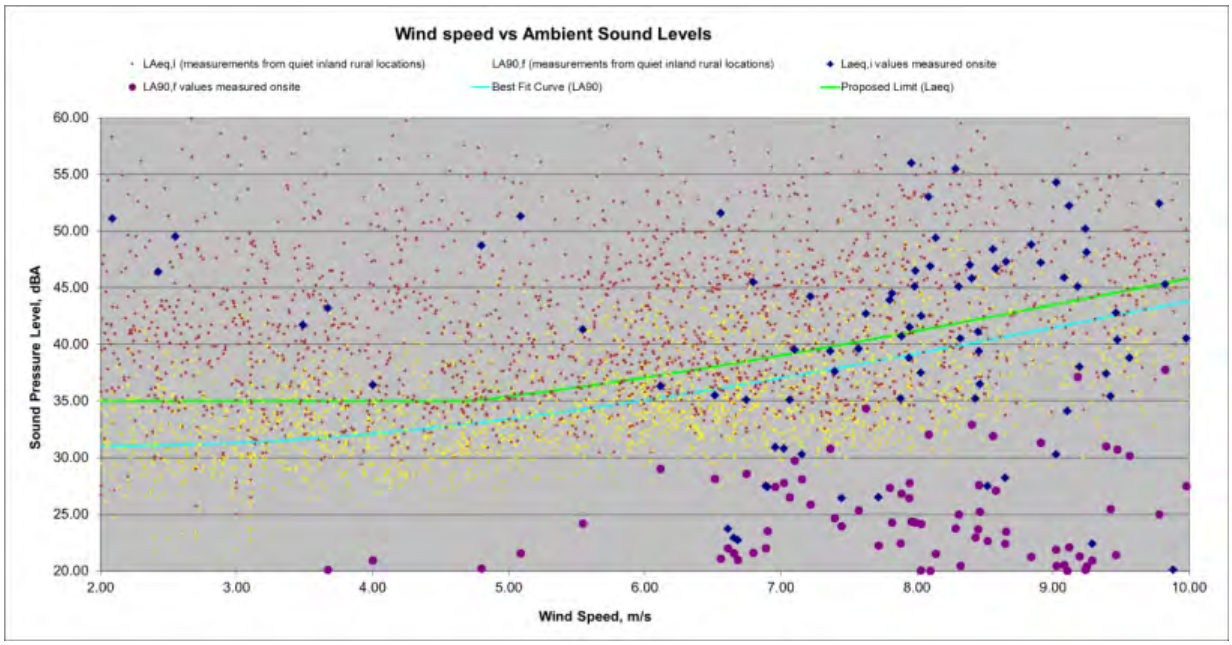

Figure 5-2: Ambient sound levels – quiet inland location (A-Weighted)

Considering this data as well as the international guidelines, noise limits starting at 40 dB that increase to more than 45 dB (as wind speeds increase) are acceptable. In addition, project participants could be exposed to noise levels up to 45 dBA (ETSU-R97) at lower wind speeds.

5.2.2.2 Using local regulations to set noise limits

Noise limits as set by the National Noise Control Regulations (GN R154 of 1992 - **section 2.1.1**) defines a "**disturbing noise**" as the noise that —

meters from the measurement location. It is possible that the wind may be blowing at the location of the wind mast with no wind at the measurement location, resulting in low sound levels recorded.

[5] Different area where longer measurements were collected.

- exceeds the rating level by 7 dBA;
- exceeds the residual noise level (where the residual noise level is higher than the rating level); or
- in the case of a low-frequency noise, exceeds the level specified in Annex B of SANS 10103;

Accepting that the area is a rural district, night-time rating levels would be 35 dBA and a noise level exceeding 42 dBA could be a disturbing noise (therefore the noise limit). The daytime rating level is 45 dBA (52 dBA for a disturbing noise).

Considering Figure 5-2 it should be noted that ambient sound was very low in the area during the period that winds were blowing (and the wind turbines will be operational). These low ambient sound levels will increase the probability of a potential noise impact which was considered in the impact assessment phase.

5.2.3 Determining the Significance of the Noise Impact

The level of detail as depicted in the EIA regulations was fine-tuned by assigning specific values to each impact while considering the DEAT (2002) guideline. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value as defined in the third column in the tables below.

The impact consequence is determined by summing the scores of Magnitude (**Table 5-2**), Duration (**Table 5-3**), Spatial Extent (**Table 5-4**), Reversibility (**Table 5-5**) and the Irreplaceability of the Resource (**Table 5-6**). An explanation of the impact assessment criteria is defined in the following tables.

Table 5-2: Impact Assessment Criteria - Magnitude

This defines the impact as experienced by any receptor. In this report the receptor is defined as any resident in the area, but excludes faunal species.		
Rating	**Description**	**Score**
Low	Increase in average ambient sound levels less than 3 dB from the expected wind induced ambient sound level. No change in ambient sound levels discernible. Total projected noise level is less than the Zone Sound Level in wind-still conditions.	1
Medium	Increase in average sound pressure levels between 3 and 5 dB from the (expected) wind induced ambient sound level. The change is barely discernible, but the noise source might become audible.	2
High	Increase in average sound pressure levels between 5 and 7 dB from the (expected) wind induced ambient sound level. Sporadic complaints expected. Any point where the zone sound levels are exceeded during wind still conditions.	3

Very High	Increase in average sound pressure levels higher than 7 dB from the (expected) wind induced ambient sound level. This can be considered as a disturbing noise level. Medium to widespread complaints expected.	4

Table 5-3: Impact Assessment Criteria - Duration

The lifetime of the impact that is measured in relation to the lifetime of the proposed development (construction, operational and closure phases).		
Rating	**Description**	**Score**
Short	Impacts are predicted to be of short duration (portion of construction period) and intermittent/occasional (less than a year).	1
Medium term	Impacts that are predicted to last only for the duration of the construction period (1 – 2years).	2
Long term	Impacts that will continue for the life of the Project, but ceases when the Project stops operating.	3
Permanent	Impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.	4

Table 5-4: Impact Assessment Criteria – Spatial extent

Classification of the physical and spatial scale of the impact		
Rating	**Description**	**Score**
Site	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.	1
Local	The impact could affect the local area (within 1,000 m from site).	2
Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.	3
National / International	The impact could have an effect that expands throughout the country (South Africa) and further.	4

Table 5-5: Impact Assessment Criteria - Reversibility

The reversibility of the potential impact.		
Rating	**Description**	**Score**
High	High reversibility of impacts (impact is highly reversible at end of project life, i.e. this is the most favourable assessment for the environment. For example, the nuisance factor caused by noise impacts associated with the operational phase of an exporting terminal can be considered to be highly reversible at the end of the project life)	1
Moderate	Moderate reversibility of impacts	2
Low	Low reversibility of impacts	3
Non-reversible	Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment. The impact is permanent. For example, the loss of a paleontological resource on the site caused by building foundations could be non-reversible)	4

Table 5-6: Impact Assessment Criteria – Loss of Resources

Irreplaceability of resource loss caused by impacts		
Rating	**Description**	**Score**
High	High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment. For example, if the project will destroy unique wetland systems, these may be irreplaceable)	4
Moderate	Moderate irreplaceability of resources	3
Low	Low irreplaceability of resources	2

Replaceable	Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment)	1

This information is used to calculate the Consequence to define the anticipated severity of the impact (**Table 5-7**).

Table 5-7: Impact Assessment Criteria – Consequence

Consequence of environmental impact		
Rating	**Description**	**Score**
Extreme	Extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease	16<
Severe	Severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease	12 < 16
Substantial	Substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease	8 < 12
Moderate	Notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner	4 < 8
Slight	Negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected	< 4

The impact significance (see **section 5.2.4**) is determined by multiplying the Consequence result with the Probability score (**Table 5-8**).

Table 5-8: Impact Assessment Criteria - Probability

This describes the likelihood of the impacts actually occurring, and whether it will impact on an identified receptor. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:		
Rating	**Description**	**Score**
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).	1
Probable	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined to be up to 50 %.	2
Highly probable	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined to be between 50 and 90 %.	3
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined to be higher than 90 %.	4

5.2.4 Defining the potential significance of the Noise Impact

Following the assignment of the necessary weights to the respective aspects, criteria are summed (Consequence score, **Table 5-7**) and multiplied by their assigned probabilities (**Table 5-8**), resulting in a Significance Rating value the noise impact (see **Table 5-9**).

Table 5-9: Potential significance of Noise Impact without and with mitigation

SR<16	Very Low Risk	Very low - The risk/impact may result in no or very minor alterations of the environment and any potential noise impacts can be easily avoided by implementing appropriate mitigation measures. The noise impact will not have an influence on decision-making.
16<**SR** <32	Low	Low - Impacts with little real effect and which should not have an influence on or require modification of the project design or alternative mitigation. No mitigation is required. The noise impact will not have an influence on decision-making).
32<**SR** <48	Moderate	Moderate - An impact or risk which is sufficiently important to require management. Of moderate significance - could influence the decisions about the project if left unmanaged.
48<**SR** <64	High	High – An impact or risk that is significant, having a considerable effect on the environment. Mitigation is critical to reduce impact or risk. Resulting impact could influence the decision depending on the possible mitigation. An impact which could influence the decision about whether or not to proceed with the project.
SR>60	Very High	Very High – An impact is significant resulting in major alteration of the environment. Significant mitigation and management will be required to reduce impact or risk. An impact that will influence the decision about whether or not to proceed with the project.

6 ASSUMPTIONS AND LIMITATIONS

6.1 MEASUREMENTS OF AMBIENT SOUND LEVELS

- Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. High measurements may not necessarily mean that noise levels in the area are high. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of the day, faunal characteristics, vegetation in the area and meteorological conditions (especially wind). This is excluding the potential effect of sounds from anthropogenic origin. It is impossible to quantify and identify the numerous sources that influenced one 10-minute measurement using the reading result at the end of the measurement. Therefore trying to define ambient sound levels using the result of one 10-minute measurement will be very inaccurate (very low confidence level in the results) for the reasons mentioned above. The more measurements that can be collected at a location the higher the confidence levels in the ambient sound level determined. The more complex the sound environment, the longer the required measurement. It is assumed that the measurement locations represent other residential dwellings in the area (similar environment), yet, in practice this can be highly erroneous as there are numerous factors that can impact on ambient sound levels, including;
    - the distance to closest trees, number and type of trees as well as the height of trees;
    - available habitat and food for birds and other animals;
    - distance to residential dwelling, type of equipment used at dwelling (compressors, air-cons);
    - general maintenance condition of house (especially during windy conditions); and
    - a number and type of animals kept in the vicinity of the measurement locations.
- Measurement locations for this project were selected to be in a relative quiet area, away from the residential dwelling to minimize the potential of extraneous noise impacting on the ambient sound levels,
- Exact location of a sound level meter in an area in relation to structures, infrastructure, vegetation and external noise sources will influence measurements. It may determine whether one is measuring anthropogenic sounds from a receptors dwelling, or environmental ambient soundscape contributors of significance (faunal, roads traffic, railway line movement etc.). At times there are extraneous noise that cannot be heard during deployment, or not operational, that can significantly impact on readings (such as water pumps, transformers, faunal communication, etc.);

- Determination of existing road traffic and other noise sources of significance are important (traffic counts etc.) – when close to any busy or significant roads. Traffic however is highly dependent on the time of day as well as general agricultural activities taking place during the site investigation. Traffic noise is one of the major components in urban areas and could be a significant source of noise during busy periods. This study found that traffic in this rural area was very low, yet it cannot be assumed that it is always low.
- Measurements over wind speeds of 3m/s could provide data influenced by wind-induced noise. While the windshields used limits, the effect of fluctuating pressure across the microphone diaphragm, the effect of wind-induced noise in the trees in the vicinity of the microphone did impact on the ambient sound levels. The site visit unfortunately coincided with a relatively windy period;
- Ambient sound levels are dependent not only on time of day and meteorological conditions, but also change due to seasonal differences. Ambient sound levels are generally higher in summer months when faunal activity is higher and lower during the winter due to reduced faunal activity. Winter months unfortunately also coincide with lower temperatures and very stable atmospheric conditions, ideal conditions for propagation of noise. Many faunal species are more active during warmer periods than colder periods. Certain cicada species can generate noise levels up to 120 dB for mating or distress purposes, sometimes singing in synchronisation magnifying noise levels they produce from their tymbals[6];
- Ambient sound levels recorded near rivers, streams, wetlands, trees and bushy areas can be high. This is due to faunal activity which can dominate the sound levels around the measurement location. This generally is still considered naturally quiet and understood and accepted as features of the natural soundscape, and in various cases sought after and pleasing;
- Considering one or more sound descriptor or equivalent can improve an acoustical assessment. Parameters such as L_{AMin}, L_{Aleq}, L_{AFeq}, L_{Ceq}, L_{AMax}, L_{A10}, L_{A90} and spectral analysis form part of the many variables that can be considered; and
- As a residential area develops the presence of people will result in increased sounds. These are generally a combination of traffic noise, voices, animals and equipment (incl. TV's and Radios). The result is that ambient sound levels will increase as an area develops.

[6] Clyne, D. *"Cicadas: Sound of the Australian Summer, Australian Geographic"* Oct/Dec Vol 56. 1999.

6.2 CALCULATING NOISE EMISSIONS ADEQUACY OF PREDICTIVE METHODS

The noise emissions (noise rating levels) into the environment from the various sources as defined by the project developer will be calculated using the sound propagation models described by ISO 9613-2 (operational phase) and SANS 10357:2004 [7] (construction phase). The following will be taken into account:

The following were considered:

- The sound power emission levels of the proposed equipment;
- The octave band sound pressure emission levels of processes and equipment;
- The distance of the receiver from the noise sources;
- The impact of atmospheric absorption;
- The operational details of the proposed project, such as projected areas where activities will be taking place;
- Topographical layout; and
- Acoustical characteristics of the ground. 25% soft ground conditions were modelled, as the area where the activity would be taking place is acceptably vegetated and sufficiently uneven to allow the consideration of relatively soft ground conditions. This is because the use of hard ground conditions could represent a too precautionary situation.

The potential noise rating levels due to construction traffic will be estimated using the SANS 10210:2004 algorithm, considering mainly the distance of a conceptual noise-sensitive receiver to the centre of a 2-way road. Mainly primary[8] corrections are used and include:

- Number of heavy and light vehicles (10 each for this report);
- Average road speed (100 and 60 km/h for this report);
- Road surface corrections (tar and gravel road for this project).

It should be noted that these models mainly project long-term average noise levels and cannot reflect transient effects (unmaintained equipment, broken or non-functional engines, etc.).

It is important to understand the difference between sound or noise level as well as the noise rating level (also see Glossary of Terms). Sound or noise levels generally refer to a sound pressure level as measured using an instrument, whereas the noise rating level refers to a calculated sound exposure level to which various corrections and adjustments were added. These noise rating levels are further processed into a 3D map illustrating

[7] SANS 10357:2004 The calculation of sound propagation by the Concave method'
[8] Secondary corrections include screening and reflection effects, angle-of-view corrections etc.

noise contours of constant rating levels or noise isopleths. In this project it illustrates the potential extent of the calculated noise of the complete project and not noise levels at a specific moment in time. It is used to define potential issues of concern and not to predict a noise level at a potential noise-sensitive receptor. For this the selected model is internationally recognised and considered adequate.

6.3 ADEQUACY OF UNDERLYING ASSUMPTIONS

Noise experienced at a certain location is the cumulative result of innumerable sounds emitted and generated both far and close, each in a different time domain, each having a different spectral character at a different sound level. Each of these sounds is also impacted differently by surrounding vegetation, structures and meteorological conditions that result in a total cumulative noise level represented by a few numbers on a sound level meter.

As previously mentioned, it is not the purpose of noise modelling to accurately determine a likely noise level at a certain receptor, but to calculate a noise rating level that is used to identify potential issues of concern.

6.4 UNCERTAINTIES ASSOCIATED WITH MITIGATION MEASURES

Any noise impact can be mitigated to have a low significance, however, the cost of mitigating this impact may be prohibitive, or the measure may not be socially acceptable (such as the relocation of a NSD), or the mitigation may result in the project not being economically viable. These mitigation measures may be engineered, technological or due to management commitment.

For the purpose of the EIA (determination of the significance of the noise impact) mitigation measures will be selected that are feasible, mainly focussing on management of noise impacts using rules, policy and require commitment from the project applicant. This however does not mean that noise levels cannot be reduced further, only that to reduce the noise levels further may require significant additional costs (whether engineered, technological or management requirements).

It should be noted that the significance of the potential noise impacts were determined to be low for the construction and operational phases.

6.5 UNCERTAINTIES OF INFORMATION PROVIDED

While it is difficult to define the character of a measured noise in terms of numbers (third octave sound power levels in this case), it is also difficult to accurately model noise levels at a receptor from any operation. The projected noise levels are the output of a numerical model with the accuracy depending on the assumptions made during the setup of the model. Assumptions include:

- The octave sound power levels selected for processes and equipment accurately represent the sound character and power levels of this processes/equipment. The determination of these levels in itself is subject to errors, limitations and assumptions with any potential errors carried over to any model making use of these results;
- Sound power emission levels from processes and equipment change depending on the load the process and equipment is subject too. While the octave sound power level is the average (equivalent) result of a number of measurements, this measurement relates to a period that the process or equipment was subject to a certain load. Normally these measurements are collected when the process or equipment is under high load. The result is that measurements generally represent a worst-case scenario;
- As it is unknown which processes and equipment will be operational (when and for how long), modelling considers a scenario where all processes and equipment are under full load for a set time period. Modelling assumptions comply with the precautionary principle and operational time periods are frequently overestimated. The result is that projected noise levels would likely over-estimate noise levels;
- Ambient sound levels vary over time of day, season and largely depend on the complexity and development character of the surrounding environment. To allow the calculation of change in ambient sound levels, a potential ambient sound level of 35 dBA is assumed. This level represents a quiet environment;
- Modelling cannot capture the potential impulsive character of a noise that can increase the potential nuisance factor;
- The impact of atmospheric absorption is simplified and very uniform meteorological conditions are considered. This is an over-simplification and the effect of this in terms of sound propagation modelling is difficult to quantify; and
- Acoustical characteristics of the ground are over-simplified with ground conditions accepted as uniform. 75% hard ground conditions will be modelled even though the area is where the facility will be located is relatively well vegetated and uneven, this will allow a more worst-case scenario.

7 PROJECTED NOISE RATING LEVELS

7.1 PROPOSED CONSTRUCTION PHASE NOISE IMPACT

This section investigates the conceptual construction activities as discussed in **section 4.1**. Construction activities are highly dependent on the final operational layout. The draft layout as provided by the developer is presented in **Figure 7-1**. As can be seen from these layouts, a number of different activities might take place close to potentially sensitive receptors, each with a specific potential impact.

7.1.1 Description of Construction Activities Modelled

The following construction activities could take place simultaneously and were considered:

- General work at a temporary workshop area. This would be activities such as equipment maintenance, off-loading and material handling. All vehicles will travel to this site where most equipment and material will be off-loaded (general noise, crane). Material, such as aggregate and building sand, will be taken directly to the construction area (foundation establishment). It was assumed that activities will be taking place for 16 hours during the 16 hour daytime period;
- Surface preparation prior to civil work. This could be the removal of topsoil and levelling with compaction, or the preparation of an access road (bulldozer/grader). Activities will be taking place for 8 hours during the 16 hour daytime period;
- Preparation of turbine foundation area (sub-surface removal until secure base is reached – excavator, compaction, and general noise). Activities will be taking place for 10 hours during the 16 hour daytime period;
- Pouring and compaction of foundation concrete (general noise, electric generator/compressor, concrete vibration, mobile concrete plant, TLB). As foundations must be poured in one go, the activity is projected to take place over the full 16 hour day time period;
- Erecting of the wind turbine generator (general noise, electric generator/compressor and a crane). Activities will be taking place for 16 hours during the 16 hour daytime period;
- Preparation of powerline corridor and foundation area (clearing of vegetation, sub-surface removal until secure base is reached – excavator, compaction, and general noise). Activities will be taking place for 10 hours during the 16 hour daytime period; and
- Traffic on the site (trucks transporting material, aggregate/concrete, work crews) moving from the workshop/store area to the various activity sites. All vehicles to travel at less than 60 km/h, with the construction vehicles travelling to the areas where work may be taking place.

There will be a number of smaller equipment, but the addition of the general noise source (at each point) covers most of these noise sources. It is assumed that all equipment would be operating under full load (generate the most noise) at a number of locations and that atmospheric conditions would be ideal for sound propagation. This is likely the worst case scenario that can occur during the construction of the facility.

As it is unknown where the different activities may take place it was selected to model the impact of the noisiest activity (laying of foundation totalling 113.6 dBA cumulative noise impact – various equipment operating simultaneously) at all locations (over the full daytime period of 16 hours) where wind turbines (or power pylons) may be erected for both layouts, calculating how this may impact on potential noise-sensitive developments (see **Figure 7-3**). Noise created due to linear activities (roads) were also evaluated and plotted against distance as illustrated in **Figure 7-4**[9].

Even though construction activities are projected to take place only during day time, it might be required at times that construction activities take place during the night (particularly for a large project). Construction activities that may occur during night time include:

- Concrete pouring: Large portions of concrete do require pouring and vibrating to be completed once started, and work is sometimes required until the early hours of the morning to ensure a well-established concrete foundation. However the work force working at night for this work will be considerably smaller than during the day; and
- Working late due to time constraints: Weather plays an important role in time management in construction. A spell of bad weather can cause a construction project to fall behind its completion date. Therefore, it is hard to judge beforehand if a construction team would be required to work late at night.

7.2 OPERATIONAL PHASE NOISE IMPACT

Typical day time activities would include:

- The operation of the various Wind Turbines,
- Maintenance activities (relatively insignificant noise source).

Noise generated from the operation of the wind turbines during the daytime period was not considered for the EIA. This is as the WEF is generally masked by other noise from a variety of sources surrounding potentially noise-sensitive developments. However, times when a quiet environment is desired (at night for sleeping, weekends etc.) ambient sound levels are more critical. The time period investigated therefore would be a quieter period,

[9] Sound level at a receiver set at a certain distance from a road

normally associated with the 22:00 – 06:00 timeslot. Maintenance activities would therefore not be considered, concentrating on the ambient sound levels created due to the operation of the various Wind Turbine Generators (WTGs) at night.

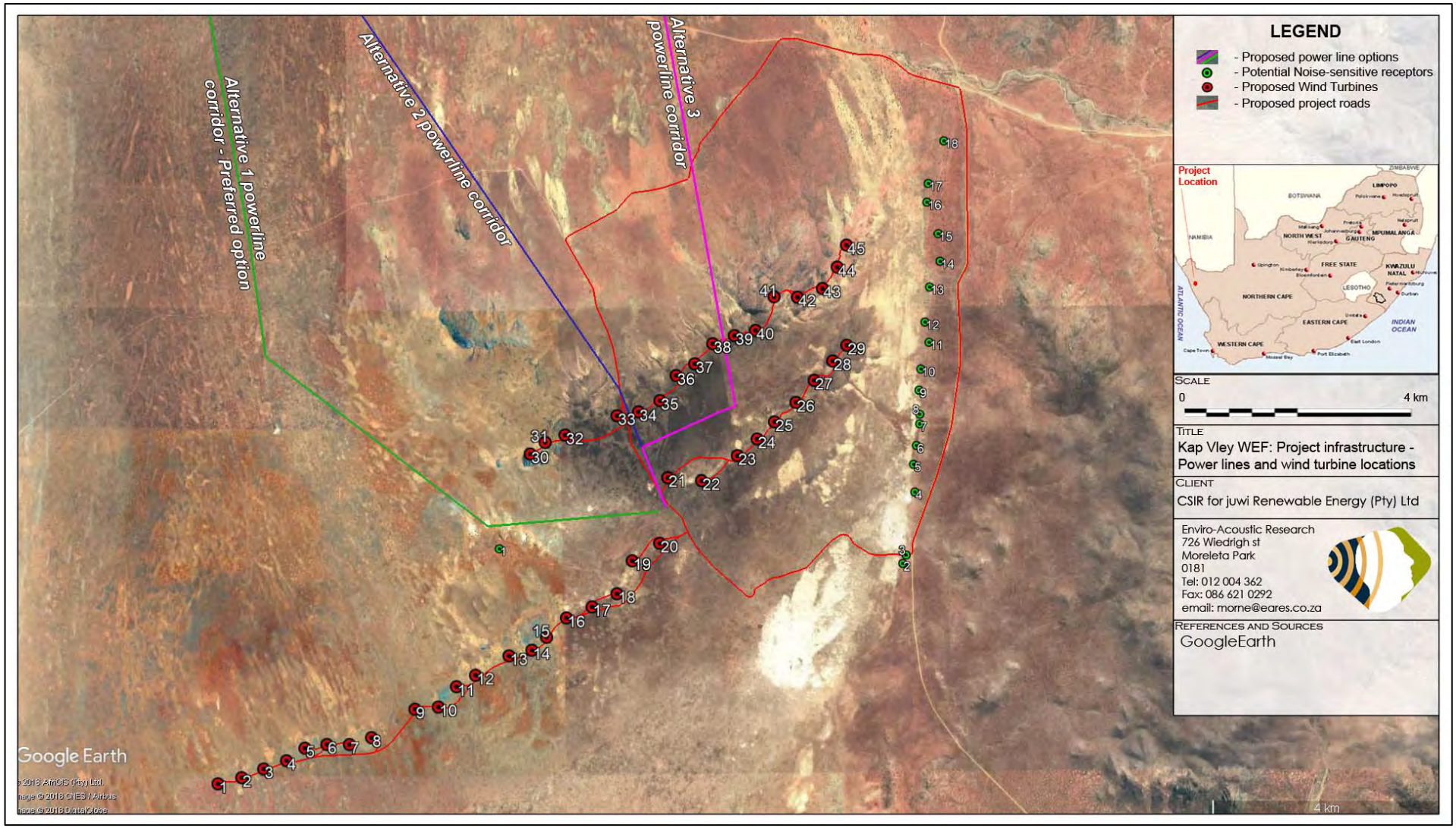

Figure 7-1: Wind Turbine Locations (and access roads) for the Kap Vley WEF – Final EIA Layout

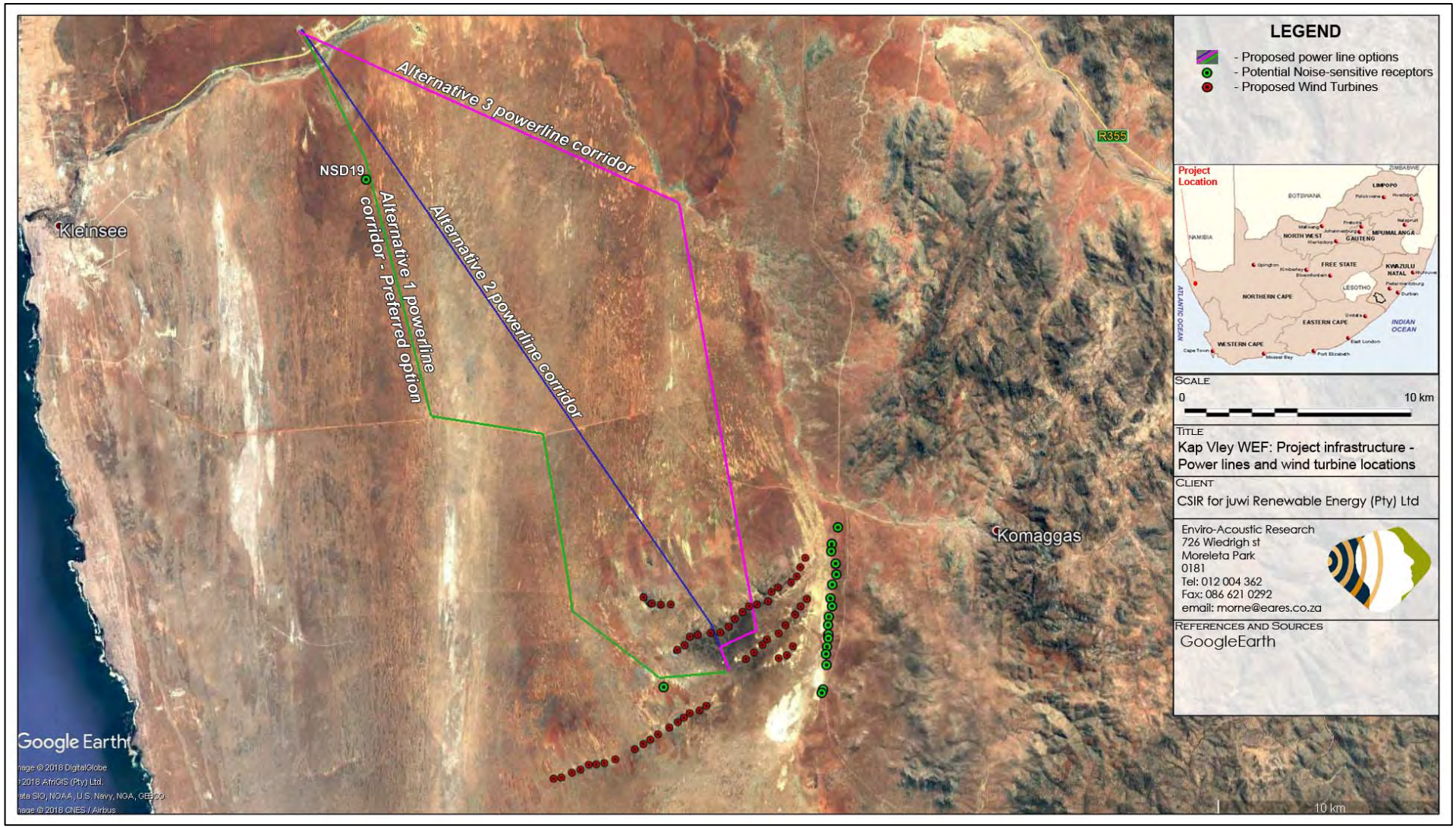

Figure 7-2: Wind Turbine Locations (and power line options) for the Kap Vley WEF – Final EIA Layout

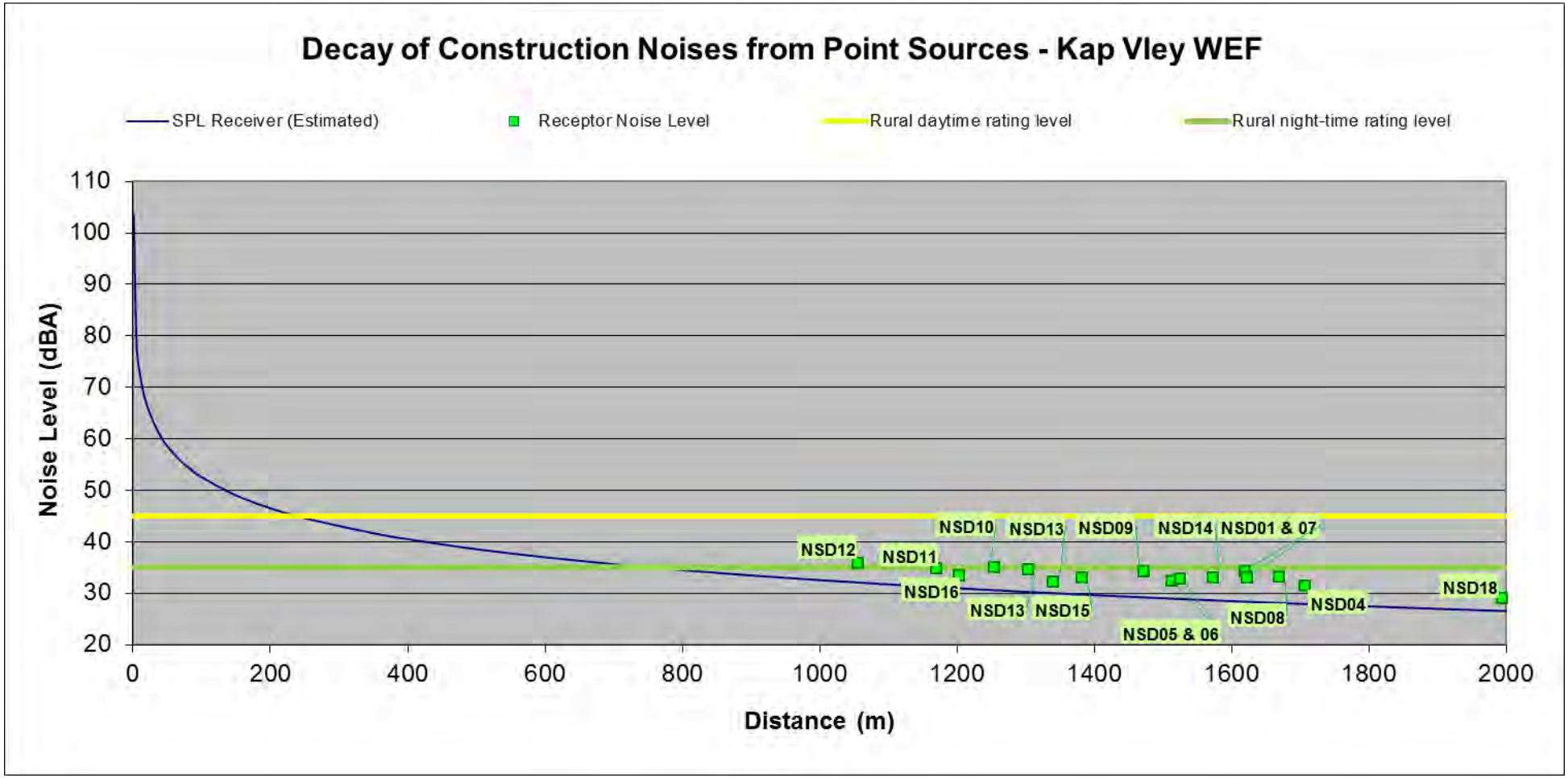

Figure 7-3: Projected conceptual construction noise levels[10] – Decay of noise from construction activities

[10] The SPL Receiver graph can also be used for the construction of the overhead power line to allow connection to the ESKOM grid. Any activities further than 500 m from any receiver will have a noise impact of low significance (daytime construction activities).

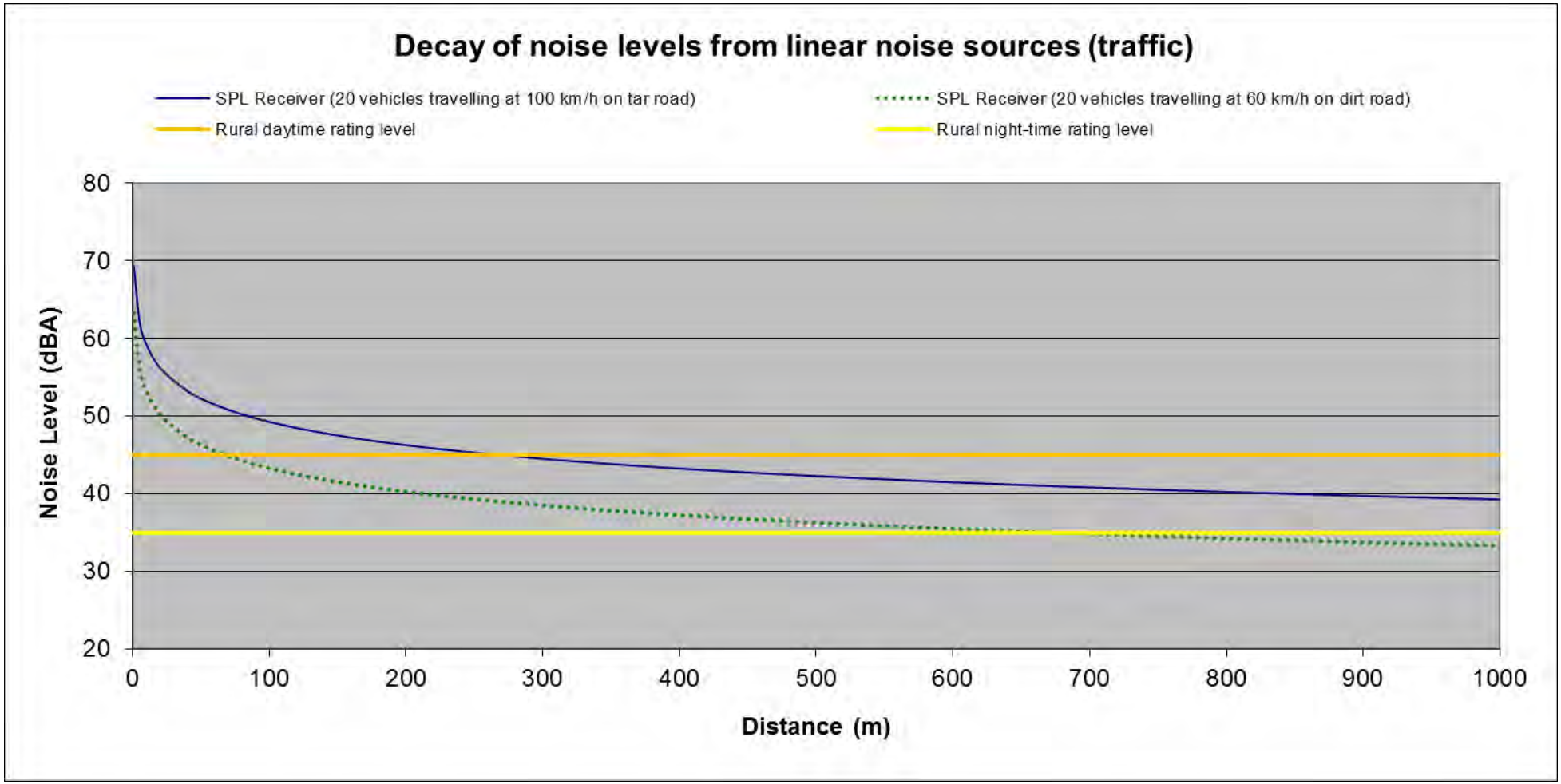

Figure 7-4: Projected conceptual construction noise levels – Decay over distance from linear activities

The draft layout presented in **Figure 7-1** was evaluated using the sound power emission levels for the Acciona AW125/3000. Being a "loud" wind turbine, this will represent the worst case scenario as the author is not aware of another wind turbine with higher sound power emission levels.

The calculated octave sound power levels of the Acciona AW125/3000 wind turbine as used for modelling are presented in **Table 7-1**, considering the 7 m/s wind speed for the noise contours. The difference between the proposed height of the nacelle (up to 150 m) and height used for modelling (87.5 m) will have a negligible impact on the results because changes in hub-height generally do not change the sound power emission level (for the same wind turbine), or the change is insignificantly small.

Table 7-1: Octave Sound Power Emission Levels used for modelling: Acciona AW125/3000

Wind Turbine: Acciona AW125/3000 at hh87.5										
Source Reference: Acciona Windpower. General Document DG200383, Rev D dated 04/04/14										
Maximum expected A-weighted Octave Sound Power Levels										
	16	**31.5**	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
Lpa (dB)	*not reported*	117.3	111.5	110.9	109.9	107.0	103.3	97.0	86.6	81.3
L_{WA} (dBA)	*not reported*	77.4	85.3	94.7	101.2	103.8	103.3	98.2	87.6	81.3
A-Weighted Sound Power Levels										
Wind speed at 10m height					Sound power level (dBA)					
4					*101.4 **					
5					*105.3 **					
6					107.3					
7					108.4					
8					108.3					
9					107.8					
10					107.8					

Total noise rating levels is illustrated in **Figure 7-6** with **Figure 7-5** defining the noise rating levels at the closest potential noise-sensitive receptors.

7.3 POTENTIAL CUMULATIVE NOISE IMPACTS

Cumulative noise impacts generally only occur when noise sources (such as other wind turbines) are closer than 2,000 m from each other (around 1,000 m from the conceptual receptor located between them). The cumulative impact also only affects the area between the wind turbines of the various wind farms.

If the wind turbines of one wind farm are further than 2,000 m from the wind turbines of the other wind farm, the magnitude (and subsequently the significance) of the cumulative

noise impact is reduced. If the distance between the wind turbines of two wind farms are further than 4 000 m, cumulative noise impacts are non-existent.

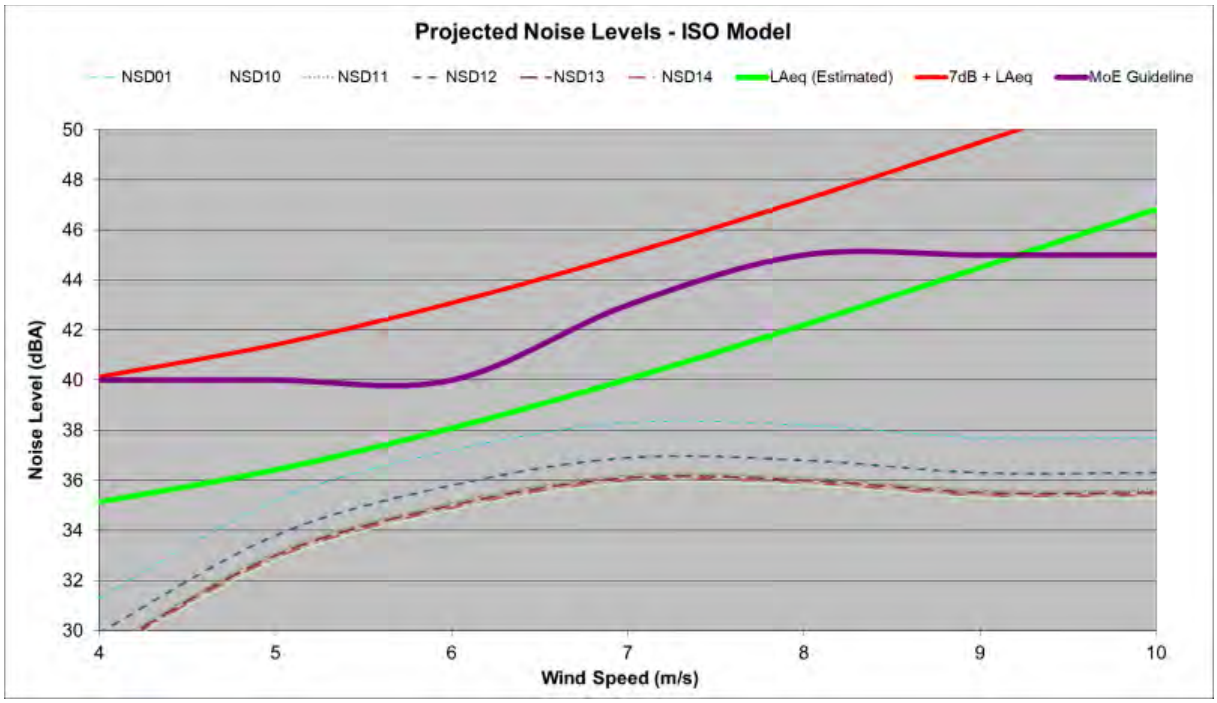

Figure 7-5: Projected noise rating levels at different wind speeds

There are a few proposed renewable projects in the vicinity of the Kap Vley project, with the author knowing of the following WEFs proposed in the area (within 30 km):

- Project Blue WEF [Diamond Wind (Pty) Ltd],
- Kleinzee WEF [Eskom Holdings SOC Limited],
- Koningaas WEF [Just Palmtree Power (Pty) Ltd].

The introduction of the Kap Vley WEF however will not result in a cumulative noise effect as these facilities are further than 5 000 m from the turbines of the proposed Kap Vley WEF. The noise contours from these activities would not even show on **Figure 7-6**.

7.4 DECOMMISSIONING AND CLOSURE PHASE NOISE IMPACT

The potential for a noise impact to occur during the decommissioning and closure phase will be much lower than that of the construction and operational phases and noise from the decommissioning and closure phases will therefore not be investigated further.

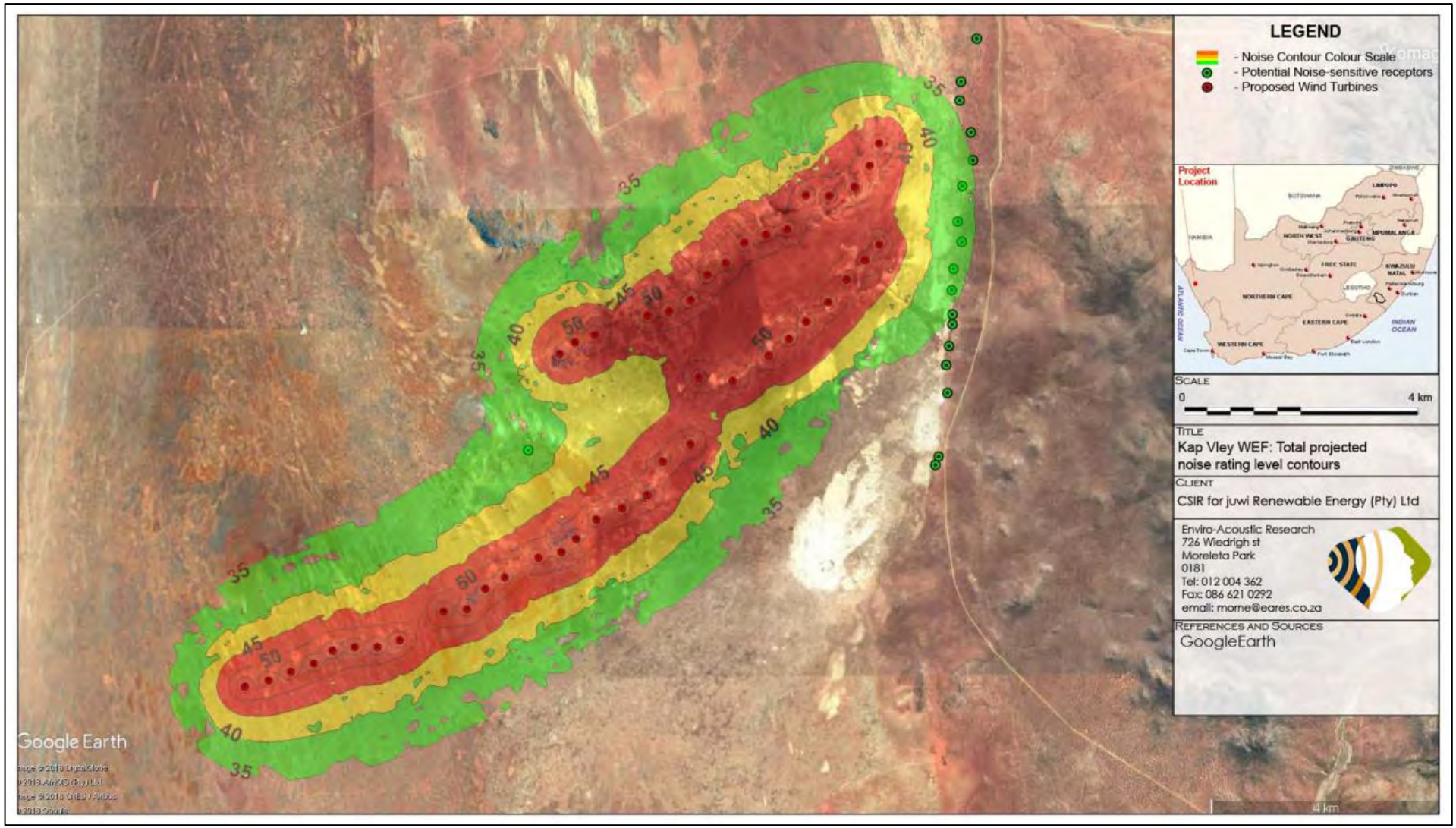

Figure 7-6: Projected conceptual noise rating levels of the Kap Vley WEF during operation

8 SIGNIFICANCE OF THE NOISE IMPACT

8.1 PLANNING PHASE NOISE IMPACT

No noise is associated with the planning phase and this will not be investigated in further.

8.2 CONSTRUCTION PHASE NOISE IMPACT

The impact assessment for the various construction activities are described in **section 4.1**, defined and assessed in **section 8.1**. Considering the projected noise levels (all significantly less than 45 dBA – projected at less than 39 dBA) as well as the expected daytime ambient sound level (arithmetic average 40 dBA, see also **Figure 5-2**), there is a very low risk for a noise impact during the construction phase for daytime construction activities (see **Table 8-1**).

Table 8-1: Impact Assessment: Construction Activities during the day

Aspect / Impact pathway: Various construction activities taking place simultaneously during the day may increase ambient sound levels due to air-borne noise.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (Construction)**	
All NSD	Noise levels below 38 dBA	Noise levels below 38 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	Moderate (3)	Moderate (3)
Consequence	Moderate (8)	Moderate (8)
Probability	Improbable (1)	Improbable (1)
Significance	**Very Low Risk (8)**	**Very Low Risk (8)**
Can impacts be mitigated?	Yes, but not required.	-
Confidence in findings: High. Worst-case scenario evaluated with all equipment operating under full load. Low daytime ambient sound levels assumed.		
Mitigation: Significance of noise impact is very low for the scenario as conceptualized. Mitigation are however highlighted for the developer to consider during the future planning stages to ensure that the significance of the noise impact remain very low.		
Cumulative impacts: Potential of cumulative noise impact is low.		

It is important to note that the developer confirmed that there will be no constructing activities at night, or that that night-time construction activities will be minimal. Considering potential delays' relating to civil works (especially concrete pouring that must be undertaking in one go), the potential significance due to night-time construction activities was assessed in **Table 8-2**.

Table 8-2: Impact Assessment: Construction Activities at night

Aspect / Impact pathway: Various construction activities taking place simultaneously at night may increase ambient sound levels due to air-borne noise.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (Construction)**	
All NSD	Noise levels below 38 dBA	Noise levels below 38 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	High (4)	High (4)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	Moderate (3)	Moderate (3)
Consequence	Substantial (12)	Substantial (12)
Probability	Probable (2)	Probable (2)
Significance	**Low Risk (24)**	**Low Risk (24)**
Can impacts be mitigated?	Yes, but not required.	-
Confidence in findings: High. Worst-case scenario evaluated with all equipment operating under full load. Very low night-time ambient sound levels assumed.		
Mitigation: Significance of noise impact is very low for the scenario as conceptualized. Mitigation are however highlighted for the developer to consider during the future planning stages to ensure that the significance of the noise impact remain very low.		
Cumulative impacts: Potential of cumulative noise impact is low.		

The noise levels associated with the construction of the overhead power line (to allow connection to the grid) and access roads can be estimated using **Figure 7-3.** From this figure it can be seen that the construction noise levels will be well within the acceptable daytime rating levels (52 dBA) if these activities are further than approximately 100 m from the closest receptors (daytime construction activities). Therefore, there is no potential of a noise impact for daytime construction activities (power line).

Considering the three power line options and the location of potential noise-sensitive receptors (see **Figure 7-2**), there is a low potential for a noise impact as highlighted in **Table 8-3**.

Table 8-3: Impact Assessment: Construction of preferred power line

Aspect / Impact pathway: Various construction activities taking place simultaneously during the day may increase ambient sound levels due to air-borne noise.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (Construction)**	
NSD19	Estimated noise levels of 48 dBA	Noise levels below 35 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	None (1)	None (1)
Consequence	Moderate (6)	Moderate (6)
Probability	Improbable (1)	Improbable (1)
Significance	**Very Low Risk (6)**	**Very Low Risk (6)**
Can impacts be mitigated?	-	-
Confidence in findings: High. Worst-case scenario evaluated with all equipment operating under full load. Very low night-time ambient sound levels assumed.		
Mitigation: It is not known if this dwelling is used for residential purposes. If occupied, daytime activities would have a low noise impact and no mitigation is required.		
Cumulative impacts: Potential of cumulative noise impact is low.		

The potential magnitude of noise rating levels due to construction traffic can be estimated using **Figure 7-4**. While the graph depends on the average speed and number of vehicles, the figure can still be used to estimate potential noise impacts. For an average of 10 each vehicles travelling at an average 60 km/h on a gravel road, noise from construction traffic will be well within the acceptable daytime rating levels (52 dBA) if the roads are further than approximately 60 m from the closest receptors (daytime construction activities). Similarly, construction noise levels will be well within the acceptable night-time rating levels (42 dBA) if these activities are further than approximately 140 m from the closest receptors.

It should be noted that, due to very low ambient sound levels measured onsite, night-time construction activities are not recommended. Excluding NSD03, these activities are unlikely to increase the noise levels above the noise limits at most receivers, but, due to the quiet soundscape night-time noise will be highly audible and could cause a noise nuisance. The potential impact of night-time traffic is assessed in **Table 8-4**.

Table 8-4: Impact Assessment: Daytime construction traffic

Aspect / Impact pathway: Various construction vehicles passing close to potential noise-sensitive receptors at night may increase ambient sound levels and crease disturbing noise		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (Construction)**	
NSD03 and NSD04	Noise levels as high as 62 dBA	Noise levels below 42 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	Very high (4)	Low (1)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	None (1)	None (1)
Consequence	Moderate (8)	Moderate (8)
Probability	Improbable (1)	Improbable (1)
Significance	**Low Risk (22)**	**Very Low Risk (6)**
Can impacts be mitigated?	Negative	-
Confidence in findings: High. Worst-case scenario evaluated with numerous construction vehicles passing the receptors at night. Very low night-time ambient sound levels assumed.		
Mitigation: The significance of the noise impact is considered low and additional mitigation is not required. If occupied, the relocation of access roads further than 140m from NSD would minimise the noise impact.		
Cumulative impacts: Potential of cumulative noise impact is low.		

8.3 OPERATIONAL PHASE NOISE IMPACT

Only the night-time scenario was assessed, as this is the most critical time period when a quiet environment is desired. The noise rating levels are calculated in **section 7.2** for the various operational activities defined in **section 4.2**.

As can be seen from **Figure 7-5**, the projected noise rating levels will be less than 42 dBA (the acceptable night-time noise limit as per **section 5.2.2.2**) at all NSDs. Based on the projected noise rating levels:

- Considering $L_{Aeq,i}$ sound levels measured onsite (see **Figure 5-2**), ambient sound levels would range between 25 – 45 dBA at a 7 m/s wind speed. Assuming a sound level typical of the L_{A90} graph, equivalent ambient sound levels could be around 37 dBA;
- The change in ambient sound levels therefore would be around 3 dB when assuming ambient sound levels of 37 dBA. The **magnitude** may be **Medium (2)**. It should be noted that it is expected that the wind turbines may be clearly audible at the identified receptors at times;
- The duration will be the full project life - **Long term (3)**;

- The wind turbines may be audible up to 2,000 m during special conditions – **Regional (3)**;
- The noise impact will stop once the project terminates and reversibility is **High (1)**;
- There is a significant potential that surrounding noise-sensitive receptors lose an environment where natural noise dominated – **Significant (3)**;

The significance of the noise impact is considered to be low as assessed and summarized in **Table 8-5**.

Table 8-5: Impact Assessment: Operational Activities at night

Aspect / Impact pathway: Wind turbines operating simultaneously at night. Increases in ambient sound levels due to air-borne noise from the wind turbines.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (Operation)**	
All NSD	Noise levels below 42 dBA	Noise levels below 42 dBA
	Without mitigation	**With mitigation (not required but possible)**
Status (positive/negative)	Negative	Negative
Magnitude	Medium (2)	Medium (2)
Duration	Long (3)	Long (3)
Extent	Regional (3)	Regional (3)
Reversibility	High (1)	High (1)
Loss of resources	Significant (3)	Significant (3)
Consequence	Substantial (12)	Substantial (12)
Probability	Probable (2)	Probable (2)
Significance	**Low Risk (24)**	**Low Risk (24)**
Can impacts be mitigated?	Yes but not required.	-
Confidence in findings: High. Worst-case scenario evaluated with all wind turbines operating under full load. Very low ambient sound levels assumed.		
Mitigation: Significance of noise impact is low for the scenario as conceptualized.		
Cumulative impacts: There is no potential for a cumulative noise impact.		

8.4 CUMULATIVE NOISE IMPACT

The introduction of the Kap Vley WEF will not raise the total noise rating level at any other NSD at other proposed wind farms in the area, as it is too far from these projects. The significance of the noise impact will be non-existent (definite confidence level).

8.5 DECOMMISSIONING PHASE NOISE IMPACT

Final decommissioning activities will have a noise impact lower than either the construction or operational phases. This is because decommissioning and closure activities normally take place during the day using minimal equipment (due to the decreased urgency of the project). While there may be various activities, there is a very small risk for a noise impact. The significance of any noise impact would be low, similar to the construction noise impact as defined in **Table 8-6** and **Table 8-7** for the day and night-time activities respectively.

Table 8-6: Impact Assessment: Decommissioning Activities during the day

Aspect / Impact pathway: Various decommissioning activities taking place simultaneously during the day may increase ambient sound levels due to air-borne noise.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (decommissioning)**	
All NSD	Noise levels below 38 dBA	Noise levels below 38 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	Low (1)	Low (1)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	Moderate (3)	Moderate (3)
Consequence	Moderate (8)	Moderate (8)
Probability	Improbable (1)	Improbable (1)
Significance	**Very Low Risk (8)**	**Very Low Risk (8)**
Can impacts be mitigated?	Yes, but not required.	-
Confidence in findings: High. Worst-case scenario evaluated with all equipment operating under full load. Low daytime ambient sound levels assumed.		
Mitigation: No mitigation required or recommended for decommissioning activities.		
Cumulative impacts: Potential of cumulative noise impact is low.		

Table 8-7: Impact Assessment: Decommissioning Activities at night

Aspect / Impact pathway: Various decommissioning activities taking place simultaneously at night may increase ambient sound levels due to air-borne noise.		
Nature of potential impact: Increase in ambient sound levels.		
Receiver no	**Projected Noise Levels (decommissioning)**	
All NSD	Noise levels below 38 dBA	Noise levels below 38 dBA
	Without mitigation	**With mitigation (not required)**
Status (positive/negative)	Negative	Negative
Magnitude	High (4)	High (4)
Duration	Short (1)	Short (1)
Extent	Local (2)	Local (2)
Reversibility	High (1)	High (1)
Loss of resources	Moderate (3)	Moderate (3)
Consequence	Substantial (12)	Substantial (12)
Probability	Probable (2)	Probable (2)
Significance	**Low Risk (24)**	**Low Risk (24)**
Can impacts be mitigated?	Yes, but not required.	-
Confidence in findings: High. Worst-case scenario evaluated with all equipment operating under full load. Very low night-time ambient sound levels assumed.		
Mitigation: No mitigation required or recommended for decommissioning activities.		
Cumulative impacts: Potential of cumulative noise impact is low.		

8.6 EVALUATION OF ALTERNATIVES

8.6.1 Alternative 1: No-go option

The ambient sound levels will remain very low.

8.6.2 Alternative 2: Proposed Renewable Power Generation activities

The proposed renewable power generation activities (worse-case evaluated) will raise the noise levels at a number of potential noise-sensitive developments slightly. There is no alternative location where the wind farm can be developed as the presence of a viable wind resource determines the viability of a commercial WEF. While the location cannot be moved, the wind turbines within the WEF can be moved around, although this layout is the result of numerous evaluations and modelling to identify the most economically feasible and environmentally friendly layout.

The proposed layout will result in increased noise levels in the area, but the noise levels will be low and is unlikely to impact on the quality of living for the surrounding receptors. In terms of acoustics, there is no benefit to the surrounding environment (closest receptors). The predicted noise impacts are of low significance (before-) and of very low significance (after mitigation – if implemented).

The project however, will greatly assist in the provision of energy, which will allow further economic growth and development in South Africa and locally. The project will generate short and long-term employment and other business opportunities and promote renewable energy in South Africa and locally. People in the area that are not directly affected by increased noise will have a positive perception of the project and will see the need and desirability of the project.

8.6.3 Location alternatives

The development of a WEF is highly dependent on the prevailing wind quality and character. The wind turbines will be located on the top of ridges that are not used by people. Located in an area where the population density is relatively low, the location of the facility is ideal.

9 MITIGATION OPTIONS

The study considers the potential noise impact on the surrounding environment due to construction activities during the day and night-time periods. It was determined that the potential noise impact would be of low significance and mitigation measures are not required or recommended.

The developer must know that community involvement needs to continue throughout the project. Annoyance is a complicated psychological phenomenon, as with many industrial operations, expressed annoyance with sound can reflect an overall annoyance with the project, rather than a rational reaction to the sound itself. At all stages surrounding receptors should be informed about the project, providing them with factual information without setting unrealistic expectations. It is counterproductive to suggest that the activities (or facility) will be inaudible due to existing high ambient sound levels. The magnitude of the sound levels will depend on a multitude of variables and will vary from day to day and from place to place with environmental and operational conditions. Audibility is distinct from the sound level, because it depends on the relationship between the sound level from the activities, the spectral character and that of the surrounding soundscape (both level and spectral character).

The developer must implement a line of communication (i.e. a help line where complaints could be lodged). All potential sensitive receptors should be made aware of these contact numbers. The Wind Energy Facility should maintain a commitment to the local community (people staying within 2,000 m from construction or operational activities) and respond to concerns in an expedient fashion. Sporadic and legitimate noise complaints could develop. For example, sudden and sharp increases in sound levels could result from mechanical malfunctions or perforations or slits in the blades. Problems of this nature can be corrected quickly and it is in the developer's interest to do so.

9.1 MITIGATION OPTIONS AVAILABLE TO REDUCE NOISE IMPACT DURING CONSTRUCTION

Mitigation options included both management measures as well as technical changes. This assessment indicated a noise impact of **low** significance during the construction of the WEF as well as day-time construction of overhead powerline, access roads and construction traffic. No additional mitigation measures are required or recommended. Continuing management objectives would be:

- Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 7 dBA;
- Ensure that total noise levels are less than 42 dBA at all potential noise-sensitive receptors;
- Prevent the generation of nuisance noises;
- Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors.

9.2 MITIGATION OPTIONS AVAILABLE TO REDUCE NOISE IMPACT DURING OPERATION

The significance of noise during the operational phase is low and additional mitigation measures are not required.

9.3 MITIGATION OPTIONS AVAILABLE TO REDUCE NOISE IMPACT DURING DECOMMISSIONING

The potential significance of the noise impact would be similar as the construction phase and no further mitigation is recommended or required for the decommissioning phase. Continuing management objectives would be:

- Ensure that the change in ambient sound levels as experienced by Potentially Sensitive Receptors is less than 7 dBA;
- Ensure that total noise levels are less than 42 dBA at all potential noise-sensitive receptors;
- Prevent the generation of nuisance noises;
- Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors.

9.4 SPECIAL CONDITIONS

9.4.1 Mitigation options that should be included in the Environmental Management Programme (EMPr)

1. The developer must investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from location where construction activities are taking place or operational wind turbine. A complaints register must be kept on site.
2. The developer should minimize night-time construction traffic if the access road is closer than 140m from NSD, alternatively, the access road must be relocated further than 140m from NSD (night-time traffic passing occupied houses).

9.4.2 Special conditions that should be considered for the Environmental Authorization

1. The potential noise impact must again be evaluated should the layout be changed where any wind turbines are located closer than 1,000 m from a confirmed NSD.
2. The potential noise impact must again be evaluated should the developer make use of a wind turbine with a maximum sound power emission level exceeding 108.4 dBA re 1 pW.
3. The developer must investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from location where construction or decommissioning activities are taking place or from the operational wind turbine.

10 ENVIRONMENTAL MONITORING PLAN

Environmental Noise Measurement can be divided into two distinct categories, namely:

- Passive measuring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active measuring – the measurement of noise levels at identified locations.

Due to the projected noise impact of a low significance during the operational phase, no active environmental noise monitoring is recommended.

Should a reasonable and valid complaint about noise be registered, it is the responsibility of the developer to investigate this complaint as per the following sections. It is recommended that the noise investigation be done by an independent acoustic consultant.

While this section recommends a noise monitoring programme, it should be used as a guideline as site specific conditions may require that the monitoring locations, frequency or procedure be adapted.

10.1 MEASUREMENT LOCALITIES AND PROCEDURES

10.1.1 Measurement Localities

Noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint. The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading. A second instrument must be deployed at a control point away from the potential noise source during the measurement period.

10.1.2 Measurement Frequencies

Once-off measurements if and when a reasonable and valid noise complaint is registered. Results and feedback must be provided to the complainant. If required and recommended by an acoustic consultant, there may be follow-up measurements or a noise monitoring programme can be implemented.

10.1.3 Measurement Procedures

The measurement of ambient sound levels should occur over a period of at least 5 nights. If required, noise levels should be measured over a period of at least 5 nights.

Measurements should be collected in 10-minute bins defining the 10-minute descriptors such as $L_{Aeq,I}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit).

Best fit analysis should be conducted on the data, where a best-fit graph are fitted through the sound (noise) levels versus the wind speeds to determine average noise levels at a set wind speed.

Spectral frequencies should also be measured to define the potential origin of noise and illustrate the spectral character of the sounds measured. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

11 CONCLUSIONS AND RECOMMENDATIONS

This report provides input to the Environmental Impact Assessment for the proposed Kap Vley WEF south-west of Komaggas, Northern Cape Province and its associated 200 m Powerline Corridor. The report considers the ambient sound levels previously measured in the area, the author's expertise, as well as a output of sound propagation model (making use of the worst-case scenario in terms of the precautionary approach) to identify potential issues of concern.

The potential noise impact for the WEF was evaluated using a sound propagation model. Conceptual scenarios were developed for the construction and operational phases. With the modelled input data as used, this assessment indicated that:

- A potential noise impact of a **very low** significance (before mitigation) and very low significance (after mitigation) during the day for the construction phase of the WEF;
- A potential noise impact of a **low** significance (before and after mitigation) at night for the construction phase of the WEF;
- A potential noise impact of a **low** significance (before mitigation) and very low (after mitigation) for daytime construction traffic;
- A potential noise impact of a **very low** significance during the construction of the powerline (preferred corridor A). There is no risk of a noise impact for the other two power line corridors;
- A potential noise impact of a **very low** significance (before and after mitigation) for the operation of the wind turbines at night; and
- A potential noise impact of a **low** significance (before and after mitigation) for the decommissioning of the WEF and associated powerline.

No additional work or assessment is required or recommended. The developer however should investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000 m from the location where construction or operational activities are taking place.

The potential noise impact for the WEF must again be evaluated should the layout be changed where any wind turbines are located closer than 1,000 m from a confirmed NSD or if the developer decides to use a different wind turbine that has a sound power emission level higher than the Acciona WTG used in this report (sound power emission level exceeding 108.4 dBA re 1 pW).

Considering the **low** significance of the noise impacts (with mitigation, inclusive of cumulative impacts) for the WEF and associated infrastructure, there is no reason that the proposed Kap Vley Wind Energy Facility with its associated Powerline Corridor should not be authorised.

12 THE AUTHOR

The Author started his career in the mining industry as a bursar Learner Official (JCI, Randfontein), working in the mining industry, doing various mining related courses (Rock Mechanics, Surveying, Sampling, Safety and Health [Ventilation, noise, illumination etc] and Metallurgy. He did work in both underground (Coal, Gold and Platinum) as well as opencast (Coal) for 4 years. He changed course from Mining Engineering to Chemical Engineering after his second year of his studies at the University of Pretoria.

He has been in private consulting for the last 15 years, managing various projects for the mining and industrial sector, private developers, business, other environmental consulting firms as well as the Department of Water Affairs. During that period he has been involved in various projects, either as specialist, consultant, trainer or project manager, successfully completing these projects within budget and timeframe. During that period he gradually moved towards environmental acoustics, focusing on this field exclusively since 2007.

He has been interested in acoustics as from school days, doing projects mainly related to loudspeaker design. Interest in the matter brought him into the field of Environmental Noise Measurement, Prediction and Control. He has been doing work in this field for the past 8 years, and was involved with the following renewable projectsin the last few years:

Wind Energy Facilities	*Full Environmental Noise Impact Assessments for - Bannf (Vidigenix), iNCa Gouda (Aurecon SA), Isivunguvungu (Aurecon), Kokerboom 1 (Aurecon), Kokerboom 2 (Aurecon), Kokerboom 3 (Aurecon), Kangnas (Aurecon), Plateau East and West (Aurecon), Wolf (Aurecon), Outeniqwa (Aurecon), Umsinde Emoyeni (ARCUS) , Komsberg (ARCUS), Karee and Kolkies Wind Farms (ARCUS), San Kraal (ARCUS), Phezukomoya (ARCUS), Canyon Springs (Canyon Springs), Perdekraal (ERM), Scarlet Ibis (CESNET), Albany (CESNET), Sutherland (CSIR), Rietrug (CSIR), Sutherland 2 (CSIR), Teekloof (Mainstream), Zen (Savannah Environmental – SE), Goereesoe (SE), Springfontein (SE), Garob (SE), Project Blue (SE), ESKOM Kleinzee (SE), Walker Bay (SE), Oyster Bay (SE), Hidden Valley (SE), Happy Valley (SE), Deep River (SE), Tsitsikamma (SE), AB (SE), West Coast One (SE), Hopefield II (SE), Namakwa Sands (SE), VentuSA Gouda (SE), Dorper (SE), Amakhala Emoyeni (SE), Klipheuwel (SE), Cookhouse (SE), Cookhouse II (SE), Rheboksfontein (SE), Suurplaat (SE), Karoo Renewables (SE), Koningaas (SE), Eskom Aberdene (SE), Spitskop (SE), Castle (SE), Khai Ma (SE), Poortjies (SE), Korana (SE), IE Moorreesburg (SE), Gunstfontein (SE), Vredenburg (Terramanzi), Loeriesfontein (SiVEST), Rhenosterberg (SiVEST), Noupoort (SiVEST), Prieska (SiVEST), Dwarsrug (SiVEST), Graskoppies (SiVEST), Hartebeest Leegte (SiVEST), Ithemba (SiVEST), !Xha Boom (SiVEST), Spitskop West (Terramanzi), Msenge Emoyeni (Windlab)*

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DRAFT BASIC ASSESSMENT REPORT

APPENDIX E10:

Transportation Impact Assessment Report

TRANSPORTATION IMPACT ASSESSMENT

Scoping and Environmental Impact Assessment for the Proposed Kap Vley Wind Energy Facility near Kleinzee, in the Northern Cape

and

Basic Assessment for the Transmission Line

Report prepared for:

CSIR – Environmental Management Services

P O Box 320

Stellenbosch

7600

Report prepared by:

Christo Bredenhann Pr Eng.

WSP Group Africa (Pty) Ltd

THE PAVILION, 1ST FLOOR

CNR PORTSWOOD AND BEACH ROAD, WATERFRONT

CAPE TOWN, 8001

SOUTH AFRICA

Tel.: +27 21 481 8700

Fax: +27 21 481 8799

March 2018

SPECIALIST EXPERTISE (SHORT CV)

CHRISTO BREDENHANN
Associate: Transport Planning

Transport and Infrastructure

5 years with the firm

16 years total

Areas of practice

Traffic & Transportation Engineering

Transportation Planning

Education

BEng (Hons) Traffic and Transportation Engineering, University of Pretoria (2010)

BEng Civil Engineering, University of Johannesburg (RAU), 1996

Professional membership

Professional Engineer, Engineering Council South Africa (20150149)

Associate Member, South African Institute of Civil Engineering (201300003)

CAREER SUMMARY

Mr Bredenhann is a professional engineer with over 16 years' work experience, specialising in the traffic and transportation engineering sector. He has extensive experience in traffic and transportation impact assessments and statements for a multitude of land uses, formal review of traffic impact assessments, transportation planning, micro and macro network and capacity analysis, transportation planning and design, road safety audits, traffic signal timing design, road signs and markings audits, multi-modal transport assessments, non-motorised transport analysis and design and transport management plans.

Relevant expertise includes project management, proposal preparation, preparation of tender documentation and bid adjudication, public transport planning and operational management, procedure development for the monitoring of integrated rapid transit operations and public transport scheduling development.

Countries of work experience include South Africa, Ethiopia, Uganda and the United Kingdom.

PROFESSIONAL EXPERIENCE

- Athlone Power Station Redevelopment, Cape Town, South Africa (Current): Lead Traffic Engineer and Transportation Planner - Transportation input to development framework and layouts. Liaison with client, stakeholders & authorities. Undertake full traffic impact assessment for Council approval for 35 ha mixed-use redevelopment of Athlone Power Station site as Transit Oriented Development. Client: City of Cape Town. Project Value: ZAR 2 m. Fee Value: ZAR 100,000.
- Ethiopian Agri-processing Plants TIA, Ethiopia (Current): Lead Transportation Engineer. Client: UNOPS. Project Value: Unknown. Fee Value: ZAR 135,000.
- IRT Phase 2A Trunk & Feeder support infrastructure Work Package E5 Stage 2 Road Safety Audit, City of Cape Town, Western Cape, South Africa (Current): Lead Road Safety Auditor. Client: GIBB Engineering & Science. Project Value: ZAR Unknown. Fee Value: ZAR 25,000.
- Farm Bergendal 1706 Mixed-Use Development TIA, Bloemfontein, Free State Province, South Africa (Current): Lead Transportation Engineer. Client: WSP Bloemfontein. Project Value: Unknown. Fee Value: ZAR 48,000.
- Tsogo Sun Wharf Street TIA, Cape Town, Western Cape, South Africa (Current): Lead Transportation Engineer. Client: Tsogo Sun. Project Value: ZAR Unknown. Fee Value: ZAR 132,000.
- Conradie Better Living Model Exemplar Project, Cape Town, South Africa (2016): Lead Traffic Engineer and Transportation Planner - Transportation input to development framework and layouts. Liaison with client, stakeholders and authorities. Develop and draft traffic impact assessment, including revisions, and Council approval for 22 ha high-density residential and mixed-use Transit Oriented Development. Client: Provincial Government of Western Cape. Project Value: ZAR 2.5 m. Fee Value: ZAR 2.5 m.
- Port of Saldanha Bay Traffic Study, Saldanha Bay, Western Cape, South Africa (2017): Project Leader - Traffic study with specific focus on measures to improve efficiency and operation of all multi-purpose terminal traffic. Client: Transnet Port Terminals. Fee Value: ZAR 210,000.
- Biotherm Solar and Wind Power Plants, Northern and Western Cape, South Africa (2016): Lead Transportation Engineer - Traffic impact assessment. Value: ZAR 100,000. Fee Value: ZAR 45,000.

SPECIALIST DECLARATION

I, Christo Bredenhann, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist: _____

Name of Specialist: Christo Bredenhann

Date: 14 March 2018

EXECUTIVE SUMMARY

WSP Group Africa (Pty) Ltd (WSP) has been appointed by juwi Renewable Energies to undertake a Transportation Impact Assessment (TIA) as part of the Environmental Impact Assessment (EIA) process for the proposed Kap Vley Wind Energy Facility (WEF) and the Basic Assessment (BA) for its associated 200 m wide power line corridor. The facility and power line infrastructure will be located near Kleinzee in the Northern Cape. The TIA assessed the expected traffic related impacts of the proposed facility during the construction, operation and subsequent decommissioning phases. In terms of the BA process for the power line corridor, no notable traffic related impacts have been identified, and therefore no impacts relating to the power line corridor were assessed or recommendations proposed to be included in the Environmental Management Programme (EMPr).

With regard to the wind energy facility, the estimated peak trip generation of the facility will be 33 veh/hr in the weekday AM and PM peaks during the Construction phase, and will be negligible for the operational phase. It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant traffic impact on the local access roads will be lower than during the Construction phase.

The main traffic related environmental impacts for the Construction, Operation and Decommissioning phases are listed below:

- Noise, dust & exhaust pollution due to vehicle trips on-site.
- Noise, dust and exhaust pollution due to additional trips on the local unsurfaced access roads.
- Noise and exhaust pollution due to additional trips on the R355 (Provincial road) and N7 Freeway (National road).

The significance of the overall impact for each phase with regards to the above traffic related environmental impacts is Low before and after mitigation.

The mitigating measures recommended during the construction phase is dust monitoring and control of all on-site and local unsurfaced roads. The expected traffic increase on the local unsurfaced access roads during the construction phase may result in deterioration of the road, as it is not designed for abnormal and heavy traffic volumes. The cost of maintaining and repairing this road during the Construction phase of the projects should be borne by the developer.

The Cumulative traffic impact of the known wind and solar energy projects in the area has been assessed, and is regarded as of low significance on the local and regional road network. Other latent developments in the greater area may utilize sections of the same regional (R355) and national (N7) road network. However, these road sections are mostly surfaced and the traffic volumes from them is likely to be low. The proposed Eskom Kleinzee 300MW WEF will be located south of Kleinzee on the west coast. The facility may take access off the N7 from Springbok via the R355, the Komaggas gravel road or mainly gravel roads from Garies via Hondeklipbaai and Koingaas. The R355 is the most direct and mostly surfaced route from the N7 to the facility. It is therefore unlikely that this WEF, or any other potential developments in the greater area will utilize the same local unsurfaced roads from the Kap Vley development to Komaggas.

The EMPr for the Kap Vley wind energy facility must include dust monitoring and mitigation measures for the on-site and unsurfaced local access roads, during the Construction and Decommissioning phases. No other traffic related conditions are required for the Environmental Authorisation, should it be granted.

It is the Professional Transportation Engineers' opinion that the proposed development should be authorised from a traffic and transportation impact point of view.

LIST OF ABBREVIATIONS

DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessment
TIA	Transportation Impact Assessment
SANRAL	South African National Roads Agency (Ltd)
veh/hr	Vehicles per hour
NMT	Non-motorised transport
WEF	Wind Energy Facility
ToR	Terms of Reference
REF	Renewable Energy Facilities
m	metres
m^2	Square metres
m^3	Cubic metres
km	Kilometre
ha	hectare

COMPLIANCE WITH THE APPENDIX 6 OF THE 2014 EIA REGULATIONS

Requirements of Appendix 6 – GN R326 (7 April 2017)	Addressed in the Specialist Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	CV-Page 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 2
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1
(cA) an indication of the quality and age of base data used for the specialist report;	Sections 1.3 and 1.5
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Sections 4 & 5
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 1.3
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying alternatives;	Section 2 & 5
g) an identification of any areas to be avoided, including buffers;	N/A
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figures 1, 2 and 3
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.4
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 4, 5 and 6
k) any mitigation measures for inclusion in the EMPr;	Section 6 and 7
l) any conditions for inclusion in the environmental authorisation;	Section 8
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6 and 8
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity and activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 8
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
q) any other information requested by the competent authority.	n/a
2. Where a government notice gazetted by the Minister provides for any protocol of minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply	n/a

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1 INTRODUCTION AND METHODOLOGY

1.1 Scope and Objectives

WSP Group Africa (Pty) Ltd (WSP) has been appointed by juwi Renewable Energies to undertake a Transportation Impact Assessment (TIA) of the proposed Kap Vley Wind Energy Facility to be located near Kleinzee in the Northern Cape.

This report assesses the expected traffic related impacts of the proposed facility during the construction, operation and subsequent decommissioning phases. The purpose of this report is to also consider the traffic impact that the facility will have on the surrounding road network and environment, and to propose mitigating measures to address these impacts, where required.

1.2 Terms of Reference

The Terms of Reference for a TIA is as per the requirements of the South Africa Committee of Transport Officials, South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012. The scope covers the following:

- Previous traffic related studies, submissions and approvals (if relevant).
- Description of the extent of the development, including location and land-use/s.
- Description of the phased development of the facility (if applicable).
- Record of liaison with authorities.
- Record of site visits, if required.
- Description of the local and potentially affected road network, including planning and comment on the road condition, where information is available.
- Description of latent developments in the vicinity of the facility that may also have an impact on the local road network
- Assessment of the required site access, parking and internal circulation.
- Assessment of expected trip generation (construction & operational phases).
- Capacity analysis (construction & operational phases)
- An assessment of the expected total E80's (heavy axle loading) for the life cycle of the facility.
- Assessment of public transport and Non-motorised Transport (NMT).
- Recommendations and conclusions with regards to the required traffic and transport related road upgrades.

The ToR for the TIA include the following: Assess traffic impacts on the relevant main roads to be affected: N7, N14 and R355;

- Identify and assess all potential traffic impacts (direct, indirect) of the construction, operational and decommissioning phases of the proposed development.
- Assess all alternatives, including the no-go alternative.
- Assess cumulative impacts by identifying other Renewable Energy Facilities (REFs) such as wind and solar and other applicable projects, such as construction and upgrade of electricity generation, and transmission or distribution facilities in the local area (i.e. within 50 km of the proposed WEF). These include projects that have been approved (i.e. positive EA has been issued), have been constructed or projects for which an Application for EA has been lodged with the Competent Authority.
- Provide recommended mitigation measures, management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts to be included in the Environmental Management Programme (EMPr);
- Provide a description of any assumptions, uncertainties, limitations and gaps in knowledge.
- Incorporate and address issues and concerns raised during the Scoping and EIA phases where they are relevant to the specialist's area of expertise.

1.3 Approach and Methodology

The Approach and Methodology is as per the ToR, listed in Section 1.2. Also note the following:

- Liaison & Data Collection
  - Comments or approval will not be required from the District Municipality and the Northern Cape Provincial Government Department of Roads & Public Works with regards to the proposed development and its potential impact on any local and provincial roads. This is due to the very low expected trip generation during all phases of the facility (construction, operation and decommissioning).
  - The relevant authority and/or owner of the local and regional roads will have to be consulted and will have to provide approval for the transportation of any abnormal loads to or from the facility.
- A specific transport related site visit was not deemed necessary for this assessment due to the remote proposed access to the local road network and the negligible expected trip generation of the development during all phases (Construction, Operation, and Decommissioning).
- This report has informed the Basic Assessment (BA) and EIA of the application and will be submitted as part of the EIA and BA process.

1.4 Assumptions and Limitations

The calculation of the expected trip generation and related impact/s on the local road network is based on information provided by juwi. This information was not validated for accuracy.Traffic counts were not undertaken of the local roads, as the volumes are expected to be negligible due to the location, network connectivity and land-use in the vicinity of the study area.

The following trip generation assumptions are relevant and are based on South African conditions:
- Standard bus occupancy to places of work: 65 persons.
- Average private vehicle occupancy to/from places of work: 1.5 passengers.

There are no known mitigation measures pertaining to the specific field of study that are inherent to the project design.

The following assumptions and limitations apply:
- No previous Transportation Assessments have been undertaken as part of this assessment.
- No local traffic counts were undertaken, as they are not required.
- Cumulative impacts are assessed by adding the expected impacts from this proposed development to existing and proposed developments with similar impacts in a 50 km radius. The existing and proposed developments that were taken into consideration for cumulative impacts include:
  - Proposed 300MW Kleinzee WEF, Northern Cape.
  - Project Blue Wind Energy Facility near Kleinzee within the Nama Khoi Local Municipality, Northern Cape (Phases 1-3).
  - Proposed Koingnaas Wind Energy Facility (Basic Assessment Process).
  - Nigramoep PV Solar Energy Facility on a site near Nababeep, Northern Cape.

There are no known gaps in information in preparing this TIA.

1.5 Source of Information

Information used in this TIA includes:
- Local, Provincial and National Road network information and maps were sourced from the 1:50 000 South African Topographical Maps, Chief Directorate: Surveys and Mapping, MapStudio, GoogleEarth, Google Maps, The South African National Roads Agency (Ltd).

- The satellite image used as a background was obtained from the Google EarthPro and Google Maps.
- Latent Energy developments in the study area was sourced from the Department of Environmental Affairs: The South African Renewable Energy Application Data, Quarter 2, 2017. www.environment.gov.za.
- The Infrastructure, Construction, Operation, and Decommissioning information of the development was sourced from juwi.

2 DESCRIPTION OF PROJECT ASPECTS RELEVANT TO TRANSPORT IMPACTS

2.1 Location of the development

The facilities will be located on various farm portions located in the Nama Khoi Local Municipality of the Namaqualand District Municipality in the Northern Cape Province.

Refer to Figure 1 for the locality map of the farm portions, proposed internal roads and power line route options, and Figure 3 in Section 2.6 for the proposed wind turbine locations along the proposed internal roads.

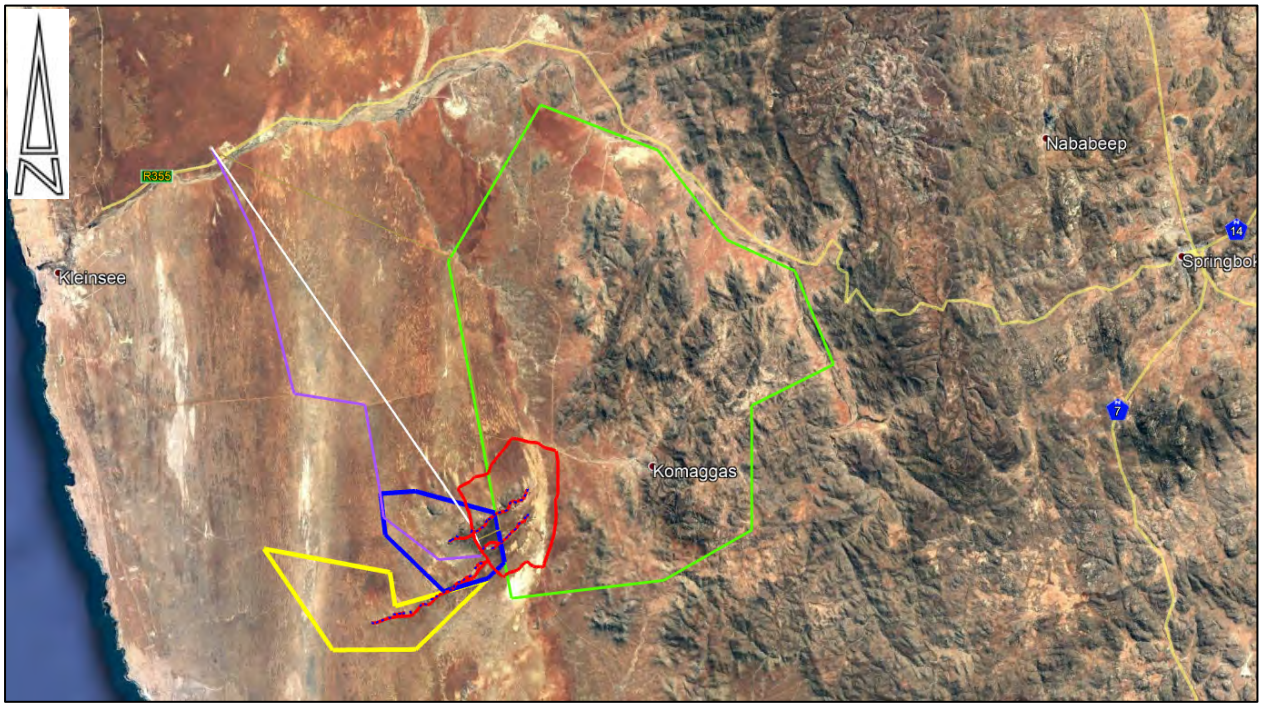

Figure 1. Farm portions of the proposed Kap Vley WEF development area

Source: GoogleEarth

2.2 Type and Extent of the development

The Kap Vley Wind Energy Facility will consist of up to 45 turbines located over 8 farm portions with a total area of approximately 128 ha. The facility will only cover a fraction of the total area during the various phases.

Refer to Table 1 for the detailed project description.

Table 1. Technical details of the facility

Generation Capacity	50-300 MW
Internal access roads	37 km of internal road linking the turbine locations. The road will be 5 m in width and 15 m in sections to allow for passing, curvature and the physical footprint due to cut and fill requirements. Turning areas are also allowed for.
Area of internal roads	Minimum 18.5 ha
Area occupied by on-site sub-station	2.3 ha (+/- 150 m x 150 m)
Number of turbines	20 – 45
Total area occupied by the turbine foundations	25 m x 25 m each
Turbine hub height	80 m - 150 m
Rotor Diameter	100 m - 160 m
Turbine Foundation	• Reinforced foundation of 25 m x 25 m deep • The extent and volume of excavation areas unknown. • Crane Platform with foundation –1 ha per turbine
Area of preferred Operations and Maintenance building	1 ha
Construction and lay down areas	• Site offices, construction camp area & lay down areas: 13 ha • Consisting of several areas along internal roads, centrally located. • On-site concrete batching plant: 0.25 ha
Cement Batching Plant (construction phase)	0.25 ha (50 m x 50 m)
Type and Height of fencing	Fencing will be required round the O&M Building and on-site substation and will be a maximum of 5 m high.
Electrical infrastructure	3 alternative power-line routings under consideration – none will have traffic related impacts
Powerline Corridor	The proposed Kap Vley WEF will connect to the Gromis Substation located on the remainder of the Farm Dikgat 195 or closer to the new Eskom substation for which the location still needs to be determined via a 132 kV overhead transmission line. Depending on the location of the substation on-site, a maximum of 40 km will be accommodated for the length of the proposed overhead line, connecting the on-site substation to the Gromis Substation or the new Eskom substation for which the location still needs to be determined.

2.3 Phasing of the development

The implementation planning of the facility is as follows:

- Commencement of construction: 2020
- Construction period: 12 – 18 months
- Commencement of operational phase: 2021
- Operational lifespan: 20 years

2.4 Road Network Master Planning

The client provided notional information of the planned upgrade of a local unsurfaced road between Garies and Kleinzee. The route starts at the N7 north of Garies, follows a westerly alignment to Hondeklip Baai on the west coast, and from there a northern alignment along the coast via Koingnaas to Kleinsee. It is understood that the road upgrade is dependant on the Eskom Kleinzee WEF, as listed in Section 1.4.

The Garies/Kleinzee route (unsurfaced or potentially upgraded in future), is not a viable access route to the Kap Vley facility due to the following:

- The distance between Garies and Komaggas along this route is approximately 250 km.
- The distance between Garies and Komaggas via Springbok along the N7 and the R355 is approximately 190km.
- The route via Springbok is therefore substantially shorter, and on a higher order and speed National road and provincial road.

The planned upgrade of the road, or in the event that the upgrade does not proceed, will not have an impact on the Kap Vley development, nor will the Kap Vley development have an impact on the road.

2.5 Road network description

The local road network consists of numerous unsurfaced roads that traverse the various farm portions. The proposed internal roads will link with 2 of the external roads at two locations as shown in Figure 2. The external roads links to the town of Komaggas to the east, and from there a single carriageway surfaced road links to the R355. The R355 is a Provincial Road which follows an east-west alignment between Kleinzee on the west coast and Springbok to the east. It is a surfaced single-carriageway 2-way road with no shoulders between the Komaggas access road and Springbok. It is unsurfaced between the Komaggas access road and Kleinzee. Refer to Figure 3.

An unsurfaced road from Garies via Hondeklip Baai and Kleinzee can also be utilised to access the development from the west. However, as noted in Section 2.4, this route is substantially longer than the direct route via Komaggas to Springbok and the the N7 and N14.

Figure 2. Regional road network

Source: GoogleMaps

2.6 Proposed Internal service road network

Unsurfaced internal roads are proposed for the construction and operation phases. These service roads of approximately 37 km in length will be 5m wide with sections of 15m wide to allow for passing, curvature and the physical footprint due to cut and fill requirements. Turning areas are also included. Refer to Figure 3.

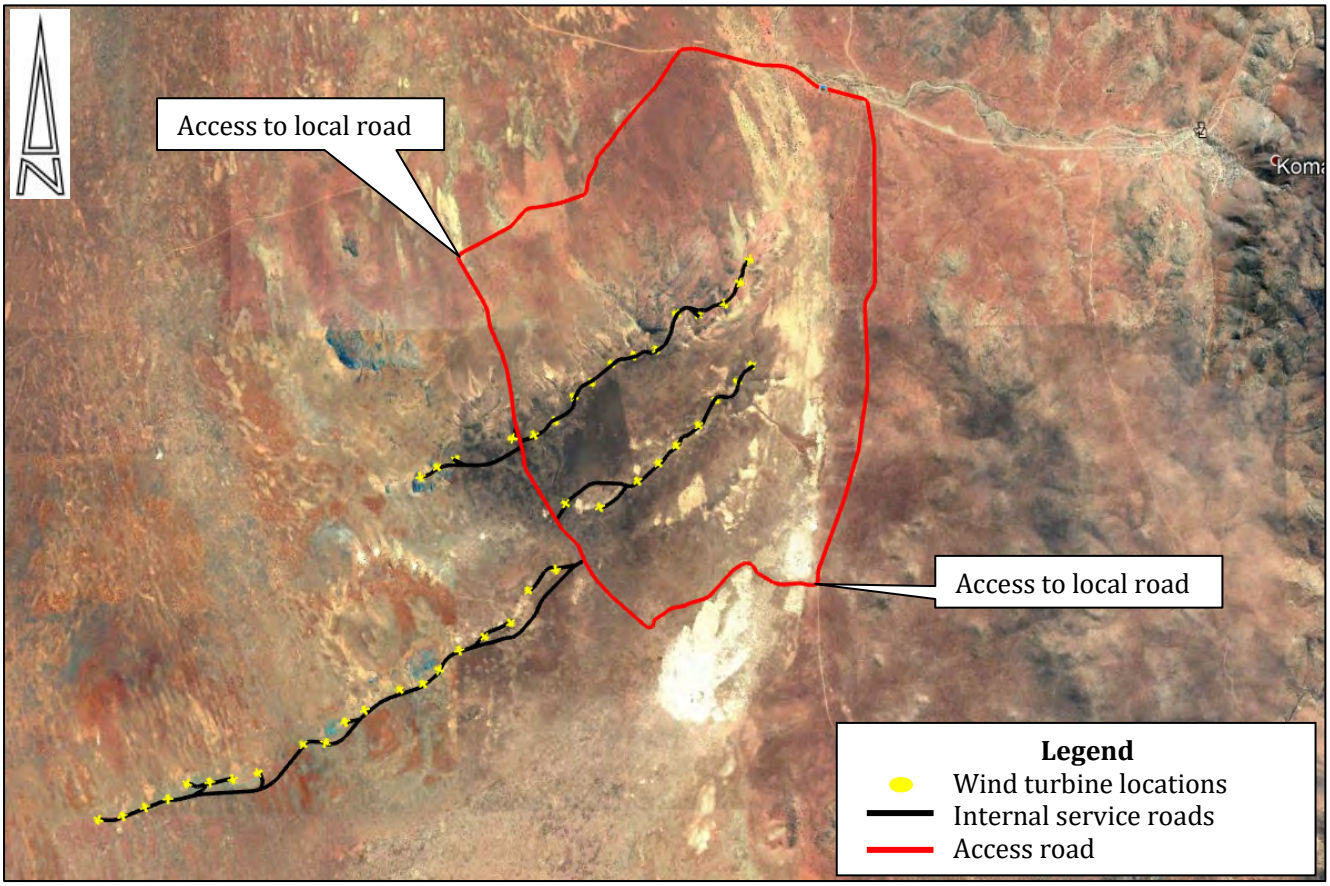

Figure 3. Turbine locations, internal access roads and access to external roads

Source: GoogleEarth

2.7 Access to the local road network

It is noted that the proposed internal roads link with the two external roads at the two locations as shown in Figure 3. These roads will be used during construction and for the future operational and ultimate decommissioning phase of the facility. These access locations are remote on very lightly traffic unsurfaced roads, and should therefore be suitable.

The expected traffic increase on these local roads during the construction phase may result in deterioration of the roads, as they are not designed for abnormal loads (weight) or high traffic volumes.

The transport route/s of the construction materials, components and any oversized/weight components may be National, Provincial or Local roads; and approval will have to be obtained from each authority for the transportation of any oversized or abnormally heavy components. This is normally the responsibility of the logistics company in charge of these deliveries.

Upgrades to the vertical or horizontal alignment of the local access roads may be required depending on the length and width of abnormal vehicles. These alignment grades cannot be determined at this stage, as the abnormal vehicle dimensions are unknown.

2.8 Parking Provision

The proposed on-site parking provision will be limited to the following:

- Construction phase: temporary parking for construction staff and construction deliveries.
- Operational phase: parking for operational & maintenance staff vehicles
- Decommissioning phase: temporary parking for construction staff and construction deliveries.

All parking will be accommodated on-site during all phases.

2.9 Public & Non-Motorised Transport Assessment

In terms of section 29 of the National Land Transport Transition Act (NLTTA) 22 of 2000, it is a requirement that an assessment of public and non-motorised transport be included in a traffic impact assessment.

Due to the remote location of the site, on private farms, public access will not be allowed or required during the construction or operational phases of the project. There is therefore no need for public transport services or non-motorised transport infrastructure, except for the transport of construction staff to and from the site, refer to Section 12.2.

2.10 Existing traffic impacts

There are no existing traffic impacts on the local roads, as the farm portions are agricultural with little to no crops or livestock rearing.

2.11 Existing traffic flows

No traffic surveys were deemed necessary due to the remote location of the development and the low-order and low-volume access roads that will be utilised during the construction period.

2.12 Development Trip Generation

The South African Trip Data Manual (TMH17) does not contain estimates for expected trip generation of a wind energy facility. The trip generation for the construction, operation and decommissioning phases was therefore estimated from client information and assumptions based on similar construction projects. Also note that the estimated traffic generation detailed below represents an absolute maximum.

Transportation Impact Assessment (TIA) is normally required for the following, refer to Table 2.

Table 2: Thresholds for TIA's

THRESHOLD VALUE	STUDY REQUIRED
Less than 50 trips per peak hour	Access Study
More than 50 trips but less than 150 trips per peak hour	Traffic Impact Statement
More than 150 trips per peak hour	Traffic Impact Study (TIA)

- At an estimated 35 veh/hr during the peak construction period, a TIA will under normal circumstances not be required for this development, due to the expected very low trip generation of the site.

2.12.1 Construction phase traffic

The construction phase of the facility will generate the only notable vehicle volumes that requires assessment. Construction traffic will include vehicles for material and component deliveries, construction staff and all other associated personnel. Trips will include the delivery of over-sized components such as rotor blades, mast sections and generators. The route/s between the origin of the material and components and the facility may be National, Provincial or Local roads, and each authority will be required to provide the necessary permits for the transportation of any oversized or weight components.

The construction phase traffic was estimated based on the assumptions listed per traffic type below.

2.12.2 Construction Staff Trip generation

- An estimated construction period of 12 to 18 months, with a variable number of staff required depending on the construction phase.
- Approximately 250 workers will be on-site every day during the peak construction period.
- Workers will not be accommodated on-site, and will be transported to site in buses from Kleinzee, Komaggas and Springbok.
- 85% of the total work force (unskilled and semi-skilled workers) will utilise buses to site from neighbouring towns: Kleinzee, Komaggas and Springbok.
- Skilled personnel will travel by private car with an average occupancy of 1.5 persons.
- 100% of the unskilled staff transport will be by bus, with 65 person per bus occupancy.
- 0% of the unskilled staff transport will be by mini-bus.
- Staff will not utilise non-motorised transport (NMT) to site due to the excessive distances to the closest towns.
- It is assumed that the public transport vehicles will not remain on-site during the workday, therefore all the buses will arrive and again depart during the morning and evening peaks.

Refer to Table 3 for the total trip generation for the construction staff. The number of workday PM trips will be the same.

Table 3: Total peak hour trip generation – construction staff

STAFF TYPE	*TOTAL*		
Unskilled/Semi-skilled staff (Maximum workers per day)	213		
Skilled staff (Maximum workers per day)	37		
Total (Maximum workers per day)	**250**		
TRIP TYPE	**TOTAL (VEH/HR)**	**IN (VEH/HR)**	**OUT (VEH/HR)**
AM Peak hour bus trips	8	4	4
AM Peak hour private vehicle trips	25	25	0
Total AM peak hour trips	**33**	**29**	**4**

2.12.3 Construction Material Trip generation

- A maximum of 45 turbines will be installed over the 8 farm portions.
- The turbine towers are expected to have a hub height of up to 150 m, with a rotor diameter of up to 160m.
- Each 160 m diameter turbine rotor will require 3 blades of up to 80 m long (maximum). Rotor blades will be manufactured off-site, (locally or abroad). Imported components (rotor blades, hubs, etc.) will likely be imported from abroad via the Port of Saldanha Bay in the Western Cape. The final dimensions and weight of the blades, their point of origin and the resultant route to the facility will determine the vehicle type and special permits that may be required for the transportation of these blades.
- The transport route/s between the Port of Saldanha Bay or other Ports and the facility may be National, Provincial or Local roads, and each authority will be required to provide the necessary permits for the transportation of all oversized and/or weight components. This will be determined by the responsible parties of the component imports (developer, logistics companies, etc.).
- The tower masts will be constructed of tubular steel, pre-cast or in-situ cast concrete or a steel and concrete hybrid. The material type is primarily determined by the height of the tower. Steel tower masts are constructed in sections of up to 30 m, and are lifted into place on site. Pre-cast concrete masts are usually constructed in sections off-site, and also lifted into place on-site. Concrete and steel hybrid masts are usually constructed from a concrete base section of up-to 80 m, and an upper section of steel. These components are also manufactured off site and lifted into place on site.
- The type and point of origin of the tower mast components will determine the delivery route and will again determine the special permits that may be required for transportation to the site.

Assumptions were made to estimate the expected trip generation of the construction phase, refer to Table 4.

- Masts are manufactured from 5 x 30 m steel segments. One segment can be delivered per vehicle trip.
- 1 rotor blade can be transported on an abnormal size vehicle.
- The foundation quantities for a typical tower is approximately 625 m^3 of concrete reinforced with 94 tons of steel.
- Aggregate for concrete is transported in 32 ton loads.
- Standard reinforced concrete (excluding steel) weighs approximately 2,250 kg/m^3.
- Concrete is mixed on site.
- Steel is transported in 32 ton loads on standard flatbed vehicles.
- Component and material deliveries will take place over a period of 18 months.
- A total of 3,014 delivery trips (in & out total) will be required over 18 months, which is approximately 8 trips a day (In & out total) for a 22 day work month.
- The delivery of materials during the AM and PM peak hours specifically will therefore be very low, as delivery vehicles will arrive and depart randomly throughout the day and after hours. If a conservative maximum of 15% of the daily trips are generated during the AM and PM peaks respectively, less than 2 trips will be generated during the peaks.

Table 4. Estimated construction phase trip generation

	Mast component (No.)	**Rotor blades (No.)**	**Rotor**	**Nacelle**	**Generator**	**Foundation material - Concrete (m^3)**	**Foundation material - Steel reinforce-ment (tons)**
No. of turbines: 1	5 x 30 m length steel sections	3 x 80m length	1	1	1	625	94
No. of turbines: 45	225	135	45	45	45	28,125	4,230
No. of vehicle trips (in & out)	**450**	**270**	**90**	**90**	**90**	**1,758**	**266**
Total No. of trips (in & out)	**3,014**						
No. of trips per workday (in & out)	**8**						
No. of trips per workday peak hour (in & out)	**2 (maximum)**						

2.12.4 Trip generation summary

Refer to Table 5 for the expected combined trip generation of the facility. It is assumed that the peak construction activities and associated highest vehicle trips will not occur at the same time, therefore Table 5 shows a maximum which is highly unlikely.

Table 5: Total maximum AM/PM peak hour trip generation (Construction phase)

FACILITY	VEHICLE TRIPS PER PEAK HOUR		
	Staff (In : Out : Total)	Material deliveries (In : Out : Total)	Total (In : Out : Total)
Kap Vley WEF (In:Out:Total)	29 : 4 : 33	1 : 1 : 2	**30 : 5: 35**

The potential maximum vehicle trips per peak hour is low.

Engineers' opinion: The above analysis and resultant trip generation represents an unlikely worst-case scenario. The background vehicle volumes along the R355 from where all trips will distribute onto the major road network, specifically National Road N7, is very low.

National Road N7 is a Class 1 Freeway, and the negligible traffic generation from this development and the cumulative impact of latent developments in the greater area will have no impact on the route.

In conclusion, the traffic impact of the facility on the local and major road network is expected to be negligible. Also refer to Section 7.

2.13 E80 summary

The total E80 loading of the construction vehicles on the local road network was estimated for the concrete and steel deliveries for the facility. The return E80 pavement loading of the empty vehicles was not calculated, as these are negligible.

Note that these calculations assume that all delivery and return trips occur along the same route to and from the site, and is therefore a conservative maximum.

- Concrete: 879 trips at 3,5 E80/HV
- Steel: 133 trips at 4.7 E80/HV

The estimated total E80 loading for the duration of the construction period is approximately 0.0035 million, and the following mitigating measures are deemed necessary:

- Local (unsurfaced roads): regular maintenance and repair of the local access roads due to damage by construction vehicles will be required.
- R355 (surfaced): No mitigating measures required.
- National Road N7 (surfaced): No mitigating measures required.

2.13.1 Operational phase traffic

The operational phase of the facility will require very few permanent staff. The vehicle trips that will be generated by the personnel will be negligible and the associated traffic impact on the surrounding road network will therefore be negligible.

2.13.2 Decommissioning phase traffic

Following the initial 20-year operational period of the facilities, its continued economic viability may be investigated. If it is still deemed viable its life may be extended; if not, it will be decommissioned. If it is completely decommissioned, all the components will be disassembled, reused and recycled or disposed of. The site will be returned to its current use.

It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant traffic impact on the local road network will again be lower than during the Construction phase. Any damage to the road caused by the decommissioning phase traffic should be repaired at the cost of the developer.

2.14 Capacity analysis

A capacity analysis of the access intersections was not undertaken as it is not deemed necessary for a development with such low maximum traffic generation.

2.15 Powerline Corridor

A powerline will be required to connect the proposed Kap Vley WEF facility to the national grid. The facility will connect to the Gromis Substation located on the remainder of the Farm Dikgat 195 or closer to the new Eskom substation for which the location still needs to be determined via a 132 kV overhead transmission line.

Depending on the location of the substation on-site, a maximum of 40 km will be accommodated for the length of the proposed overhead line, connecting the on-site substation to the Gromis Substation or the new Eskom substation for which the location still needs to be determined.

Refer to Figure 4 for the three power line alignment alternatives.

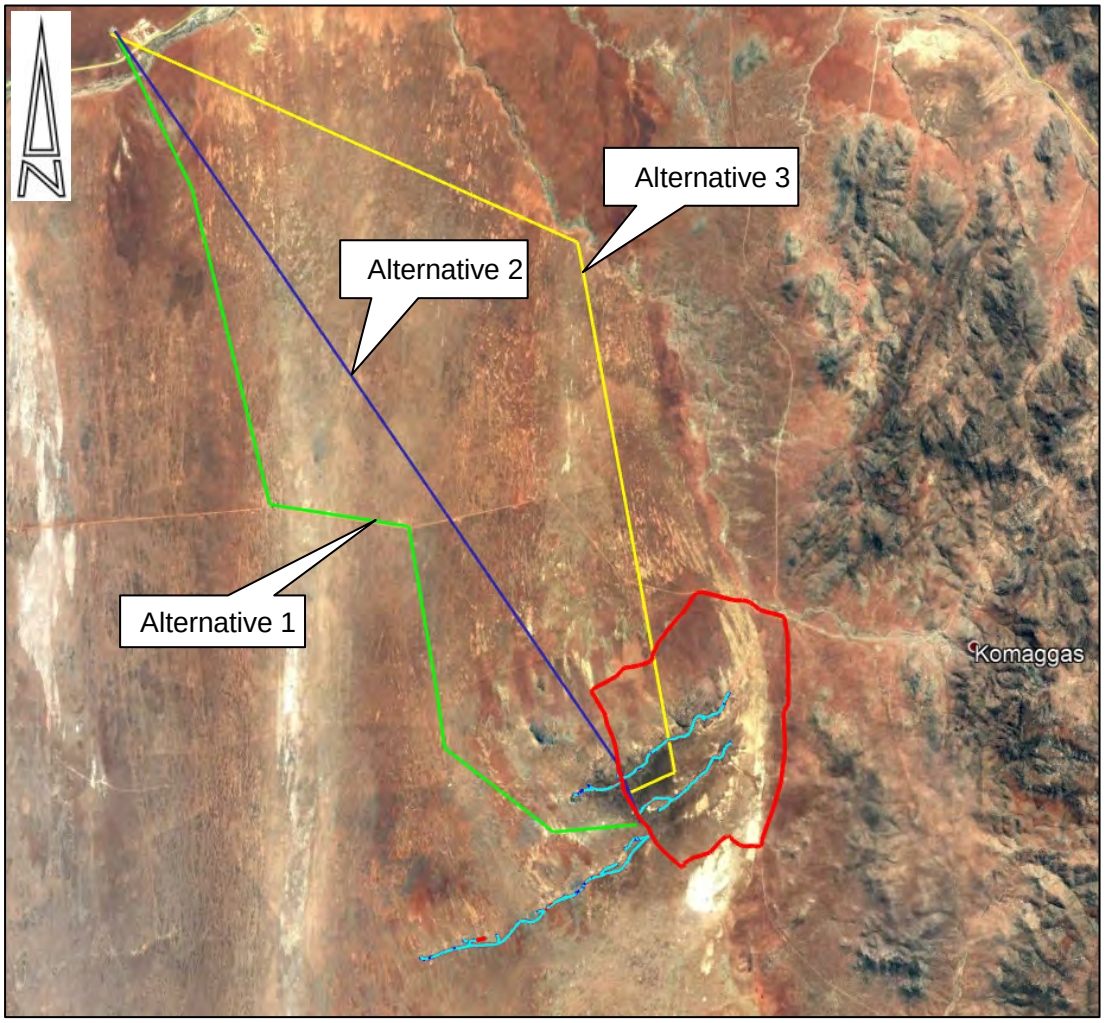

Figure 4. Power line alignment alternatives

Source: GoogleEarth

The likely traffic related impacts due to the powerline (all alternatives) are briefly discussed below:

Construction phase

- The construction phase of the powerline will generate the only notable vehicle volumes that requires assessment. Construction traffic will include vehicles for deliveries (pylon components, foundation material, power cables, etc.), construction staff and all other associated personnel. Abnormal vehicle trips are unlikely.
- The routes between the origin of the material and labour and the powerline construction area is expected to be from the N7 via the R355, the Komaggas road, the WEF's internal road network and other local farm roads.
- The construction period will be approximately 12 – 18 months.
- The expected construction vehicle volumes and number of staff has not been determined. It can be expected that the volumes will be substantially lower than for the construction of the WEF itself.
- Therefore the construction phase traffic and associated impact is regarded as low.

Operational phase

- Negligible traffic will be generated to maintain the powerline, therefore there will be no traffic impact.

Decommissioning phase

- Following the initial 20-year operational period of the facilities, its continued economic viability may be investigated. If it is still deemed viable its life span may be extended; if not, it will be decommissioned. If it is completely decommissioned, the power line infrastructure may also be disassembled, reused and recycled or disposed of.
- It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant traffic impact on the local road network will be negligible.

3 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

A TIA is normally required by the local authority (Local & District Municipality), where a land-use change or densification (Rezoning) is applied for. However, that is not the case for this proposed development due to the very low or negligible traffic generation during the construction, operation and decommissioning phases.

There are no National Roads in the vicinity of the development, however the development traffic may utilise the N7 from Springbok. Due to the low/negligible traffic volumes and the high-order classification of the route, the South African National Roads Agency (Ltd) (SANRAL) will not be required to approve the TIA.

Note that the transport of any abnormal or oversized items on National or other roads will require approval from the relevant road owner (authority). These routes and trips can however not be assessed at this stage.

4 IDENTIFICATION OF KEY ISSUES

4.1 Key Issues Identified During the Scoping Phase

The potential traffic related issues identified during the scoping phase of this EIA process include:

Construction phase

- Increased vehicles trips on the internal roads
- Increased vehicles trips on the local access roads
- Increased vehicles trips on the high-order local road (R355 & N7)

Operational phase

- Increased vehicles trips on the internal roads
- Increased vehicles trips on the local access roads
- Increased vehicles trips on the high-order local road (R355 & N7)

Decommissioning phase

- Increased vehicles trips on the internal roads

- Increased vehicles trips on the local access roads
- Increased vehicles trips on the high-order local road (R355 & N7)

Consultation process
No traffic related comments have been received yet through the EIA public participation process to date.

4.2 Identification of Potential Impacts

Based on the increased number of vehicle trips expected due to the development, the following potential impacts have been identified:

Construction Phase
- Noise, dust & exhaust pollution due to vehicle trips on-site
- Noise, dust and exhaust pollution due to additional trips on the local unsurfaced access roads
- Noise and exhaust pollution due to additional trips on the R355 & N7

Operational Phase
- Noise, dust & exhaust pollution due to vehicle trips on-site
- Noise, dust and exhaust pollution due to additional trips on the local unsurfaced access roads
- Noise and exhaust pollution due to additional trips on the R355 & N7

Decommissioning Phase
- Noise, dust & exhaust pollution due to vehicle trips on-site
- Noise, dust and exhaust pollution due to additional trips on the local unsurfaced access roads
- Noise and exhaust pollution due to additional trips on the R355 & N7

4.3 Cumulative impacts

The known latent energy facilities in the region are:
- Proposed 300MW Kleinzee WEF, Northern Cape. The EIA, dated May 2015, was made available. A TIA is not included in this report.
- Project Blue Wind Energy Facility near Kleinzee within the Nama Khoi Local Municipality, Northern Cape (Phases 1-3)
- Proposed Koingnaas Wind Energy Facility Environmental Basic Assessment Process,
- Nigramoep Solar PV Energy Facility on a site near Nababeep, Northern Cape.

The EIA for the proposed Kleinzee WEF identified three potential access routes to the site, namely:
- R355 via Springbok (97km). The most direct primarily tarred road.
- Komaggas gravel road off the R355 – Shortest route to the N7.
- Combination of mainly gravel roads from Garies off the N7 via Hondeklipbaai and Koingaas.

The EIA stated that there are no preferences regarding access to the WEF from an environmental perspective.

The cumulative traffic impacts due to these latent developments in the study area is of low significance. The reasons are as follow:

- The latent developments are located more than 30 km from the proposed Kap Vley Development.
- The construction and future decommissioning phase time periods of the latent developments are unknown. During these phases the highest additional traffic generation will occur. However, it is unlikely that these phases will coincide exactly with those of the Kap Vley construction and decommissioning phase time periods. The cumulative impacts are therefore regarded as low, even if they should coincide.
- The operational phases of the various latent development and the Kap Vley development will coincide more, as these are long term (20 year) phases. The negligible additional traffic during the operational phase of each development, and their cumulative traffic impact, will be low.
- The latent developments will not utilize the local same unsurfaced roads that the Kap Vley development will use. The unsurfaced roads are more prone to traffic impacts due to them being unsurfaced and of a lower order, i.e. not designed for large volumes of traffic.
- The latent developments may utilize section of the same regional R355) and national (N7) road network. However, these roads or sections of roads are higher order surfaced and the low traffic volumes from these developments will have a low cumulative impact.

5 ASSESSMENT OF IMPACTS AND IDENTIFICATION OF MANAGEMENT ACTIONS

5.1 Potential Impact 1 - Noise, dust & exhaust pollution due to vehicle trips on-site (Construction Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - Regular dust suppression methods on internal local roads (dust suppressant) if required
- It is recommended that dust prevention and monitoring form part of the Environmental Management Programme (EMPr).
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and construction materials to site.

5.2 Potential Impact 2 - Noise, dust & exhaust pollution due to vehicle trips on the local unsurfaced access roads (Construction Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - Maintenance and repairs of local roads
- It is recommended that dust prevention (as required) and monitoring form part of the EMPr.
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and construction materials to site

5.3 Potential Impact 3 – Noise & exhaust pollution due to vehicle trips on the local provincial road (R355) (Construction Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None

- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and construction materials to site
- There are no viable alternatives with less impact identified to transport staff and construction materials to site

5.4 Potential Impact 4 – Noise & exhaust pollution due to vehicle trips on the High-order (National) road network (N7) (Construction Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and construction materials to site
- There are no viable alternatives with less impact identified to transport staff and construction materials to site

5.5 Potential Impact 5 - Noise, dust & exhaust pollution due to vehicle trips on-site (Operation phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures – None (very low vehicle volumes and no heavy vehicles)
- Low significance of impact with mitigation measures

5.6 Potential Impact 6 - Noise, dust & exhaust pollution due to vehicle trips on the local unsurfaced access roads (Operation Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None (very low vehicle volumes and no heavy vehicles)
- Low significance of impact with mitigation measures

5.7 Potential Impact 7 – Noise & exhaust pollution due to vehicle trips on the local provincial road (R355) (Operation Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures

5.8 Potential Impact 8 – Noise & exhaust pollution due to vehicle trips on the high order (National) road network (N7) (Operation Phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures

5.9 Potential Impact 9 - Noise, dust & exhaust pollution due to vehicle trips on-site (Decommissioning phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - Regular dust suppression methods on internal local roads if necessary (dust suppressant)
- It is recommended that dust prevention and monitoring form part of the EMPr.
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the site

5.10 Potential Impact 10 - Noise, dust & exhaust pollution due to vehicle trips on the local unsurfaced access roads (Decommissioning phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- It is recommended that dust prevention and monitoring form part of the EMPr.
- Low significance with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the site

5.11 Potential Impact 11 – Noise & exhaust pollution due to vehicle trips on the local provincial road (R355) (Decommissioning phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the site

5.12 Potential Impact 12 – Noise & exhaust pollution due to vehicle trips on the high order (National) road network (N7) (Decommissioning phase)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the site

5.13 Cumulative Impacts

- The potential cumulative traffic impacts due to the latent developments in the study area is of low significance, refer to Section 4.3 and below.

5.14 Cumulative Potential Impact 13 – Noise & exhaust pollution due to vehicle trips on the local provincial road (R355) (All phases)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the various latent sites.

5.15 Cumulative Potential Impact 14 – Noise & exhaust pollution due to vehicle trips on the high order (National) road network (N7) (All phases)

- Negative impact
- Low significance of impact without mitigation measures
- Proposed mitigation measures - None
- Low significance of impact with mitigation measures
- There are no viable alternatives with less impact identified to transport staff and remove construction materials from the various latent sites.

6 IMPACT ASSESSMENT SUMMARY

The assessment of impacts and recommendation of mitigation measures as discussed above are collated in Table 6-1 to Table 6-4 to below.

Table 6-1 Impact assessment summary table for the Construction Phase

Impact pathway	Nature of potential impact/ risk	Status[1]	Extent[2]	Duration[3]	Consequence	Probability	Reversibility of impact	Irreplace-ability of receiving environment / resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
CONSTRUCTION PHASE															
Vehicle trips on-site	Noise, dust & exhaust pollution	Negative	Local	Medium term	Slight	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes - no	Dust suppression and maintenance of internal roads	Low	4	High
Additional trips on the local unsurfaced access roads	Noise, dust & exhaust pollution	Negative	Regional	Medium term	Slight	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes – no	Maintenance/repairs of local roads	Low	4	High
Additional trips on the R355	Noise & exhaust pollution	Negative	Regional	Medium term	Slight	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High
Additional trips on the N7	Noise & exhaust pollution	Negative	Regional	Medium term	Slight	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High

[1] Status: Positive (+) ; Negative (-)
[2] Site; Local (<10 km); Regional (<100); National; International
[3] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 yrs); Long-term (project duration); Permanent (beyond project decommissioning)

Table 6-2 Impact assessment summary table for the Operational Phase

Impact pathway	Nature of potential impact/ risk	Status[4]	Extent[5]	Duration[6]	Consequence	Probability	Reversibility of impact	Irreplace-ability of receiving environment / resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
OPERATIONAL PHASE															
Vehicle trips on-site	Noise, dust & exhaust pollution	Negative	Local	Long term	Moderate	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes - no	Dust suppression and maintenance of internal roads	Low	4	High
Additional trips on the local unsurfaced access roads	Noise, dust & exhaust pollution	Negative	Regional	Long term	Moderate	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes - no	Maintenance/repairs of local roads	Low	4	High
Additional trips on the R355	Noise & exhaust pollution	Negative	Regional	Long term	Moderate	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High
Additional trips on the N7	Noise & exhaust pollution	Negative	Regional	Long term	Moderate	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High

[4] Status: Positive (+) ; Negative (-)
[5] Site; Local (<10 km); Regional (<100); National; International
[6] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 yrs); Long-term (project duration); Permanent (beyond project decommissioning)

Table 6-3 Impact assessment summary table for the Decommissioning Phase

Impact pathway	Nature of potential impact/ risk	Status[7]	Extent[8]	Duration[9]	Consequence	Probability	Reversibility of impact	Irreplace-ability of receiving environment / resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confit-dance level
DECOMMISSIONING PHASE															
Vehicle trips on-site	Noise, dust & exhaust pollution	Negative	Local	Short term	Moderate	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes – no	Dust suppression and maintenance of internal roads	Low	4	High
Additional trips on the local unsurfaced access roads	Noise, dust & exhaust pollution	Negative	Regional	Short term	Moderate	Very likely	High	N/a	Low	No	Noise – no Dust – yes Exhaust fumes – no	Maintenance/repairs of local roads	Low	4	High
Additional trips on the R355	Noise & exhaust pollution	Negative	Regional	Short term	Moderate	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High
Additional trips on the N7	Noise & exhaust pollution	Negative	Regional	Short term	Moderate	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High

[7] Status: Positive (+) ; Negative (-)
[8] Site; Local (<10 km); Regional (<100); National; International
[9] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 yrs); Long-term (project duration); Permanent (beyond project decommissioning)

Table 6-4 Impact assessment summary table - Cumulative

Impact pathway	Nature of potential impact/ risk	Status[10]	Extent[11]	Duration[12]	Consequence	Probability	Reversibility of impact	Irreplace-ability of receiving environment / resource	Significance of impact/risk = consequence x probability (before mitigation)	Can impact be avoided?	Can impact be managed or mitigated?	Potential mitigation measures	Significance of residual risk/impact (after mitigation)	Ranking of impact/ risk	Confidence level
CUMULATIVE IMPACTS															
Additional trips on the R355	Noise & exhaust pollution	Negative	Regional	Long term	Slight	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High
Additional trips on the N7	Noise & exhaust pollution	Negative	Regional	Long term	Slight	Very likely	High	N/a	Low	No	Noise – no Exhaust fumes - no	None	Low	4	High

[10] Status: Positive (+) ; Negative (-)
[11] Site; Local (<10 km); Regional (<100); National; International
[12] Very short-term (instantaneous); Short-term (<1yr); Medium-term (1-10 yrs); Long-term (project duration); Permanent (beyond project decommissioning)

7 INPUT TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME

It is recommended that dust prevention and monitoring form part of the EMPr for the EIA for wind energy facility as detailed below. Since no traffic impacts are associated with the power line corridor there are no traffic related recommendations for the BA for the power line corridor.

Construction phase

- Internal roads - regular monitoring of site road surface quality, construction traffic and dust monitoring.
- Implementation of dust suppression methods when required (i.e. water spraying, grading of road surfaces)
- Local access roads - regular monitoring of road surface quality, construction traffic and dust monitoring.

Operation phase

No traffic related EMPr mitigation measures required due to negligible traffic volumes on-site, on local access roads and on provincial roads.

Decommissioning phase

- Internal roads - regular monitoring of site road surface quality, construction traffic and dust monitoring.
- Implementation of dust suppression methods when required (i.e. water spraying, grading of road surfaces)
- Local access roads - regular monitoring of road surface quality, construction traffic and dust monitoring.

8 CONCLUSION AND RECOMMENDATIONS

The key findings of this TIA are as follow:

- There are no notable traffic related impacts associated with the proposed power line corridor, and therefore no impacts assessed on EMPr recommendations made as part of the BA process for the power line corridor.
- With regard to the wind energy facility, there are no confirmed planned road upgrades in the study area that will have an impact on the Kap Vley development. The potential upgrade of the Garies/Hondeklipbaai /Kleinsee route will have no traffic impact on the development or vice-versa.
- The known latent developments in the study area will have a negligible cumulative traffic impact on the local, regional or national road network. The reasons are as follow:
    - The latent developments are located more than 30 km from the proposed Kap Vley Development.
    - The construction and future decommissioning phases of the latent developments are unknown. During these phases the highest additional traffic generation will occur. However, it is unlikely that these phases will coincide exactly with those of the Kap Vley construction and decommissioning phases. The cumulative impacts are therefore regarded as low, even if they coincide.

  - The operational phases of the various latent development and the Kap Vley development will coincide more, as these are long term (20 year) phases. The negligible additional traffic during the operational phase of each development, and their cumulative traffic impact, will be low.

  - The latent developments will not utilize the local same unsurfaced roads that the Kap Vley development will use. The unsurfaced roads are more prone to traffic impacts due to them being unsurfaced and of a lower order, i.e. not designed for large volumes of traffic.

  - The latent developments may utilize section of the same regional R355) and national (N7) road network. However, these roads or sections of roads are higher order surfaced roads and the low traffic volumes from these developments will have a low cumulative impact.

- The site can be accessed off two existing local roads (unsurfaced) via the R355, a single carriageway 2-way surfaced road (1 lane per direction), with no surfaced shoulders. It is recommended that only the existing local roads be utilised for access during construction, operational and the decommissioning phase.

- Construction, operational and decommissioning phase parking will be accommodated on-site.

- There is no need for public transport services or non-motorised transport infrastructure to serve the site for the construction and operational phase, except for the transport of staff.

- The estimated peak trip generation of the facility will be 35 veh/hr in the weekday AM and PM peaks during the Construction and Decommissioning phases, and will be negligible for the operational phase.

- The expected traffic increase on the internal and local access roads during the construction phase may result in deterioration of the road, as it is not designed for abnormal and heavy traffic volumes. The cost of maintaining and repairing this road during the Construction phase of the projects should be borne by the developer.

- It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant traffic impact on the local access roads will be lower than during the Construction phase. Any damage to the unsurfaced roads caused by the decommissioning phase traffic should be repaired at the cost of the developer.

- The estimated total E80 loading on the surfaced road to the R355, the surfaced portion of the R355 to Springbok and National Road N7 for the duration of the construction period is negligible, and no mitigating measures are deemed necessary.

- The transport route/s between the origin of the construction material and turbine components and the facility may be National, Provincial or Local roads; and each authority will be required to provide the necessary permits for the transportation of any oversized or abnormally heavy components.

- A capacity analysis of the accesses was not undertaken and is not deemed necessary.

- The mitigating measures recommended are dust monitoring and control on all on-site and local unsurfaced roads.

The EMPr for the Kap Vley wind farm must include dust monitoring and mitigation measures for the on-site and unsurfaced local access roads, during the Construction and Decommissioning phase. This should be a condition for the Environmental Authorisation of the facility.

No other traffic related conditions are required for the Environmental Authorisation for the Kap Vley wind farm or its associated power line corridor, should it be granted.
It is the Professional Transportation Engineers' opinion that the proposed development should be authorised from a traffic and transportation impact point of view.

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DRAFT BASIC ASSESSMENT REPORT

APPENDIX F:

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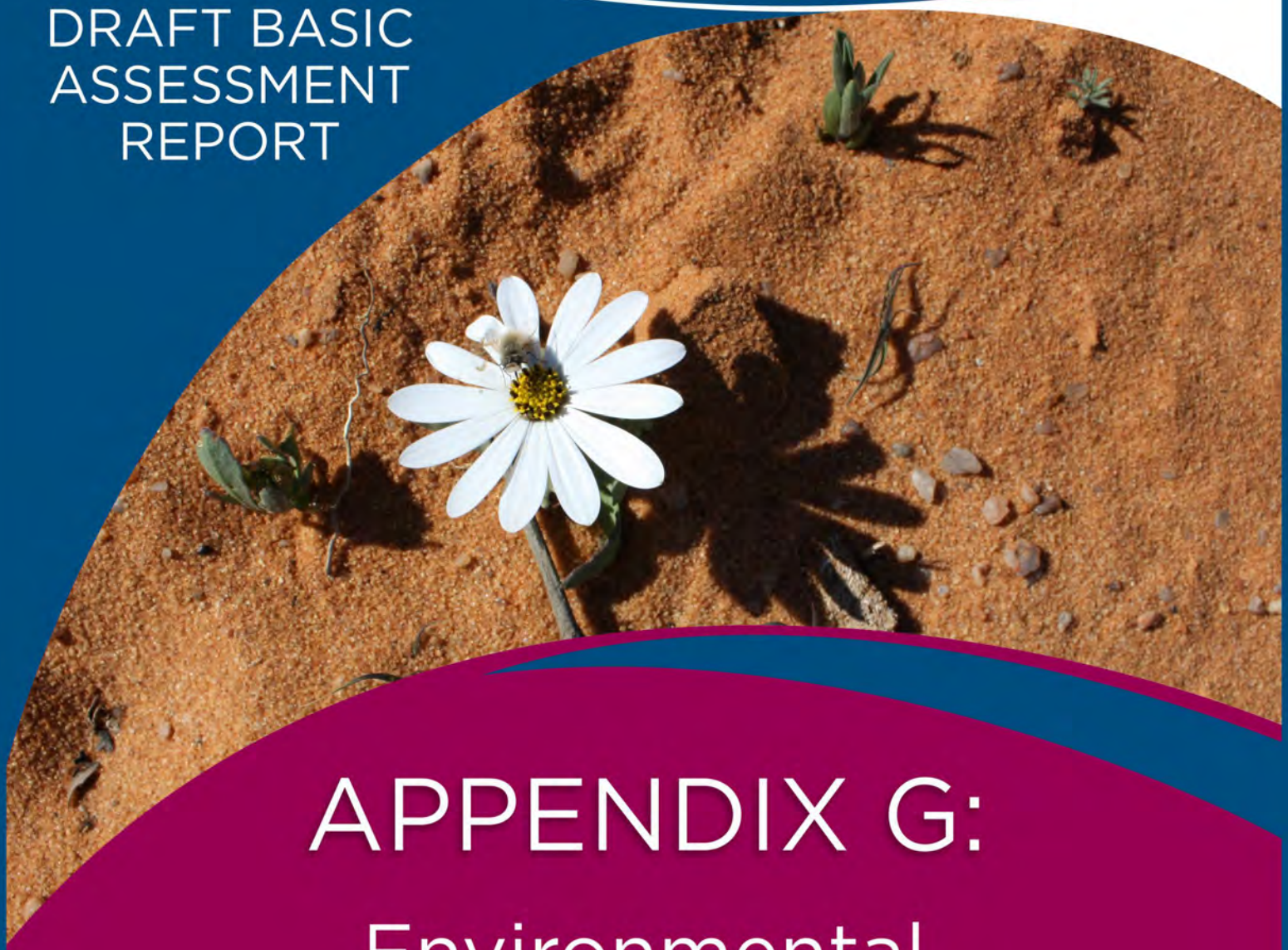
Basic Assessment for the Proposed Construction and Operation of Electrical Grid Infrastructure to support the juwi Kap Vley Wind Energy Facility, near Kleinzee, Northern Cape Province

DRAFT BASIC ASSESSMENT REPORT



APPENDIX G:

Environmental Management Programme (EMPr)

CONTENTS

1. INTRODUCTION

This Environmental Management Programme (EMPr) has been prepared as part of the requirements of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R325 on 7 April 2017. This EMPr is being submitted to the National Department of Environmental Affairs (DEA) as part of the Application for Environmental Authorisation (EA) for the proposed construction of electrical infrastructure to support the proposed Kap Vley Wind Energy Facility (WEF), 30 km south east of Kleinzee in the Northern Cape within the Nama Khoi Local Municipality, Northern Cape Province (Figure 1).

juwi Renewable Energies (PTY) Ltd (hereinafter referred to as juwi) intends to develop electrical infrastructure to connect the proposed Kap Vley WEF to the Eskom Gromis Substation or to the new proposed Eskom Substation which is closer and to ensure that the electricity generated by the proposed WEF feeds into the national grid. The proposed transmission line and electrical infrastructure will be constructed within a single electrical infrastructure corridor.

As noted in the Basic Assessment (BA) Report for the proposed electrical infrastructure, a separate Environmental Impact Assessment (EIA) Report was compiled for the proposed Kap Vley WEF (DEA Reference Number: 14/12/16/3/3/2/1046).

This EMPr is being made available to Interested and Affected Parties (I&APs), stakeholders and Organs of State, as part of the BA Report, for a 30-day review period. Comments received from stakeholders during this aforementioned review period will be incorporated into this EMPr, where applicable. Following the incorporation of comments from I&APs, stakeholders and Organs of State, this EMPr is intended as a "living" document and should continue to be updated regularly, as needed.

1.1 PROJECT DESCRIPTION

The following proposed transmission line and electrical infrastructure will be constructed:

- An 132 kV transmission line from the proposed Kap Vley WEF to the Gromis Substation located on the remainder of the Farm Dikgat 195 or closer to the new Eskom substation, for which the location still needs to be determined, via a 132 kV overhead transmission line. This will include tower/pylon infrastructure and foundations;
- An on-site substation with a capacity of 22/33 to 132 kV (this is assessed under the separate EIA process for the proposed Kap Vley WEF) ;
- For powerline maintenance existing service and access roads will be utilised as much as possible. Where no existing access is present, due to the low traffic anticipated, access will be provided in the form of jeep tracks, as opposed to formalised roads.

As part of this BA, three connectivity alternatives were considered, namely:

1. **Alternative 1– Transmission Line**
2. **Alternative 2– Transmission Line**
3. **Alternative 3– Transmission Line**

A description of each alternative is summarised in Table 1 below.

Table 1: The Kap Vley Alternatives – Transmission Line descriptions

	Kap Vley Alternative 1	Kap Vley Alternative 2	Kap Vley Alternative 3
Line length	39 km	34 km	40 km
Farm portions affected	Kap Vley 315/1	Kap Vley 315/1	Kap Vley 315/1
	Kap Vley 315/2	Kourootjie 316/rem.	Komaggas 200/rem. of portion 5
	Kap Vley 315/3	Pienaars Bult 317/1	Kourootjie 316/rem.
	Kourootje 316/rem.	Pienaars Bult 317/2	Pienaars Bult 317/2
	Pienaars Bult 317/1	Klein Schaap Kop 320/rem.	Pienaars Bult 317/rem.
	Pienaars Bult 317/2	Mannels Vley 321/rem.	Doornfontein 319/rem.
	Kannabieduin 317/rem.	Dikgat 195/rem.	Doornfontein Wes 196/rem.
	Sand Kop 322/rem.		Mannels Vley 321/rem.
	Mannels Vley 321/rem.		Dikgat 195/rem
	Dikgat 195/rem.		
Foundation	Concrete	Concrete	Concrete
Pylon	Tower	Tower	Tower
Tower type	Self-supporting suspension structures or Guyed monopoles	Self-supporting suspension structures or Guyed monopoles	Self-supporting suspension structures or Guyed monopoles
Height	32 m	32 m	32 m
Span length	100 - 200 m	100 - 200 m	100 - 200 m
Servitude width	40 m	40 m	40 m
Onsite substation with Feeder bays, Busbars and Transformers	2.3 ha	2.3 ha	2.3 ha

Each of these alternative connectivity options are proposed within a 200 m wide electrical infrastructure corridor. These corridors were considered and assessed by the specialists in order to ensure that any development constraints or environmental sensitivities will be avoided in the final siting and location of the proposed transmission line. It is important to note that should the routing change subsequent to the issuing of an EA (should such authorisation be granted), any alternative layout or revisions to the layout occurring within the boundaries of the corridor would not be regarded as a change to the scope of work or the findings of the impact assessments undertaken during the BA Phase. This is based on the understanding that the specialists have assessed the larger corridor and have identified sensitivities, which have been avoided in the siting of the proposed infrastructure. The corridor is considered to be a "box" in which the project components can be constructed at whichever location (within the boundary of the corridor) without requiring an additional assessment or change in impact significance. Any changes to the layout within the boundaries of the corridor following the issuing of the EA (should it be granted) will therefore be considered to be non-substantive.

The location of the proposed supporting electrical infrastructure, the three connectivity options, farm portions affected and the proposed Kap Vley WEF properties are shown in Figure 1.

As discussed previously, the overall aim of this proposed project is to provide the necessary electrical infrastructure to ensure that the proposed Kap Vley WEF is equipped and enabled to transmit the generated electricity (from the WEF) to the Gromis Substation or the proposed Eskom Substation. The three routing options for the proposed transmission line were considered to determine the most acceptable and preferred routing. Please refer to Figure 1 for the locality map of the three routing options that were assessed. The three routing options for the proposed transmission line were considered to determine the most acceptable and preferred routing. The preferred routing option is the **Alternative 1 - Transmission line,** as described above**.** The preferred routing was determined based on environmental sensitivities, as well as economic feasibility (following farm boundaries and alignment with property boundaries and existing powerline corridors), and the willingness of landowners to provide consent for the development of the proposed electrical infrastructure on their land.

The proposed project can be divided into the following three main phases:

- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

Each activity undertaken as part of the above phases may have environmental impacts and has therefore been assessed by the specialist studies (Appendix E of the BA Report).

It is proposed that the local municipality will provide services in terms of water, waste removal, and sewage for the construction phase of the proposed project. However, should the municipality not have adequate capacity available for the handling of waste and sewage, and the provision of water; then the Applicant will make use of private contractors to ensure that the services are provided. The Applicant will also ensure that adequate waste disposal measures are implemented by obtaining waste disposal dockets of waste and sewage that is removed from site. Any electricity required during the construction phase will be generated through the use of onsite generators. During the operational phase, the distribution line will not have any electricity requirements as the project itself will transmit and distribute electricity. It is important to note that for the operational phase, requirements for water, sewage management and waste disposal do not apply.

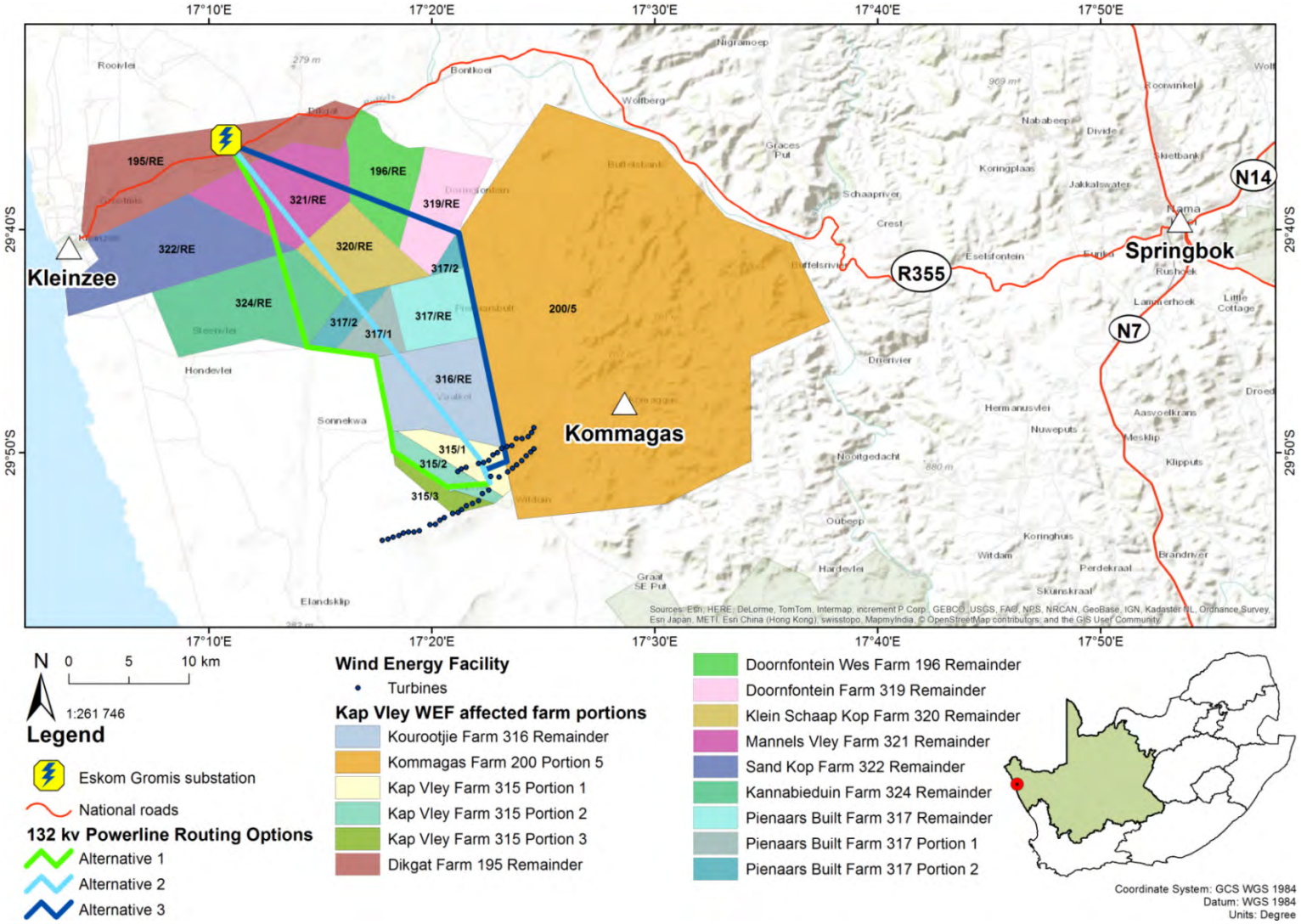


Figure 1: Locality Map of the proposed 132 kV Transmission line connectivity options (showing affected farm portions)

The construction phase will take place subsequent to the issuing of an EA from the DEA and a successful off-taker is selected. The construction phase is expected to extend for approximately 12 months.

The main activities that will form part of the construction phase are:

- Removal of vegetation for the proposed infrastructure;
- Excavations for infrastructure and associated infrastructure;
- Stockpiling of topsoil and cleared vegetation;
- Transportation of material and equipment to site, and personnel to and from site; and
- Construction of the 132 kV transmission line and additional infrastructure.

The following main activities will occur during the operational phase:

- The transmission of electricity generated from the proposed Kap Vley WEF to the Eskom Gromis Substation or the proposed Eskom Substation; and
- Maintenance of the transmission line servitude including the gravel service road.

In the event of decommissioning, the main aim would be to return the land to its original, pre-construction condition. Should the unlikely need for decommissioning arise (i.e. if the actual WEF becomes redundant or the land needs to be used for other purposes), the decommissioning procedures will be undertaken in line with the EMPr and any legislation or guidelines relevant at the time and the site will be rehabilitated and returned to its pre-construction state. Possible decommissioning activities will include removing the infrastructure, and covering the concrete footings with soil to a depth sufficient for the re-growth of natural vegetation. Any other supporting infrastructure no longer in use will be removed from the site and either disposed of at a registered disposal facility or recycled if possible.

It should be noted that a detailed project description (based on the conceptual design) is provided in Section A (3) of the BA Report.

1.2 AUTHOR OF THE EMPr

This EMPr has been compiled by the Environmental Assessment Practitioner and the various specialists on the team (as indicated in Table 2). The details and expertise (including the Curriculum Vitae) of the Environmental Assessment Practitioner and the specialists are respectively provided in Appendix A and Appendix E of the BA Report.

Minnelise Levendal, Pri. Sci. Nat. registered, 117078 (EAP): Minnelise is a Senior EAP in the EMS group of the CSIR and has a Master's degree in Botany. She has 15 years of experience in Environmental Management (which includes nine years working as an EAP). Before she joined the CSIR she was employed at the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) where she assessed EIAs, BAs and EMPs. Minnelise is currently managing various EIAs for wind and solar renewable energy projects in South Africa. Minnelise was the CSIR project manager for the 100 MW Ubuntu Wind Energy Facility near Jeffrey's Bay (Environmental Authorisation granted in June 2012), as well as the 50 MW Banna Ba Pifhu Wind Energy Facility proposed by WKN Wind current near Humansdorp in the Eastern Cape (Environmental Authorisation granted in July 2014). She was the project manager of ten BAs for wind monitoring masts in South Africa as part of the National Wind Atlas Project of the Department of Energy. Environmental Authorisation from the national Department of Environmental Affairs for all the ten masts was obtained in 2010. She was also the Project Leader

for seven Solar Photovoltaic facilities near Kenhardt in the Northern Cape in 2016 for Mulilo Renewable Project Developments. Minnelise is the Project Manager of the Special Needs and Skills Development Programme of DEA which provides pro bono environmental assessments (BAs) to applicants with special needs (i.e. financial constraints).

Table 2: The BA Management Team

NAME	ORGANISATION	ROLE/STUDY TO BE UNDERTAKEN
Environmental Management Services (CSIR)		
Paul Lochner	CSIR	Technical Advisor and Quality Assurance (EAPSA) Certified
Minnelise Levendal	CSIR	EAP (Pr. Sci. Nat.)
Specialists		
Simon Todd	Simon Todd Consulting	Terrestrial Ecology Impact Assessment (including fauna and flora)
Bernard Oberholzer and Quinton Lawson	Bernard Oberholzer Landscape Architect and BOLA	Visual Impact Assessment
Luanita Snyman van der Walt *External Reviewer:* Dr Liz Day	CSIR *External Reviewer:* Freshwater Consulting	Dry and Ephemeral Watercourses Impact Assessment
Dr. Jayson Orton	ASHA Consulting (Pty) Ltd	Heritage Impact Assessment (Archaeology and Cultural Landscape)
John Pether	Private, sub-contracted by ASHA Consulting (Pty) Ltd	Desktop Palaeontological Impact Assessment
Andrew Pearson and Anja Albertyn	ARCUS	Bird Impact Assessment
Jonathan Aronson		Bat Impact Assessment
Johann Lanz	Private	Soils and Agricultural Potential Assessment
Surina Laurie *External Reviewer:* Elena Broughton	CSIR *External Reviewer:* Urban-Econ Development Economists	Socio-Economic Impact Assessment
Morné de Jager	Enviro-Acoustic Research	Noise Impact Assessment
Christo Bredenhann	WSP Group Africa (Pty) Ltd	Transportation Impact Assessment

1.3 POTENTIAL IMPACTS IDENTIFIED DURING THE BA PROCESS

Based on the specialist studies, the following main direct potential impacts, as indicated in Table 3, have been identified and appropriate management and mitigation measures included within the EMPr (where required) as per the recommendations made in the specialist studies to ensure the potential impacts are suitably addressed and managed during all phases of the project. Indirect and cumulative impacts are noted in Sections 4 to 12 of this EMPr. It should be noted that other impacts for which specialist studies were not undertaken but where mitigation or management actions may be required, are also included in the EMPr.

Table 3: Potential Impacts to Bats Identified in the Basic Assessment

KEY IMPACT	IMPACTS IDENTIFIED
Terrestrial Ecology (fauna and flora),	Construction Phase: ▪ Impact on vegetation and plant Species of Conservation Concern (SCC); and ▪ Direct and indirect impacts on fauna. Operational Phase: ▪ Increased soil erosion; and ▪ Impacts on CBAs. Decommissioning Phase: ▪ Increased soil erosion; and ▪ Increased alien plant invasion.
Birds	Construction Phase: ▪ Habitat destruction; ▪ Habitat loss through perceived increased predation risk (displacement), and reduced breeding success. Operational Phase: ▪ Bird mortality due to collisions with overhead powerlines; ▪ Habitat loss through perceived increased predation risk (displacement) due to disturbance ▪ and noise from maintenance activities. Decommissioning Phase: ▪ Habitat loss through perceived increased predation risk (displacement.
Bats	Construction Phase: ▪ Roost disturbance; ▪ Roost destruction; and ▪ Habitat modification. Operational Phase: ▪ Habitat creation in high risk locations leading to bat mortality; and ▪ Displacement and reduced foraging opportunities for bats due to light pollution. Decommissioning Phase: ▪ Roost disturbance.
Dry and Ephemeral Watercourses	Construction Phase: ▪ Physical disturbance and destruction of dry and ephemeral watercourses (incl. drainage lines); and ▪ Altered drainage patterns, increased runoff, erosion and sedimentation of surrounding ecosystems. Operational Phase: ▪ Altered drainage patterns, increased runoff, erosion and sedimentation of surrounding ecosystems

KEY IMPACT	IMPACTS IDENTIFIED
	Decommissioning Phase: ▪ Physical disturbance and destruction of dry and ephemeral watercourses (incl. drainage lines); and ▪ Altered drainage patterns, increased runoff, erosion and sedimentation of surrounding ecosystems.
Visual	Construction Phase: ▪ Potential visual intrusion, dust and noise affecting the rural sense of place. Operational Phase: ▪ Potential visual intrusion of transmission line on ridgelines. Decommissioning Phase: ▪ Potential visual effect of remaining roads, after decommissioning.
Heritage (Archaeology and Cultural Landscape)	Construction Phase: ▪ Potential direct and indirect impacts to archaeological resources; ▪ Potential direct and indirect impacts to palaeontological resources; ▪ Potential direct and indirect impacts to graves; and ▪ Potential direct impacts to the cultural landscape and disruption of traditional activities. Operational Phase: ▪ Potential direct impacts to the cultural landscape and disruption of traditional activities. Decommissioning Phase: ▪ Potential direct impacts to the cultural landscape and disruption of traditional activities.
Soils and Agricultural Potential.	Construction Phase: ▪ Minimal loss of agricultural land use under project footprint; ▪ Soil erosion; ▪ Loss of topsoil; and ▪ Degradation of veld vegetation. Operational Phase: ▪ Minimal loss of agricultural land use under project footprint; and ▪ Soil erosion. Decommissioning Phase: ▪ Soil erosion; ▪ Loss of topsoil; and ▪ Degradation of veld vegetation.
Socio-Economic	Construction Phase: ▪ Employment opportunities and skills development;

KEY IMPACT	IMPACTS IDENTIFIED
	Operational-Decommissioning phase: ▪ Impacts are negligible.
Noise	Construction Phase: ▪ Increase in ambient sound levels as a result of construction activities during the day. Operational Phase: ▪ Impacts are negligible. Decommissioning Phase: ▪ Increase in ambient sound levels as a result of decommissioning activities during the day.
Transportation	Construction, Operational and Decommissioning Phases: ▪ Noise, dust & exhaust pollution due to the increased vehicles trips on the internal on-site roads; ▪ Noise, dust & exhaust pollution due to the increased vehicles trips on the local unsurfaced access roads; ▪ Noise, dust & exhaust pollution due to the increased vehicles trips on the local provincial road (R355); and ▪ Noise, dust & exhaust pollution due to the increased vehicles trips on the High-order (National) road network (N7).

2. APPROACH TO PREPARING THE EMPr

2.1 COMPLIANCE WITH RELEVANT LEGISLATION

In terms of legal requirements, a crucial objective of the EMPr is to satisfy the requirements of Section 24N of the NEMA, as amended, and Appendix 4 of the amended NEMA EIA Regulations published in Government Notice No. R 326 of 7 April 2017. These regulations regulate and prescribe the content of the EMPr and specify the type of supporting information that must accompany the submission of the report to the authorities. An overview of where the requirements are addressed in this EMPr is presented in Tables 4 and 5.

Table 4: Compliance with Section 24N of NEMA

Requirements of Section 24N of NEMA	Where it is included in this EMPr?
2) The environmental management programme must contain- a) information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of: (i) planning and design; (ii) pre-construction and construction activities; (iii) the operation or undertaking of the activity in question; (iv) the rehabilitation of the environment; and (v) closure, if applicable;	Section 1.3 (Page 8-11) and the columns detailing the impact description, mitigation and management objectives, and mitigation and management actions in Sections 4 to 12 of this EMPr (Page 18–82).
b) details of- (i) the person who prepared the environmental management programme; and (ii) the expertise of that person to prepare an environmental management programme;	Section 1.2 (Page 7) of this EMPr and Appendix A of the BA Report
c) a detailed description of the aspects of the activity that are covered by the environmental management programme;	Section 1 and Section 1.1 (Page 3-7)
d) information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a);	Columns in Section 4 to 12 (Page 18-82) of the EMPr regarding the monitoring responsibility, including the requirements for monitoring and reporting on compliance and the responsible parties noted in Section 3 (Page 15-17).
e) information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance;	The columns detailing the mitigation and management actions, and the monitoring methodology, frequency and responsibility in Sections 4 to 12 of this EMPr (Page 18-82).
f) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and	Sections 4 to 12 (Page 18-82)of this EMPr, as applicable to the post-construction, rehabilitation phase and the decommissioning phase.
g) a description of the manner in which it intends to- (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	The columns detailing the mitigation and management objectives, mitigation and management actions, and the monitoring

Requirements of Section 24N of NEMA	Where it is included in this EMPr?
(ii) remedy the cause of pollution or degradation and migration of pollutants; and (iii) comply with any prescribed environmental management standards or practices.	methodology, frequency and responsibility in Sections 4 to 12 (Page 18-82) of this EMPr.
3) The environmental management programme must, where appropriate- a) set out time periods within which the measures contemplated in the environmental management programme must be implemented; b) contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation which may occur inside and outside the boundaries of the operations in question; and c) develop an environmental awareness plan describing the manner in which- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.	The columns detailing the mitigation and management actions, and the monitoring methodology, frequency and responsibility in Sections 4 to 12 (Page 18-82) of this EMPr. Section 11 (Page 58-61) of this EMPr includes an Environmental Awareness Plan.
5) The Minister, the Minister responsible for mineral resources or an MEC may call for additional information and may direct that the environmental management programme in question must be adjusted in such a way as the Minister, the Minister responsible for mineral resources or the MEC may require.	Not applicable at this stage.
6) The Minister, the Minister responsible for mineral resources or an MEC may at any time after he or she has approved an application for an environmental authorisation approve an amended environmental management programme.	Not applicable at this stage.
7) The holder and any person issued with an environmental authorisation- a) must at all times give effect to the general objectives of integrated environmental management laid down in section 23; b) must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment; c) must manage all environmental impacts (i) in accordance with his or her approved environmental management programme, where appropriate; and (ii) as an integral part of the prospecting or mining, exploration or production operation, unless the Minister responsible for mineral resources directs otherwise; d) must monitor and audit compliance with the requirements of the environmental management programme; e) must, as far as is reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and f) is responsible for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological	Through-out the EMPr.

Requirements of Section 24N of NEMA	Where it is included in this EMPr?
degradation as a result of his or her operations to which such right, permit or environmental authorisation relates.	
8) Notwithstanding the Companies Act, 2008 (Act No. 71 of 2008), or the Close Corporations Act, 1984 (Act No. 69 of 1984), the directors of a company or members of a close corporation are jointly and severally liable for any negative impact on the environment, whether advertently or inadvertently caused by the company or close corporation which they represent, including damage, degradation or pollution.	Section 3 (Page 15) details the responsibility of the Project Applicant.

Table 5: Compliance with Appendix 4 of the 2014 NEMA EIA Regulations (as amended on 7 April 2017)

Requirements of Appendix 4 of the 2014 NEMA EIA Regulations (as amended on 7 April 2017 in GN R326)	Where it is included in this EMPr?
1. (1) An EMPr must comply with section 24N of the Act and include: a) details of: (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Section 1.2 (Page 7) of this EMPr and Appendices A and E of the **BA Report**. Appendices A and E of the **BA Report** includes the Curriculum Vitae of the Environmental Assessment Practitioners and specialists respectively.
b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 1 and Section 1.1 (Page 3-7).
c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	Appendix A and Appendix B of this EMPr (Page 87-90).
d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including: (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	Section 1.3 Page 8-9) and the columns detailing the impact description, mitigation and management objectives, and mitigation and management actions in Sections 4 to 12 (Page 18-82) of this EMPr.
e) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to: (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial	The columns detailing the mitigation and management actions in Sections 4 to 12 (Page 18-82) of this EMPr.

Requirements of Appendix 4 of the 2014 NEMA EIA Regulations (as amended on 7 April 2017 in GN R326)	Where it is included in this EMPr?
provisions for rehabilitation, where applicable;	
f) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	The columns detailing the monitoring methodology in Sections 4 to 12 (Page 21-98) of this EMPr.
g) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	The columns detailing the monitoring frequency in Sections 4 to 12 (Page 21-98) of this EMPr.
h) an indication of the persons who will be responsible for the implementation of the impact management actions;	The columns detailing the monitoring responsibility in Sections 4 to 12 (Page 21-98) of this EMPr.
i) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	The columns detailing the mitigation and management actions, and the monitoring methodology and frequency in Sections 4 to 12 (Page 21-98) of this EMPr.
j) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	The columns detailing the mitigation and management actions, and the monitoring methodology, frequency and responsibility in Sections 4 to 12 (Page 21-98) of this EMPr.
k) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 4 to 12 (Page 21-98) of the EMPr, including the requirements for monitoring and reporting on compliance and the responsible parties noted in Section 3.
l) an environmental awareness plan describing the manner in which: (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Section 11 (Page 58-61) of this EMPr.
m) any specific information that may be required by the competent authority.	Section 2.2 (Page 12-13) and the management objectives and management actions in Sections 4 to 11 (Page 18-82). It should be noted that this is based on previous renewable energy projects and corresponding feedback from the DEA.
(2) Where a government notice *gazetted* by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	Not Applicable

2.2 COMPLIANCE WITH DEA REQUIREMENTS

The EMPr is structured in such a way to comply with the requirements of the DEA and to ensure that the mitigation and management measures that have been identified during the BA Process are included in the respective plans. These requirements are detailed in Table 6 below. It is important to note that other project specific aspects (such as the findings and recommendations of the specialist studies), in addition to those covered by the plans normally required by the DEA, have been included in Section 12 of the EMPr.

Table 6: DEA Requirements for the EMPr

DEA Requirements	Relevant Section in the EMPr
All recommendations and mitigation measures recorded in the BA Report and the specialist studies conducted.	Recommended mitigation measures and monitoring actions as noted in the BA Report and specialist studies have been included in this EMPr, where relevant.
The final site layout map	Refer to Appendix A of this EMPr for the site layout map. Refer to Section 1.1 (Page 3-7) of this EMPr for a description of the proposed project infrastructure.
Measures as dictated by the final site layout map and micro-siting.	Refer to Appendix A (Page 84) of this EMPr for the site layout map. Refer to Section 1.1 (Page 3-7) of this EMPr for a description of the proposed project infrastructure and information regarding the final siting of the proposed infrastructure, which will take place during the detailed engineering phase (taking into consideration the findings of the specialists in terms of environmental sensitivity).
An environmental sensitivity map indicating environmental sensitive areas and features identified during the BA Process.	Refer to Appendix B (Page 87) of this EMPr for an environmental sensitivity map. Refer to Section 1.1 (Page 3-7) of this EMPr for a description of the approach followed to identify the environmental sensitivities.
A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	Refer to Appendix B (Page 87) of this EMPr for a combined environmental sensitivity and layout map.
An alien invasive management plan to be implemented during the construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken.	Refer to Section 4 (Page 18-22) of this EMPr.
A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase.	Refer to Section 5 (Page 23-41) of this EMPr. It should be noted that faunal protection and habitat rehabilitation has also been included in this section.
A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	Refer to Section 5 (Page 23-41) of this EMPr. It should be noted that faunal protection and habitat rehabilitation has also been included in this section.
An open space management plan to be implemented during the construction and operation of the facility.	Refer to Section 6 (Page 42-44) of this EMPr.
A traffic management plan for the site access roads to ensure that no hazards would result from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimise impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon	Refer to Section 7 (Page 45-47) of this EMPr.

DEA Requirements	Relevant Section in the EMPr
commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.	
A transportation plan for the transport of components, main assembly cranes and other large pieces of equipment.	Refer to Section 7 (Page 45-47) of this EMPr.
A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.	Refer to Section 8 (Page 48-51) of this EMPr.
A fire management plan to be implemented during the construction and operation of the facility.	Refer to Section 11 (Page 58-61) of this EMPr. It should be noted that this has been combined with an Environmental Awareness Plan.
An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.	Refer to Section 9 (Page 52-54) of this EMPr.
An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems	Refer to Section 10 (Page 55-58) of this EMPr.
Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.	Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments have been included throughout the EMPr, such as Sections 8 (Page 48-51), 9 (Page 52-54) and 10 (Page 55-58).

2.3 CONTENTS OF THE EMPr

Where applicable, each section of the EMPr is divided into the following four phases of the project cycle:

- Design Phase;
- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

The EMPr includes the findings and recommendations of the BA Process and specialists studies. Furthermore, as noted above, the EMPr is considered a “living” document and must be updated with additional information or actions during the design, construction, operational and decommissioning phases if applicable.

The EMPr follows an approach of identifying an over-arching goal and objectives, accompanied by management actions that are aimed at achieving these objectives. The management actions are presented in a table format in

order to show the links between the goal and associated objectives, actions, responsibilities, and monitoring requirements and targets.

The management plans for the design, construction, operational and decommissioning phases consist of the following components:

- **Impact:** The potential positive or negative impact of the development that needs to be enhanced, mitigated or eliminated.
- **Objectives:** The objectives necessary in order to meet the goal; these take into account the findings of the specialist studies.
- **Mitigation/Management Actions**: The actions needed to achieve the objectives of enhancing, mitigating or eliminating impacts; taking into consideration factors such as responsibility, methods, frequency, resources required and prioritisation.
- **Monitoring**: The key monitoring actions required to check whether the objectives are being achieved, taking into consideration methodology, frequency and responsibility.

2.4 GOAL FOR ENVIRONMENTAL MANAGEMENT

The overall goal for environmental management for the proposed Kap Vley Transmission Line project is to construct and operate the project in a manner that:

- Minimises the ecological footprint of the project on the local environment;
- Minimises impacts on fauna, flora and freshwater ecosystems;
- Facilitates harmonious co-existence between the project and other land uses in the area; and
- Contributes to the environmental baseline and understanding of environmental impacts of WEFs and associated supporting electrical infrastructure in a South African context.

3. ROLES AND RESPONSIBILITIES

For the purposes of the EMPr, the generic roles that need to be defined are those of the:

- Project Owner;
- Environmental Control Officer; and
- Construction Manager (Lead Contractor).

It is acknowledged that the specific titles for these functions will vary from project to project. The intent of this section is to give a generic outline of what these roles typically require. It is expected that this will be appropriately defined at a later stage.

3.1 PROJECT OWNER

The Project Owner is the current 'owner' of the project and, as such, is responsible for ensuring that the conditions of the EA issued in terms of NEMA (should the project receive such authorisation) are fully adhered to, as well as ensuring that any other necessary permits or licenses are obtained and complied with. It is

expected that the Project Owner at the point of construction will appoint the Environmental Control Officer and the Lead Contractor.

3.2 ENVIRONMENTAL CONTROL OFFICER

An independent Environmental Control Officer (ECO) must be appointed to monitor the compliance of the proposed project with the conditions of EA (should such authorisation be granted by the DEA) are complied with at all times. The ECO must also monitor compliance of the proposed project with environmental legislation and recommendations of the EMPr, as well as oversee the implementation of the EMPr during the phases of the project, monitor environmental impacts, undertake record-keeping.

The ECO will be responsible for updating the EMPr as and when necessary, and compiling a monitoring checklist based on the EMPr. The roles and responsibilities of the ECO should include the following:

- The ECO must undertake periodic environmental audits during the relevant phases of the proposed project in order to monitor and record environmental impacts and non-conformances, and to monitor site activities to ensure adherence to the specifications contained in the EMPr, using a monitoring checklist. The timeframes for environmental audits will be indicated in the EA (should such authorisation be granted by the DEA);
- Environmental compliance/audit reports must be compiled and submitted by the ECO to the Competent Authority (i.e. DEA and/or Provincial Department of Environment and Nature Conservation) on a regular basis (i.e. at intervals as indicated in the EA (should such authorisation be granted by the DEA));
- The ECO must maintain a diary of site visits and audits, a copy of the EA (should such authorisation be granted by the DEA) and relevant permits for reference purposes, a non-conformance register, a public complaint register, and a copy of previous environmental audits undertaken;
- Prior to the commencement of construction, the ECO must meet on site with the Contractor to confirm the construction procedure and designated construction areas and work activity zones;
- Reporting of any non-conformances within 48 hours of identification of such non-conformance to the relevant agents;
- Conducting an environmental inspection on completion of the construction period and 'signing off' the construction process with the Contractor;
- Ensure that records are kept of all monitoring activities and results; and
- Conducting an environmental inspection on completion of decommissioning and 'signing off' the site rehabilitation process.

The Lead Contractor and sub-contractors may have their own Environmental Officers, or designate Environmental Officer functions to certain personnel.

3.3 CONSTRUCTION MANAGER

The Construction Manager will be responsible for the following:

- Ensure that all appointed contractors and sub-contractors are aware of the EMPr and their respective responsibilities;
- Prior to the commencement of construction, the Construction Manager must meet on site with the ECO in order to confirm the construction procedure and designated construction areas and work activity zones;

- Ensure that each sub-contractor employs an Environmental Officer (or employs a designated suitably qualified individual to fulfil the role of an Environmental Officer) to monitor and report on the daily activities on-site during the construction period;
- Implementation of the overall construction programme, project delivery and quality control for the construction for the proposed electrical grid infrastructure project;
- Overseeing compliance with the Health, Safety and Environmental Responsibilities specific to the project management related to project construction;
- Promoting total job safety and environmental awareness by employees, contractors and sub-contractors and stress to all employees and contractors and sub-contractors the importance that the project proponent attaches to safety and the environment;
- Ensuring that safe, environmentally acceptable working methods and practices are implemented and that sufficient plant and equipment is made available properly operated and maintained, to facilitate proper access and enable any operational to be carried out safely;
- Ensuring that all appointed contractors and sub-contractors repair, at their own cost, any environmental damage as a result of a contravention of the specifications contained in the EMPr, to the satisfaction of the Project Owner's ECO; and
- Implement the Traffic Management Plan (Section 7), Transportation Plan (Section 7) and Storm Water Management Plan (Section 8).

4. ALIEN INVASIVE VEGETATION MANAGEMENT PLAN

Impact	Mitigation/ Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. DESIGN PHASE					
4.1. Impacts due to establishment and increases in the prevalence of exotic and invasive plants.	Reduce proliferation of alien and invasive species, which is expected within any disturbed areas particularly as there is a degree of alien and invasive species within the study area at present.	4.1.1. Ensure compliance with relevant Environmental Specifications (amendments to the regulations under the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) and Section 28 of the NEMA) for the control and removal of alien invasive plant species. 4.1.2. Seek guidance from a suitably qualified specialist or contact relevant authorities on the removal of the alien vegetation on site. 4.1.3. Compile exotic weed, and alien and invasive control plan for the proposed project site to ensure that these species are eradicated and controlled to prevent their spread beyond the project footprint. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled.	▪ Appoint a suitable specialist/ Contractor or contact the relevant authorities to seek guidance on the removal of the planted alien invasive species. ▪ Appoint a suitable specialist to identify dominant weed species within the region and compile approach and management plan for exotic weed control during and post construction. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the design phase. ▪ Once-off during the design phase (i.e. prior to commencement). ▪ Once-off during the design phase.	▪ Project Owner ▪ Project Owner and ECO ▪ ECO
B. CONSTRUCTION PHASE					
4.2. Change in habitat form and structure as a result of general activities and disturbance on site, and import of earth materials during the construction phase, giving rise to prevalence of exotic vegetation. Indigenous	Reduce the opportunity for invasive plant material to establish on site, primarily arising through the import of fill and related materials.	4.2.1. Undertake exotic weed control, vegetation control and broader vegetation management of source materials and the construction site through monitoring during the construction phase and identifying the source of fill materials. 4.2.2. Identify any exotic plant material in the fill material and remove and dispose. Monitor the point of infilling and address any emergent exotic plant material.	▪ Monitor the source of fill material, the importing of such material to the construction site, the presence of alien invasive plants in the fill material, as well as recurrence of these species in the area of infilling during the construction phase via visual inspections and take action to remove and control these species.	▪ Ongoing during the construction phase.	▪ ECO and Contractor

Impact	Mitigation/ Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
vegetation may also serve to alter habitat form and structure.					
4.3. Increased presence of exotic and disturbance driven plant species. With increasing levels of anthropogenic activity on site and within the surrounding area (50 km radius), the propensity for plant invasion or the dominance of species that are tolerant of higher levels of disturbance will see such species dominating and perhaps ousting other less tolerant species. This is a cumulative impact.	Reduce the opportunity for invasive plant material to establish on site as a result of increased anthropogenic activity.	4.3.1. Implement vegetation management and conservation initiatives, such as control of exotic vegetation, and avoid unnecessary disturbance to the ground which promotes exotic weed invasion and vegetation change.	▪ Undertake site and visual inspections and report any non-compliance.	▪ On-going	▪ ECO and Contractor
4.4. Increases in the prevalence of alien and invasive plants.	Ensure the appropriate removal of alien invasive vegetation from the proposed project area and prevent the establishment and spread of alien invasive plants due to the project activities.	4.4.1. Ensure compliance with relevant Environmental Specifications (amendments to the regulations under the CARA and Section 28 of the NEMA for the control and removal of alien invasive plant species. Implement correct choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used. 4.4.2. Implement the exotic weed, and alien and invasive control plan. Undertake regular visual monitoring and redress of exotic weeds in and around site, particularly during construction. Ensure that alien invasive vegetation found on site, within the proposed project footprint, is immediately	▪ Implement intermittent but regular weed control initiatives. ▪ Undertake site and visual inspections and report any non-compliance. ▪ Carry out visual inspections and site visits to ensure that the footprint of the area associated with alien plant species removal is kept as small as possible. Monitor and manage vegetation clearing by undertaking visual inspections to ensure minimal disturbance and to restrict activities to within demarcated areas.	▪ As necessary during the construction phase. ▪ Ongoing during the construction phase. ▪ Ongoing during the construction phase. ▪ Prior to construction and during construction phase following monitoring. ▪ Prior to the	▪ Project Owner, ECO ▪ Contractors and ECO ▪ Contractors and ECO ▪ Project Owner and ECO ▪ Project Owner, ECO and Specialist Contractor ▪ ECO ▪ Contractors and

Impact	Mitigation/ Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		controlled and removed promptly, in a scheduled manner throughout the construction phase. 4.4.3. Ensure footprint areas are kept as small as possible when removing alien plant species. Keep clearance and disturbance of indigenous vegetation to a minimum. The entire width of the distribution line servitude should not be cleared of vegetation and should be cleared below the distribution line and from either side of the centre line based on the requirements of Eskom and standard operating procedures. 4.4.4. No vehicles should be allowed to drive through designated sensitive drainage line and riparian areas during the eradication of alien and weed species. 4.4.5. All alien vegetation identified should be removed from rehabilitated areas and reseeded with indigenous vegetation as specified by a suitably qualified specialist (ecologist). 4.4.6. The removed alien invasive vegetation should be immediately disposed at a suitable waste disposal facility and should not be kept on site for prolonged periods of time, as this will enhance the spread of these species. 4.4.7. All soils compacted as a result of construction activities falling outside of the project footprint areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout all construction and rehabilitation phases to prevent loss of floral habitat. 4.4.8. Ensure that the footprint required for the proposed	▪ Demarcate sensitive drainage and riparian areas during eradication to restrict vehicle access. ▪ Ensure that a suitably qualified specialist is contacted with regards to the re-seeding process. ECO to ensure that this is taken into consideration and implemented. ▪ Monitor the removal of the alien vegetation found on site via visual inspections. ▪ Monitor the presence of alien invasive plants via visual inspections and take action to remove, control, and rehabilitate these species. ▪ Verify that the proposed project area is determined and outlined prior to the commencement of the construction phase by undertaking visual inspections. ▪ ECO to conduct visual inspections to verify that machinery and equipment are cleaned, and report any non-compliance.	commencement of construction ▪ As necessary during the construction phase. ▪ On-going ▪ Once-off prior to construction and as required during the construction process. ▪ As necessary during the construction phase.	ECO ▪ Contractors and ECO ▪ Contractors and ECO

Impact	Mitigation/ Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		project activities (such as temporary stockpiling, earthworks, storage areas, site establishment etc.) is kept at a minimum. 4.4.9. All construction machinery and plant equipment delivered to site for use during the construction phase should be cleaned in order to limit the introduction of alien species.			
C. OPERATIONAL PHASE					
4.5. Increased spread and introduction of exotic vegetation as a result of the movement of vehicles within the study area, particularly along the transmission line and service road, which may change or alter the local ecology.	To prevent the excessive growth and propagation of exotic weeds on disturbed lands that form part of the power line. Reduce the establishment and spread of alien invasive plants. To remove exotic weeds as and when they may arise and thereby prevent alteration of local and adjacent habitat forms.	4.5.1. Implement vegetation management and conservation operations such as control of exotic vegetation along roads and the transmission line, and avoid unnecessary disturbance to the ground which promotes exotic weed invasion and vegetation change. 4.5.2. Review the vegetation composition around the project site. 4.5.3. Undertake removal of exotic vegetation using approved and appropriate herbicides. 4.5.4. Implement management actions in Section 4.4 above as applicable.	▪ Carry out inspections to monitor the presence of exotic vegetation, and the level of disturbance, as well as the implementation of interventions. ▪ Undertake annual routine weed control. ▪ Monitor the use of herbicide sprays for removal of alien vegetation by undertaking visual inspections and reporting any non-compliance. ▪ Maintain register of weed spraying activities and ensure that herbicide use is recorded.	▪ Monthly	▪ Project Owner
D. DECOMMISSIONING PHASE					
4.6. Exotic weed invasion of the decommissioned site resulting in ecological change	To prevent the excessive growth and propagation of exotic weeds on disturbed lands that formed a portion of the proposed electrical infrastructure.	4.6.1. All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction. 4.6.2. Exotic weed control measures to be instituted through weed control programme. Regular redress of exotic weed through the use of herbicides. 4.6.3. Ensure the stabilization of site, once	▪ Final external audit of area to confirm that area is rehabilitated to an acceptable level. ▪ Undertake weed eradication according to weed eradication programme, along disturbance sites following dismantling of structures. ▪ Monitor newly disturbed areas where	▪ Once off ▪ Once-off ▪ During the decommissioning phase ▪ During the decommissioning phase	▪ Lead Contractor with advice from specialist ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner/

Impact	Mitigation/ Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		decommissioning and removal of infrastructure has arisen. 4.6.4. Implement management actions in Section 4.4 above for the decommissioning phase, as applicable.	infrastructure has been removed to detect and quantify any aliens that may become established after decommissioning and rehabilitation. ▪ Monitor the condition of the distribution line route via site inspections throughout the decommissioning phase and at the end to verify that the site is stabilized and all infrastructure has been removed. Record non-compliance and incidents. ▪ Implement monitoring methodology in Section 4.4 above for the decommissioning phase, as applicable.	▪ During the decommissioning phase ▪ Implement monitoring frequency in Section 4.4 above for the decommissioning phase, as applicable.	Contractor ▪ ECO ▪ Implement monitoring responsibility in Section 4.4 above for the decommissioning phase, as applicable.

5. PLANT RESCUE AND PROTECTION PLAN INCLUDING RE-VEGETATION AND HABITAT REHABILITATION PLAN (INCLUDING AQUATIC ECOLOGY, FRESHWATER RESOURCES, AND TERRESTRIAL AND AQUATIC FAUNA AND FLORA)

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. DESIGN PHASE					
5.1. Alteration of surface water quality on account of construction activities that lead to change in water chemistry.	To reduce the potential of contamination of soils and local water resources and change in ecological structure. To ensure that as far as possible all infrastructure is placed outside of water resource areas and their respective buffer zones.	5.1.1. Ensure that as far as possible all infrastructure is placed outside of water resource areas and their respective 32 m buffer zones. If these measures cannot be adhered to, strict mitigation measures will be required to minimise the impact on the receiving watercourses. 5.1.2. Special mention is made of the need to ensure that careful planning of the placement of the monopoles takes place in order to minimise the risk of placing infrastructure unnecessarily within riparian zones. Wherever possible, it is highly recommended that where the linear development (i.e. transmission lines) spans the relevant watercourse, and every effort should be made to prevent/avoid placement of monopoles within the riparian zone/habitat or applicable zones of regulation in terms of NEMA and/or GN509. If this is not avoidable, the monopoles should be placed as far from the active channel of the watercourse as possible. If at all practicable, all monopoles should be developed above the applicable zone of regulation in terms of Regulation GN509 of the NWA. This is particularly relevant to the Buffels River which needs to be crossed by all three proposed alternative routings for the 132 kV powerline near to the Eskom Gromis substation. The river is considered to be sensitive	▪ Ensure that the 32 m zone of regulation is taken into consideration in the final layout of the proposed electrical infrastructure. Ensure that this is taken into account, where possible and as feasible, and that the recommended mitigation measures are implemented as required. ▪ Monitor the placement of the monopoles to ensure minimal interference with riparian habitat. ▪ Monitor the placement of the substation to be 32 m away from watercourses.	▪ Once-off prior to the commencement of construction.	▪ Project Owner and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		environment that should be avoided (Figure A.6.2 in the BA Report). The banks on either side of the river are however steep and it is likely that the river can be spanned without impact. 5.1.3. Careful planning of the location of the substations. The applicable zone of regulation around the freshwater resources in terms of NEMA is 32 m, and this must be adhered to, in order to assist in minimising impacts on the freshwater resources in close proximity to the proposed substations.			
5.2. Impact on avian behavior and avian species as a result of collision with transmission line and associated electrical infrastructure.	To reduce impact on avifauna	5.2.1. The most important mitigation measure is to select the optimal route for the new power line. As discussed in detail in Section 4 of Appendix E3 of the BA Report, it is recommended that Alternative 1 transmission line be selected as the preferred alternative. Alternative 2 is also a viable alternative. However, Alternative 3 is not recommended by the Ecologist as it traverses a large extent of habitat that is sensitive to disturbance and also cuts through the *Acacia erioloba* forest on the plains below the site 5.2.2. A site specific avifaunal walk through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, so as to ensure that no sensitive bird species have started breeding on or near site. If any such sites are found case specific mitigation measures will need to be designed.	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing.	▪ Once during the design and planning phase.	▪ Project Owner and Contractor (and Ornithologist for the walk-through)
B. CONSTRUCTION PHASE					
5.3. Change in ecological processes and habitat form and alteration of	Reduce points of vegetation clearance and unnecessary clearance of vegetation.	5.3.1. Conduct a site survey, habitat identification and relocation prior to construction. Carry out a survey of all the proposed transmission line tower points at	▪ Appoint a suitably qualified Ecologist to conduct a pre-construction survey of the construction corridor.	▪ Once-off, prior to construction. ▪ Once-off, prior to	▪ Project Owner, Construction Manager, ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
biophysical factors at a localised level as a result of the removal of indigenous vegetation, site clearance and levelling for the stringing of the transmission line, as well as earthworks.		the final survey stage prior to the construction phase, taking measures to avoid more sensitive terrain, while meeting stringing distance between towers, together with a plant and fauna rescue programme. 5.3.2. Undertake a site review and fauna and plant search and rescue prior to the commencement of the construction phase, and possible removal/relocation of flora and fauna of value within the affected site (i.e. such specimens may be relocated/removed or avoided (with the relevant permits and approvals in place)). 5.3.3. Ensure the necessary permits or licences are identified and applied for as applicable for removal of protected, indigenous vegetation. Await response and provision of permit (as required) from the relevant Authorities prior to the removal of the indigenous species (if required). Once these permits are obtained, search and rescue must be undertaken for the indigenous species. Efforts should be made to minimise impacts on protected trees (if any) by avoiding areas where such species may occur. 5.3.4. Ensure that demarcation of the construction area is undertaken prior to the commencement of construction and that it is maintained throughout. Fencing of the site is an option for containment. In this regard, conduct a survey of the work space around the proposed on-site substation site and laydown area (i.e. in order to ensure delimiting through demarcation of the construction area). 5.3.5. Ensure that access roads are adequately routed and	▪ Ensure that this is taken into consideration by reviewing signed minutes of meetings or signed reports. ▪ Appoint a suitable contractor to complete the search and rescue. Identify the plants that may need to be relocated or rescued. Contact the relevant Authorities if any protected species are found during the search and rescue. Review permits prior to undertaking search and rescue. Ensure that this is taken into consideration by reviewing signed minutes of meetings or signed reports. ▪ Ensure that a suitable specialist is appointed to compile a Vegetation Rehabilitation Plan. ▪ Verify that the proposed project construction area is determined and outlined prior to the commencement of the construction phase by reviewing signed minutes of meetings or signed reports. ▪ Verify that the proposed access routes are determined and outlined prior to the commencement of the construction phase by reviewing signed minutes of meetings or signed reports. Ensure that vegetation removal is kept to a minimum by reviewing and contributing to the approved site plan. ▪ Ensure that significant lithic	construction. ▪ At commencement ▪ Prior to commencement of construction and search and rescue. ▪ Once-off prior to construction. ▪ Once-off prior to construction and implementation during construction. ▪ Once-off prior to construction. ▪ Once-off prior to construction. ▪ Once-off prior to construction. ▪ Once-off prior to construction.	and Ecologist ▪ Project Owner, Search and Rescue Contractor, and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ ECO ▪ Project Owner, Construction Manager, ECO and Ecologist ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		identified prior to the construction phase, and ensure that they are clearly demarcated for use throughout the construction phase. Access roads should be surveyed prior to the construction of the proposed power line towers and follow routes that avoid unnecessary large scale clearance of vegetation and avoid sensitive habitats. 5.3.6. Ensure that lithic environments are incorporated or avoided during the construction phase. 5.3.7. Stringing of towers may be performed using aerial methods (e.g. helicopter) if and where possible, to avoid undue disturbance to habitat.	environments and features, in proximity to the proposed project area, are demarcated as no-go areas so that they can be avoided. ▪ Ensure that suitable methods for the stringing of the power line are taken into consideration and adopted as required.		
5.4. The disturbance of fauna and loss of vegetation/habitat through anthropogenic activities, disturbance of refugia and general change in habitat.	To reduce change in faunal populations and faunal ethos within the region and/associated development area.	5.4.1. Undertake survey of sites prior to construction Carry out a survey of all the proposed transmission line tower points and development footprint prior to the construction phase, taking measures to avoid more sensitive terrain, while meeting stringing distance between towers. 5.4.2. A pre-construction site walk-through should be undertaken shortly before commencement of construction in order to identify any important faunal communities that may have relocated to the line route. 5.4.3. Undertake plant search and rescue operations within the affected site, where such specimens may be relocated/removed or avoided (with the relevant permits and approvals in place). 5.4.4. Ensure that demarcation of the construction area is undertaken prior to the commencement of construction and that it is maintained throughout (i.e. containment of construction and laydown areas).	▪ Appoint a suitably qualified Ecologist to conduct a pre-construction survey of the final site and development footprint. ▪ The specific impact of construction on these species should be noted and the possibility of relocation of species may be considered. ▪ Ensure that this is taken into consideration by reviewing signed minutes of meetings or signed reports. ▪ Appoint a suitable contractor to complete the search and rescue. Identify the plants that may need to be relocated or rescued. ▪ Contact the relevant Authorities if any protected species are found during the search and rescue. Review permits prior to undertaking search and rescue. Ensure that this is taken into	▪ Once-off, prior to construction. ▪ Once-off, prior to construction. ▪ Once-off, prior to construction. ▪ At commencement ▪ Prior to commencement of construction and search and rescue. ▪ Once-off, prior to construction. ▪ Once-off, prior to construction.	▪ Project Owner, Construction Manager, ECO and Ecologist ▪ Project Owner, Construction Manager, ECO and Ecologist ▪ Project Owner, Search and Rescue Contractor, and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
			consideration by reviewing signed minutes of meetings or signed reports. ▪ Verify that the proposed project construction area is determined and outlined prior to the commencement of the construction phase by reviewing signed minutes of meetings or signed reports.		
5.5. Loss of refugia particularly in respect of fauna associated with lithic habitats (e.g. *Homopus* spp). Rock ledges and other geological structures are intrinsic habitat for species such as padlopers and tortoises, and removal of these features (as a result of site clearance and levelling) will result in the loss of this habitat (i.e. localised ousting of species and change in ecosystem function).	Identify affected points of lithic or eco-geomorphological importance within the development footprint or adjacent to the development footprint.	5.5.1. Undertake survey of sites prior to construction Carry out a survey of all the proposed power line tower points and development footprint prior to the construction phase, taking measures to avoid more sensitive terrain, while meeting stringing distance between towers. 5.5.2. Undertake plant search and rescue operations within the affected site, where such specimens may be relocated/removed or avoided (with the relevant permits and approvals in place). 5.5.3. Ensure that demarcation of the construction area is undertaken prior to the commencement of construction and that it is maintained throughout (i.e. containment of construction and laydown areas). 5.5.4. Ensure that lithic environments are incorporated or avoided during the construction phase. Ensure that these features are cordoned off or demarcated, if required. 5.5.5. Postpone construction activities (in the affected specific area) and consult with a suitably qualified Ecologist, where refugia are utilised by gravid or rearing of juveniles.	▪ Appoint a suitably qualified Ecologist to conduct a pre-construction survey of the final site and development footprint. ▪ Ensure that this is taken into consideration by reviewing signed minutes of meetings or signed reports. ▪ Appoint a suitable contractor to complete the search and rescue. Identify the plants that may need to be relocated or rescued. ▪ Contact the relevant Authorities if any protected species are found during the search and rescue. Review permits prior to undertaking search and rescue. Ensure that this is taken into consideration by reviewing signed minutes of meetings or signed reports. ▪ Verify that the proposed project construction area is determined and outlined prior to the commencement of the construction phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off, prior to construction. ▪ Once-off, prior to construction. ▪ At commencement ▪ Prior to commencement of construction and search and rescue. ▪ Once-off, prior to construction. ▪ Once-off, prior to construction.	▪ Project Owner, Construction Manager, ECO and Ecologist ▪ Project Owner, Search and Rescue Contractor, and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner, Construction Manager, ECO and Ecologist

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
			▪ Ensure that significant lithic environments and features, in proximity to the proposed project area, are demarcated as no-go areas so that they can be avoided. ▪ Consult with a suitably qualified Ecologist where refugia are utilised by gravid or rearing of juveniles within the development footprint.		
5.6. Local extinction of species leading to ecosystem change due to direct faunal mortalities as a result of construction activities such as traffic movement and general disturbance on site.	To reduce the risk to fauna in respect of activities within construction footprints and activities that may arise in and around construction areas.	5.6.1. Ensure proper management of traffic movement and construction labour conduct is implemented. The construction personnel and staff should be made aware of the presence of fauna within the proposed project area. The construction personnel and staff must also be made aware of the general speed limits on site and must be alert at all times for potential crossings. 5.6.2. Develop protocols in respect of management of wildlife within and adjacent to construction sites. 5.6.3. Undertake pre operations assessment of the construction site to identify the presence of fauna within work areas. Address and relocate any fauna identified. Establish a recording method in order to monitor the construction activities, including species presence within site, mortalities and sitings.	▪ Carry out Environmental Awareness Training with a discussion on the management of terrestrial fauna and flora on site, and traffic movement in this regard. Place signage to inform and educate the construction staff regarding this. ▪ Conduct audits of the signed attendance registers. ▪ Place signage to inform and educate the construction staff regarding the management of terrestrial fauna and flora on site. ▪ Undertake inspections of the construction site to verify the presence of fauna, monitor mortalities and identify the cause if encountered, as well as to relocate the identified fauna (if applicable).	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly ▪ Intermittent during the construction phase	▪ Contractor/ECO ▪ ECO ▪ Project Owner, Contractor and ECO ▪ Contractor and ECO
5.7. Change in habitat form and structure as a result of alteration of surface hydrology due to	Reduce changes in surface hydrology associated with construction activities.	5.7.1. Implement ripping of disturbed areas and compacted soils, and create a managed environment. 5.7.2. Implement measures to attenuate or decelerate	▪ Identify areas of compaction and rip or remediate. ▪ Identify changes in surface topography and implement deceleration	▪ Ongoing during the construction phase, with a weekly evaluation	▪ ECO and Contractor ▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
hardpanning of the upper soil horizon (i.e. soil compaction) due to traffic movement within and around the construction area, as well as use of materials to establish a sound working platform (including site levelling and site earthworks). This is also linked to a cumulative impact as a result of increased levels of areas dominated by built structures (within a 50 km radius).		surface flow, where required.	mechanisms if and where required. Ensure that this is taken into consideration in the Method Statement for Stormwater Management during the construction phase.	in response to the commencement and progression of construction work. ▪ As required during the construction phase	
5.8. Change in habitat structure due to general erosion primarily as a result of the movement of construction traffic, earth and plant operations, which causes compaction and surface disturbance. Erosion may occur particularly on steeper slopes where the trampling and compaction of vegetation occurs.	Reduce the likelihood of excessive erosion arising from construction traffic and plant operations.	5.8.1. Ensure site management and timeous redress of evident wind and water erosion. Identify points of rilling and address through ripping or infilling. 5.8.2. Identify alteration in surface topography and address through sculpting or remediation of surface flow.	▪ Undertake monitoring of the construction site and access routes to the construction site. Identify points of rilling and implement mechanisms to rectify it, if and where required. Ensure that this is taken into consideration in the Method Statement for Erosion Management during the construction phase. ▪ Identify changes in surface topography and implement sculpting or remediation of surface flow, if and where required. Ensure that this is taken into consideration in the Method Statement for Stormwater Management during the construction	▪ Weekly	▪ Project Owner, ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			phase.		
5.9. Impact of solid waste generation on fauna with possible mortalities as a result of potential ingestion or ensnarement. Solid waste (e.g. small bolts, wires etc.) has the potential to harm or kill animals through ingestion or ensnarement.	To reduce the impact of solid waste materials on particular fauna. The containment and disposal of solid waste is required in order to avert behavioural change in local fauna as well as general pollution impacts on terrestrial habitat.	5.9.1. Reduce the amount of material packaging imported to sites. Monitor site for materials (small metallic objects, off cuts, wire etc.) that may be within and around the construction area. 5.9.2. Ensure that waste disposal systems are present on site. 5.9.3. Ensure that waste generated on site is contained in order to prevent access by terrestrial fauna and avifauna. 5.9.4. Remove waste from site on a regular basis, following by safe disposal at a licensed waste disposal facility.	▪ Conduct audits to ensure that a waste disposal system is compiled and abided by, and updated as required. ▪ Conduct audits to ensure that receptacles for waste are available at all sites of operation and that these are sealed off and contained. Record and report any non-compliance. ▪ Conduct audits and site inspections to ensure that regular cleaning operations are undertaken on site, and that this includes the clearance of waste materials. Record and report any non-compliance.	▪ Daily	▪ Project Owner and ECO ▪ Contractor and ECO ▪ Contractor and ECO
5.10. Changes in ecological processes and vegetation and habitat alteration through the introduction of nutrients and other materials which may impact directly or indirectly on flora and faunal components of region.	Identify points where surface run off and related disposals may arise and reduce potential for change in habitat by identifying habitat form and nature and taking avoidance actions.	5.10.1. Compile and implement a Vegetation Rehabilitation Plan for the construction phase. 5.10.2. Conduct a site survey of the final development footprint prior to construction and identify points of significance or the overall significance of the site. 5.10.3. Containment and demarcation of the construction area, labour workforce and related activities. Construction activities should be confined to the laydown area and construction footprints. 5.10.4. Cordon off any significant features if required, or take remedial measures to avoid area if required. 5.10.5. Implementation of control measures relating to the conduct of construction staff and contractors on site and in relation to the prevailing natural environment. Construction staff should be managed and maintained within construction areas, and educated on waste management and	▪ Ensure that a suitable specialist is appointed to compile a Vegetation Rehabilitation Plan. Review signed minutes of meetings or signed reports. ▪ Appoint a suitably qualified Ecologist to conduct a pre-construction survey of the final site and development footprint. ▪ Verify that the proposed project construction area is determined and outlined prior to the commencement of the construction phase by reviewing signed minutes of meetings or signed reports. ▪ Ensure that significant lithic environments and features, in proximity to the proposed project area,	▪ Prior to the commencement of construction. ▪ Prior to construction ▪ Once-off, prior to the commencement of construction ▪ Once-off, prior to the commencement of construction ▪ Once-off, prior to the commencement of construction	▪ Project Owner, Construction Manager, ECO and Ecologist ▪ Project Owner, Construction Manager, ECO and Ecologist ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Contractor/ECO ▪ ECO ▪ ECO ▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		conduct on site. 5.10.6. Control of all imported materials including concrete and hazardous materials to ensure that materials are managed on site and within the construction footprint. Control of all waste materials to ensure that all materials are removed from site, including sewage, for disposal at an appropriate point (i.e. a licenced facility). 5.10.7. Ensure a well-managed and timeous construction schedule to avoid prolonged period of construction and disturbance.	are demarcated as no-go areas so that they can be avoided. ▪ Ensure that this is taken into consideration by reviewing signed minutes of meetings or signed reports. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers. ▪ Conduct audits to ensure that a waste disposal system is compiled and abided by, and updated as required. ▪ Carry out audits to verify if the construction process is being managed efficiently with the aim of avoiding unnecessary delays, which may have an impact on the surrounding environment.	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly ▪ Daily ▪ Weekly	▪ ECO and Contractor
5.11. Ousting and behavioural change in fauna through effects such as altering corridors associated with movement, herbivory and predation. Certain species will benefit from the various changes in land use, while others will be ousted from areas.	Changes in factors around the proposed on-site substation and transmission line areas (e.g. noise, human presence etc.), changes to the localized ecology and through extension affects corridors and the broader ecology of the region.	5.11.1. Refer to management measures in Sections 5.9.1 to 5.9.8 above and implement them for this potential impact, along with the associated monitoring methodology, frequency, and responsibility. 5.11.2. Identify areas that may show increased faunal presence (streams, rivers, pans etc.). 5.11.3. Identify mitigation measures to reduce impacts on faunal movement, access to water points etc.	▪ Consider site topography and nature using ecological assessment techniques. Ensure that a suitable specialist is appointed in this regard. ▪ Identify the proposed project site in relation to the broader habitat. ▪ Introduce specific management measures to mitigate against noise, light and human presence.	▪ Prior to and during construction	▪ Construction Manager and ECO (and Ecologist once-off)
5.12. Increased ELP levels as a result of light pollution that may be associated with all built structures of the	To reduce the impact of increased ELP on nocturnal species, resulting in alteration of ecological processes.	5.12.1. The direction of lighting should not be focused outside of the subject area, while the level of lumens should be such that the necessary lighting to achieve its objective is achieved (security,	▪ Ensure that these lighting requirements are taken into consideration and included in the contract specifications. Verify this by	▪ Once-off, prior to the commencement of construction	▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
proposed project and the projects considered within the 50 km radius (cumulative impact). The cumulative level of increased lighting in the area will serve to alter the behaviour of a number of nocturnal (and possibly crepuscular and diurnal) species and alter ecological processes in and around these points (i.e. localised change in species composition and ethology with concomitant change in ecosystem function).		operations etc.).	undertaking site audits and recording and reporting any non-compliance.		
5.13. Increased and expanded anthropogenic influences across the region (within a 50 km radius), with the likely influence of ousting particular species of fauna. Increased noise pollution levels with concomitant impact on faunal behaviour in respect of smaller mammals and other fauna that utilise sound in their various behavioural patterns (prey	To reduce the likelihood of ousting of fauna and impact on faunal behaviour as a result of increased and expanded anthropogenic influences and noise pollution.	5.13.1. Control and management procedures relating to construction activities in and around the transmission line and associated infrastructure to be implemented (i.e. management relating to disturbance of flora and fauna).	▪ Carry out visual inspections to ensure strict control over the disturbance of flora and fauna.	▪ Weekly	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
detection, social interaction). These are cumulative impacts.					
5.14. Vegetation and habitat alteration, and change in ecological processes and habitat with reversion to secondary habitat structure at transformed sites. Recruitment and behavioural change in fauna (i.e. change in ecological processes and habitat). These are cumulative impacts.	To reduce the impact of vegetation and habitat alteration and the likelihood of recruitment and behavioural change in fauna.	5.14.1. Compile and implement a Vegetation Rehabilitation Plan in order to improve habitat diversity and maintenance of improved habitat within areas subject to change as a consequence of the proposed development.	▪ Ensure that a suitable specialist is appointed to compile a Vegetation Rehabilitation Plan. Review signed minutes of meetings or signed reports.	▪ Once-off prior to construction and implementation during construction.	▪ Project Owner, Construction Manager, ECO and Ecologist
5.15. Increased dissection of habitat on account of increasing levels of infrastructure resulting in changes in plant community structure and species composition. This is a cumulative impact.	Reduce dissection of habitat.	5.15.1. Implementation of control measures relating to conduct of staff and contractors on site and in relation to the prevailing natural environment.	▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ Contractor and ECO ▪ ECO
5.16. Loss of freshwater habitat and ecological structure; changes to the freshwater resource ecological and	To reduce the potential of loss of freshwater habitat and ecological structure and associated impacts.	5.16.1. All areas of increased ecological sensitivity should be marked as such and be off limits to all unauthorised construction vehicles and personnel. 5.16.2. Where it is impossible to avoid placing	▪ Ensure that the 32 m zone of regulation is taken into consideration in the final layout of the proposed electrical infrastructure. Ensure that	▪ Once-off prior to the commencement of construction.	▪ Project Owner and ECO ▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
sociocultural service provision; impacts on the freshwater resources hydrological function and sediment balance; and potential impacts on water quality.		infrastructure within riparian habitat, flow connectivity must be retained by preventing fragmentation of the riparian habitat. Fragmentation of the riparian habitat can be avoided by (for example) ensuring that the disturbance footprint remains as small as possible, that no solid strips are excavated within the riparian habitat, that structures (such as culverts or monopoles) placed within the active channel do not cause increased turbulence, which will result in erosion. It must also be ensured that no canalization or incision of the riparian resource takes place as a result of the construction activities. 5.16.3. Ensure that vegetation clearing and indiscriminate vehicle driving does not occur within demarcated sensitive areas, including the identified freshwater resources, their associated riparian zones and the applicable 32 m NEMA zone of regulation. 5.16.4. Contractor laydown areas must not be permitted within the 32 m NEMA zone of regulation around the identified freshwater resources. 5.16.5. Minimize construction footprints and edge effects of construction activities. Edge effects of activities, particularly erosion and alien/weed control need to be strictly managed. 5.16.6. Clearing of vegetation at all impact sites must be kept to an absolute minimum, and growth of indigenous vegetation must be promoted to protect soils. 5.16.7. All development footprint areas should remain as small as possible and should not encroach onto surrounding more sensitive areas. It must be	this is taken into account, where possible and as feasible (as recommended by the Aquatic Ecology Specialist), and that the recommended mitigation measures are implemented as required. ▪ Ensure that flow connectivity is retained if it is not avoidable to place infrastructure within riparian habitat, and that fragmentation is prevented. Ensure that these measures are implemented by undertaking site audits and reporting any non-compliance. ▪ Undertake site audits and inspections to ensure that vegetation removal and vehicle driving occurs on demarcated routes and that all sensitive areas are regarded as no-go areas. Ensure that the contractor demarcates sensitive areas and dedicated access routes for construction personnel. Monitor and report any non-compliance. ▪ Ensure that the limits of the construction boundary and temporary access roads are confirmed and that the construction area and vegetation removal is kept to a minimum. Conduct site audits and inspections to verify if this is undertaken and record and report any non-compliance. ▪ Ensure that these management actions	▪ Weekly ▪ Once-off prior to construction for demarcation and weekly to ensure these demarcated areas are respected. ▪ Weekly ▪ Weekly	▪ ECO and Contractor ▪ ECO and Contractor ▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		ensured that the freshwater resources, and their associated regulatory zones are off-limits to construction vehicles and personnel. The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. 5.16.8. Planning of temporary access routes should take the site sensitivity plan into consideration, and wherever possible, existing roads should be utilised. If additional roads are required, such as in the form of jeep tracks, then wherever feasible such "roads" should be constructed a distance from the more sensitive riparian areas and not directly adjacent thereto. If crossings are required they should cross the system at right angles, as far as possible to minimise impacts in the receiving environment, and any areas where bank failure is observed due to the effects of such crossings should be immediately repaired by reducing the gradient of the banks to a maximum of a 1:3 slope and where needed necessary, installing support structures. This should only be necessary if existing access roads are not utilised. 5.16.9. Implement alien vegetation control program; and promote indigenous vegetation growth to protect soils. 5.16.10. Construction activities should occur in the low flow season/ dry season to avoid sedimentation and minimize disturbance to hydraulic function. The duration of possible impacts on the riverine system should be minimised as far as possible by ensuring that the duration of time in which possible flow	are taken into consideration during the construction phase via site audits and inspections, and record and report any non-compliance.		

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		alteration and sedimentation will take place is minimised. 5.16.11. Use construction techniques to support the hydrology and sediment control functions of the freshwater resource. A suitably qualified engineer should be consulted for guidance in this regard, and these techniques should be incorporated into the EMPr and stormwater management plan. 5.16.12. Limit excavations to ensure that drainage patterns return to normal after construction. 5.16.13. No disposal of waste within/in the vicinity of the freshwater resources. Correct waste management principles must be implemented on site and adequate waste disposal facilities must be provided. 5.16.14. Rehabilitate disturbed areas following completion of construction activities through reprofiling and revegetation. 5.16.15. Desilt the freshwater resource areas affected by construction activities, in the vicinity of construction activities. Desilting should preferably be undertaken by hand, and not using heavy machinery to avoid further impacts on the freshwater resources. 5.16.16. Strict erosion control and soil management measures must be implemented during the construction and operational phases, particularly in areas where vegetation has been removed. 5.16.17. Stockpiled soil must be levelled as required during construction and post-construction to avoid sedimentation from runoff, and revegetated with indigenous vegetation. 5.16.18. Compacted soil should be ripped, reprofiled and reseeded with indigenous vegetation following			

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		completion of construction activities.			
5.17. Disturbance of terrestrial fauna and flora on site due to construction workers and activities.	To advise construction staff of the requirements in respect of management of flora and fauna on site during the construction phase.	5.17.1. Conduct an Environmental Awareness Training and induction for all construction staff and personnel.	▪ Carry out Environmental Awareness Training with a discussion on the management of terrestrial fauna and flora on site. ▪ Conduct audits of the signed attendance registers.	▪ Prior to construction and as required by the ECO. Ensure that all new staff are inducted. ▪ Monthly	▪ ECO and Contractor ▪ ECO
C. OPERATIONAL PHASE					
5.18. Change in ecological processes and habitat due to disturbance as a result of general activities associated with the maintenance operations around the transmission line, which will include replacing of parts and infrastructure, as well as use of materials such as hydrocarbons.	Reduce impacts on terrestrial fauna and flora as a result of the operation of the proposed on-site substation.	5.18.1. Implement sound and appropriate management of the proposed project (i.e. electrical infrastructure) site including storm water management, vegetation management and related aspects around the site. 5.18.2. Ensure that containment of maintenance activities is achieved to within the on-site substation to avoid unnecessary disturbance outside of the footprint. 5.18.3. Implementation of control measures relating to the conduct of maintenance staff and contractors on site and in relation to the prevailing natural environment. Operational staff should be educated on correct procedures to be used in waste disposal, conduct on site and operations of vehicles and machinery. 5.18.4. Implement control of all imported material (where applicable) to ensure that all materials are managed on site and within the footprint of the proposed on-site substation and O&M Building. 5.18.5. Control of all waste materials to ensure that all materials are removed from site, including sewage, for disposal at an appropriate facility (i.e. a licenced facility).	▪ Ensure that these factors are taken into consideration by undertaking site audits and visits and recording any non-compliance.	▪ Ongoing	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		5.18.6. Appropriate lighting of the on-site substation should be provided in order to avoid unnecessary illumination of the surrounding environment. 5.18.7. Ensure the appropriate establishment of electric fencing around the proposed on-site substation (neutral line lowest). Inter alia, a neutral line should be established at ground level, while methods to prevent perching of birds on upper stands should be explored. 5.18.8. Monitoring of the fence line on an ongoing basis will alleviate impacts on smaller fauna, such as tortoise, that may become entrapped by the electric fence.			
5.19. Change in ecological processes and habitat, disturbance of emergent and established vegetation, changes in edaphics and other drivers, ousting of fauna in and around the site and particularly adjacent to the transmission line, mortalities of species such as tortoise, and changes in biophysical drivers along the proposed transmission line route (soil, vegetation cover, surface hydrology etc.), as a result of general activities during the transmission line and service road maintenance	Reduce impacts on terrestrial fauna and flora as a result of the operation of the proposed transmission line and service road.	5.19.1. Implement sound and appropriate management of points around the proposed towers including storm water management and vegetation control. 5.19.2. Ensure that containment of maintenance activities is achieved to the proposed transmission line servitude and points around towers to avoid unnecessary disturbance outside of the footprint. 5.19.3. Implementation of control measures relating to the conduct of maintenance staff and contractors on site and in relation to the prevailing natural environment. Operational staff should be educated on waste management while on site, adherence to speed limits and general conduct on site. 5.19.4. Implement control of all imported material to ensure that materials are managed during operations along the proposed transmission line route. 5.19.5. Control of all waste materials to ensure that all materials are removed from along the proposed transmission line route and disposed of correctly at	▪ Ensure that these factors are taken into consideration by undertaking site audits and visits and recording any non-compliance.	▪ Ongoing	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
processes.		a licenced facility.			
5.20. Disturbance of vegetation and alteration of vegetation community structure and habitat form as a result of maintenance operations around the proposed on-site substation and O&M building, of the transmission line and service road, as well as increased human and vehicle traffic levels.	The maintenance of the prevailing habitat form and type in areas subject to disturbance during the operational phase.	5.20.1. Implement vegetation management and conservation initiatives which includes exotic weed control; vegetation management along the power line and service road route; and around fence lines and within the site; and monitoring and maintenance of larger plant associations in proximity to infrastructure. 5.20.2. Undertake regular review of vegetation and habitat in and around the towers and substation. 5.20.3. Specific consideration of habitat change indicated by moribund state, rapid change in structure and composition of vegetation etc.	▪ Undertake monitoring via visual inspections of the site, and record and report non-compliance and recommend methods to rectify any areas of concern.	▪ Monthly	▪ Project Owner
5.21. Increase in terrestrial mortalities through the movement of vehicles along the line route (particularly tortoises). Electric fencing also offers a potential threat to some species. This has the potential to inflict lethal consequences on smaller and less mobile species such as tortoises (i.e. localised extinction or ousting of species with concomitant change in ecosystem function).	To reduce the risk to fauna due to activities associated with the operations of the proposed infrastructure.	5.21.1. Develop protocols in respect of management of wildlife within and immediately adjacent to the operational area. 5.21.2. Undertake a regular assessment of the operational site to identify the presence of fauna within work areas. Address and relocate any fauna identified. 5.21.3. Log any identified mortalities and identify the cause of such, along with remedial actions.	▪ Monitor mortalities and identify the associated cause if encountered. Record the number of faunal mortalities and ensure that remedial actions are implemented.	▪ Ongoing	▪ Project Owner
5.22. Change in faunal behaviour due to	To manage impacts on faunal behaviour and associated	5.22.1. Develop protocols in respect of management of wildlife within and immediately adjacent to the	▪ Identify points of excessive noise or light and consider mitigation measures,	▪ Daily to intermittent	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
increased lighting around the proposed on-site substation and O&M Building (ELP), which will be lit at night. In particular, invertebrate species may be attracted to lights which have concomitant influences on the behavioural patterns of other species in the area. Alternatively, hunting and other behaviours may alter as a consequence of additional lighting within an area previously devoid of such factor. Increased ELP levels is also listed as a cumulative impact.	ecological aspects associated with ELP and operations.	operational area. 5.22.2. Undertake a regular assessment of the operational site to identify the presence of fauna within work areas. Address and relocate any fauna identified. 5.22.3. Ensure that nuisance factors, in particular noise and light are mitigated and minimised. 5.22.4. Apply suitable lumens and ensure direction of lighting is within the boundary of the proposed on-site substation. The direction of lighting should not be focused outside of the subject area, while the level of lumens should be such that the necessary lighting to achieve its objective is achieved (security, operations etc.).	if possible; and monitor and log changes and faunal mortalities that are identified from time to time.		
5.23. Birds nesting on transmission line or on-site substation.	To reduce conflict with infrastructure management and fire risks of nests. Reduce nesting of birds on the electrical infrastructure	5.23.1. Nest management on a case by case under the supervision of an Ornithologist, and in conformance with all relevant national and provincial legislation. 5.23.2. The operational phase EMP must include provision for application to the provincial authority for permits for any necessary nest management.	▪ Nest relocation or removal should be done under permit from the provincial authority.	▪ As required	▪ ECO
D. DECOMMISSIONING PHASE					
5.24. Recruitment and behavioural change in	To manage impacts on faunal behaviour and associated	5.24.1. Develop protocols in respect of management of wildlife within and adjacent to the site designated	▪ Appoint a suitable specialist to undertake a final site evaluation and to	▪ Prior to demolition and/or	▪ Project Owner and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
fauna resulting in change in ecological processes and habitat.	ecological aspects during decommissioning activities.	for decommissioning. Compile and implement a Vegetation Rehabilitation Plan in order to improve habitat diversity. Improved habitat complexity will buffer transformation and reduce impacts on faunal behaviour and populations. 5.24.2. Undertake regular assessment of sites to identify the presence of fauna within work areas prior to and post construction. Address and relocate any fauna identified prior to demolition. 5.24.3. Ensure that nuisance factors, in particular noise and light are mitigated and minimised during removal.	complete the search and rescue. Identify the plants that may need to be relocated or rescued. ▪ Ensure that a suitable specialist is appointed to compile a Vegetation Rehabilitation Plan. Review signed minutes of meetings or signed reports. ▪ Undertake site audits and record and report any non-compliance.	decommissioning ▪ Prior to demolition and/or decommissioning ▪ Daily	▪ Project Owner, Ecologist and ECO ▪ ECO and Contractor
5.25. Impact of solid waste generation on fauna as a result of potential ingestion or ensnarement. Solid waste (e.g. small bolts, wires etc.), and solid and derelict structures left on site following the demolition and removal of structures has the potential to harm or kill animals (local fauna) through ingestion or ensnarement.	The containment and correct disposal of solid waste is required in order to avert behavioural change in local fauna as well as general pollution impacts on the terrestrial habitat.	5.25.1. Ensure that waste generated on site is contained in order to prevent access by terrestrial fauna and avifauna. 5.25.2. Remove waste from site on a regular basis, following by safe disposal at a licensed waste disposal facility. 5.25.3. Ensure that a thorough survey of the site following clearance and decommissioning is undertaken. All material is to be removed from site at the end of the decommissioning phase.	▪ Conduct audits to ensure that receptacles for waste are available at all sites of operation and that these are sealed off and contained. Record and report any non-compliance. ▪ Conduct audits and site inspections to ensure that regular cleaning operations are undertaken on site, and that this includes the clearance of waste materials. Record and report any non-compliance. ▪ Conduct a final external audit to confirm that area is left in a suitable condition.	▪ Daily ▪ Daily ▪ At the end of the decommissioning phase	▪ Contractor and ECO ▪ Contractor and ECO ▪ Project Owner and ECO
5.26. Vegetation and habitat alteration and reversion to secondary habitat structure at transformed sites. Removal of the proposed transmission line and related infrastructure	Reinstatement of vegetation and habitat following closure of site or decommissioning of operations.	5.26.1. Remove all structures and relocate material off site and dispose of waste materials correctly. 5.26.2. Rip and manage compacted surface soils at areas. Areas that have been subject to compaction should be ripped mechanically, or by hand in order to promote vegetative colonisation of the affected areas. Undertake topographic sculpting of site. If	▪ Carry out site inspections and audits to review the site and ensure that all structures are removed from site and correctly disposed (as required and where applicable). ▪ Carry out inspections and site audits to ensure that the site is ripped and	▪ Once-off operation ▪ Throughout the decommissioning phase. ▪ Throughout the decommissioning	▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Project Owner,

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
will alter the localised topography at points, which may prevent successional processes establishing at these points on account of intrinsic changes in edaphics, lithic or other factors.		and where required, areas should be sculpted to mimic the prevailing habitat. Ensure that the site is revegetated. 5.26.3. Monitor and address any exotic plant establishment. 5.26.4. Compile and implement a Vegetation Rehabilitation Plan in order to improve habitat diversity. Establish rehabilitation protocols and management interventions for site that would include post construction remediation and rehabilitation. 5.26.5. Undertake management of secondary emergent vegetation communities to ensure that emergent vegetation is aligned to prevailing habitat.	sculpted to conform to the prevailing topography, and that the site is re-vegetated, if and where required. Monitor the management measures to verify if they are implemented successfully in order to ensure plant re-vegetation. ▪ Carry out visual inspections to verify the removal of exotic plant species and record and report any non-compliance. ▪ Ensure that a suitable specialist is appointed to compile a Vegetation Rehabilitation Plan. Review signed minutes of meetings or signed reports.	phase. ▪ Once-off prior to decommissioning and implementation during decommissioning.	Decommissioning Manager, ECO and Ecologist
5.27. Rehabilitation of flora on site	Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction.	5.27.1. All damaged areas shall be rehabilitated upon completion of the contract. 5.27.2. All natural areas must be rehabilitated with species indigenous to the area. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction. 5.27.3. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas.	▪ Conduct a final external audit to confirm that area is rehabilitated to an acceptable level.	▪ Once off	▪ Project Owner with feedback and input from an appropriate specialist.

6. OPEN SPACE MANAGEMENT PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. DESIGN PHASE					
6.1. Loss of vegetation and habitat fragmentation.	Keeping the area cleared of vegetation to a minimum.	6.1.1. Clearing of vegetation should be kept to a minimum and take into consideration the sensitivities on site shown in Appendix B of this EMPr.	▪ Ensure that design and layout is uniform and well-adapted to the surrounding environment and that no unnecessary areas are cleared of vegetation.	▪ Once-off during design	▪ Project Owner
6.2. Impacts due to establishment of alien invasive plants.	Ensure the appropriate removal of alien invasive vegetation from the proposed project area and prevent the establishment and spread of alien invasive plants due to the project activities.	6.2.1. Ensure compliance with relevant Environmental Specifications for the control and removal of alien invasive plant species. 6.2.2. Appoint a specialist or contact relevant authorities to seek guidance on the removal of the alien vegetation on site. 6.2.3. Compile and finalise an alien weed eradication programme.	▪ Appoint a suitable specialist/ Contractor or contact the relevant authorities to seek guidance on the removal of the planted alien invasive species. ▪ Appoint a suitable specialist to compile an alien invasive vegetation eradication plan. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the design phase. ▪ Once-off during the design phase. ▪ Once-off during the design phase.	▪ Project Owner ▪ Project Owner ▪ ECO
6.3. Permanent barriers to animal movement and habitat fragmentation.	To reduce the impact that permanent barriers (as a result of construction activities and the proposed infrastructure) will have on animal movement within the area.	6.3.1. Fencing should allow for the passage of small and medium sized mammals and all forms of mesh fencing should be avoided. 6.3.2. All remaining areas that are not impacted upon by the proposed development footprint should remain unfenced to allow for movement corridors between the remainder of the farm.	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the planning and design phase ▪ Once-off during the planning and design phase	▪ Project Owner ▪ Project Owner
B. CONSTRUCTION PHASE					
6.4. Permanent barriers to animal movement and habitat fragmentation.	The reduction in the impact that permanent barriers (as a result of construction activities will have on animal movement	6.4.1. Fencing should allow for the passage of small and medium sized mammals and all forms of mesh fencing should be avoided.	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during the planning and design phase	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
	within the area.				
6.5. Loss of vegetation and habitat fragmentation.	Keeping the area cleared of vegetation to a minimum.	6.5.1. Clearing of vegetation should be kept to a minimum, keeping the width and length of the earthworks to a minimum.	▪ Monitor activities and record and report non-compliance.	▪ Daily	▪ ECO and Contractor
6.6. Increases in the prevalence of exotic and invasive plants.	Reduce area of disturbance and decrease the level of exotic plants within or around the site.	6.6.1. Regular monitoring through visual inspection and redress of exotic weeds in and around site, particularly during construction. 6.6.2. Avoidance of excessive earthworks and sculpting of land.	▪ Monitor the presence of alien invasive species on the development site. ▪ Maintenance of vegetation and avoidance of unnecessary clearance of route.	▪ Ongoing, and as required. ▪ Ongoing	▪ ECO and Contractor ▪ ECO and Contractor
C. OPERATIONAL PHASE					
6.7. Increased risk of alien plant invasion.	Ensure that the site is kept free from alien invasive species.	6.7.1. Monitor the site and remove alien invasive species that are found.	▪ Implement intermittent but regular weed control initiatives on the development site.	▪ Reporting frequency depends on legal compliance framework.	▪ Project Owner
6.8. Increased animal road mortality.	Minimise loss of fauna as a result of road mortalities.	6.8.1. Create awareness during staff induction programmes. Staff must be made aware of the general speed limits as well as the potential animals that may cross and how to react in these situations.	▪ Conduct staff awareness training programmes.	▪ Once-off training and ensure all new staff are inducted.	▪ Project Owner
D. DECOMMISSIONING PHASE					
6.9. No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going	To manage impacts on the surrounding environment during the operational phase.	6.9.1. Disturbed and transformed areas should be contoured to approximate naturally occurring slopes to avoid lines and forms that will contrast with the existing landscapes	▪ Final external audit of area to confirm that area is rehabilitated to an acceptable level	▪ Once off	▪ Project Owner
		6.9.2. Stockpiled topsoil should be reapplied to disturbed areas and these areas should be re-vegetated using a mix of native species in such a way that the areas will form as little contrast in form, line, colour and texture with the surrounding undisturbed landscape.	▪ Final external audit of area to confirm that area is rehabilitated to an acceptable level	▪ Once off	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions		Monitoring		
				Methodology	Frequency	Responsibility
occupation of the area.		6.9.3.	Edges of re-vegetated areas should be feathered to reduce form and line contrasts with surrounding undisturbed landscape.	▪ Final external audit of area to confirm that area is rehabilitated to an acceptable level.	▪ Once off	▪ Project Owner

7. TRAFFIC MANAGEMENT PLAN INCLUDING TRANSPORTATION PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. DESIGN PHASE					
7.1. Increased traffic generation	Manage impact that additional traffic generation will have on road network	7.1.1. If abnormal loads need to be transported by road to the site, a permit needs to be obtained from the relevant provincial government department.	▪ Ensure that the permits are applied for and obtained prior to commencement. ▪ Verify that this has been undertaken by reviewing approved permits.	▪ Once-off during the design phase ▪ Once-off during the design phase.	▪ Contractor ▪ ECO
B. CONSTRUCTION PHASE					
7.2. Increased traffic generation during the construction phase resulting in a reduction of road based level of service	Reduce the amount of road based traffic during the construction phase.	7.2.1. Well maintained vehicles should be used together with well-trained drivers during the construction phase. Vehicle maintenance and driver competency should be monitored. Proof of driver competency as well as the vehicle checks should be verified and undertaken to ensure that vehicles are roadworthy and hence, do not pose a safety risk. The Contractors must ensure that construction vehicles are roadworthy, properly serviced and maintained, and respect the vehicle safety standards implemented by the Project Owner. 7.2.2. During the construction phase, suitable parking areas should be designated for trucks and vehicles. 7.2.3. The use of public transport (buses and/or minibus taxis) to convey construction personnel to the site should be encouraged. 7.2.4. It is recommended that vehicles are not overloaded during the construction phase in order to reduce impacts on the road structures, particularly the access roads leading to the site.	▪ Carry out random checks of driver licenses and conduct random visual inspections of construction vehicles for roadworthiness. ▪ Monitor the placement of the designated parking area for trucks and vehicles via visual inspections and record and report any non-compliance. ▪ Contractor may record arrival and departure times as well as number of workers using minibuses. ▪ Perform visual inspection of vehicles during the construction phase.	▪ Random visual inspection of vehicles weekly. ▪ Once-off prior to construction and as required during the construction phase. ▪ Once a month on a randomly selected day. ▪ Random visual inspection of vehicles weekly.	▪ Contractor ▪ Project Owner and ECO ▪ Contractor ▪ Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		Random visual inspection of vehicles should be undertaken in order to monitor for overloading. The inspections should also verify if the trucks are covered with appropriate material (such as tarpaulin) if and where possible.			
7.3. Increased level of road accidents (involving pedestrians, animals, other motorists on the surrounding tarred/ gravel road network) due to increased traffic during construction.	Minimise the impact of the construction activities on the local traffic and avoid accidents with pedestrians, animals and other drivers on the surrounding tarred/ gravel roads. Reduce number of road accidents due to increased traffic during construction.	7.3.1. Well maintained vehicles should be used together with well-trained drivers during the construction phase. Vehicle maintenance and driver competency should be monitored. Proof of driver competency as well as the vehicle checks should be verified and undertaken to ensure that vehicles are roadworthy and hence, do not pose a safety risk. The Contractors must ensure that construction vehicles are roadworthy, properly serviced and maintained, and respect the vehicle safety standards implemented by the Project Owner. 7.3.2. Road mortality monitoring programme (inclusive of wildlife collisions record keeping) should be established. 7.3.3. Adhere to all speed limits applicable to all roads used. 7.3.4. Implement clear and visible signage and signals indicating movement of vehicles within and around site, especially along access roads and intersections with public and private roads.	▪ Carry out random checks of driver licenses and conduct random visual inspections of construction vehicles for roadworthiness. ▪ Appropriate monitoring should be undertaken. ▪ Ensure that speed limits are adhered to. ▪ Carry out random visual inspections to verify speed limits and general awareness of vehicle drivers. ▪ Implement clear signalisation. ▪ Carry out random inspections to verify whether proper construction signage is being implemented.	▪ Random visual inspection of vehicles weekly. ▪ Weekly ▪ Daily ▪ Random during the construction phase ▪ On-going ▪ Random during the construction phase	▪ Contractor ▪ Contractor and ECO ▪ Contractor and ECO ▪ ECO ▪ Contractor and ECO ▪ ECO
C. OPERATIONAL PHASE					
7.4. Increased level of road accidents (involving pedestrians, animals, other motorists on the surrounding tarred/	Minimise the impact of the operational activities on the local traffic and avoid accidents with pedestrians, animals and other drivers on	7.4.1. Adhere to all speed limits applicable to all roads used. 7.4.2. Implement clear and visible signage and signals indicating movement of vehicles at the intersection with the Transnet Service Road to	▪ Ensure that speed limits are adhered to. ▪ Carry out random visual inspections to verify speed limits and general awareness of vehicle drivers.	▪ Daily ▪ Random during the operational phase ▪ Ongoing ▪ Random during the	▪ Project Owner ▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
gravel road network) due to traffic on the maintenance road during the operational phase.	the surrounding tarred/ gravel roads. Reduce number of road accidents due to traffic during the operational phase.	ensure safe entry and exit.	▪ Implement clear signalisation. ▪ Carry out random inspections to verify whether proper operational signage is being implemented.	operational phase	
D. DECOMMISSIONING PHASE					
7.5. Ensure that the construction mitigation and management measures are adhered to during the decommissioning phase.					

8. STORM WATER MANAGEMENT PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. DESIGN PHASE					
8.1. Impact of the project if a detailed storm water management plan is not correctly prepared.	To limit the effect of uncontrolled storm water run-off from developed areas onto natural areas.	8.1.1. Prepare a detailed stormwater management plan outlining appropriate treatment measures to address runoff from disturbed portions of the site, such that they do not: ▪ result in concentrated flows into natural watercourses i.e. provision should be made for temporary or permanent measures that allow for attenuation, control of velocities and capturing of sediment upstream of natural water courses; ▪ result in any necessity for concrete or other lining of natural water courses to protect them from concentrated flows of the development; ▪ divert flows out of their natural flow pathways, thus depriving downstream watercourses of water.	▪ Check compliance with specified conditions. ▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during design followed by regular control ▪ During the design phase	▪ Contractor ▪ ECO
B. CONSTRUCTION PHASE					
8.2. Diversion and impedance surface water flows – changes to the hydrological regime and increased potential for erosion. Diversion and	Prevent interference with natural run-off patterns, diverting flows and increasing the velocity of surface water flows.	8.2.1. The appointed Contractor should compile a Method Statement for Stormwater Management during the construction phase. 8.2.2. Erosion and sedimentation into water bodies must be minimised through the effective stabilisation (gabions and Reno mattresses or similar) and the re-vegetation of any disturbed riverbanks.	▪ Compile a Method Statement for Stormwater Management during the construction phase. ▪ Inspect and verify if a Method Statement for Stormwater Management has been compiled by the Contractor via audits prior to the commencement of the construction	▪ Prior to the construction phase. ▪ Once-off prior to the commencement of the construction phase. ▪ Weekly or Bi-weekly ▪ Weekly or bi-weekly ▪ As needed during the	▪ Contractor ▪ ECO ▪ ECO ▪ ECO ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
increased velocity of surface water flows – reduction in permeable surfaces.		8.2.3. Place energy dissipation structures in a manner that allows the management of flows prior to being discharged into the natural environment, thus not only preventing erosion, but supporting the maintenance of natural base flows within these systems i.e. hydrological regime (water quantity and quality) is maintained. 8.2.4. Reinforce soil slopes to minimise erosion during rehabilitation (as needed, and once construction in a specific area has ceased). 8.2.5. Drainage along the sides of the roads should be designed so that it does not result in concentrated flows into watercourses. 8.2.6. Perform periodic inspections and maintenance of soil erosion measures and stormwater control structures.	phase. ▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement. ▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement. ▪ Monitor activities and record and report non-compliance. ▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement. ▪ Monitor activities and record and report non-compliance.	construction phase ▪ Weekly or bi-weekly ▪ As needed during the construction phase	▪ ECO ▪ ECO
8.3. Pollution of the surrounding environment as a result of the contamination of stormwater. Contamination could result from the spillage of chemicals, oils, fuels, sewage, solid waste, litter etc.	To prevent contaminated stormwater from entering into and adversely impacting on freshwater ecosystems and reducing the water quality. To reduce sedimentation of nearby water systems. To apply best practice principles in managing risks to storm water pollution.	8.3.1. The appointed Contractor should compile a Method Statement for Stormwater Management during the construction phase. 8.3.2. Provide secure storage for fuel, oil, chemicals and other waste materials to prevent contamination of stormwater runoff. Fuels and chemicals (i.e. any hazardous materials and dangerous goods) used during the construction phase must be stored safely on site and in bunded areas. Fuel and chemical storage containers must be inspected to ensure that any leaks are detected early. 8.3.3. All stockpiles must be protected from erosion and stored on flat areas where run-off will be minimised. Erosion and sedimentation into	▪ Compile a Method Statement for Stormwater Management during the construction phase. ▪ Inspect and verify if a Method Statement for Stormwater Management has been compiled by the Contractor via audits prior to the commencement of the construction phase. ▪ Monitor the storage and handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents. Monitor if spillages have taken place and if they are removed correctly.	▪ Prior to the construction phase. ▪ Once-off prior to the commencement of the construction phase. ▪ Weekly ▪ Daily ▪ Weekly ▪ Weekly or Bi-weekly ▪ Weekly or Bi-weekly ▪ Once-off prior to construction and as required during the construction phase.	▪ Contractor ▪ ECO ▪ ECO ▪ ECO ▪ Contractor and ECO ▪ ECO ▪ ECO ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		water bodies must be minimised through effective stabilisation. No stockpiling should take place within a watercourse. 8.3.4. Stockpiles must be located away from river channels i.e. greater than 32 m. 8.3.5. Littering and contamination of water resources during construction must be prevented by effective construction camp management. 8.3.6. Emergency plans must be in place to deal with potential spillages (especially those leading to any watercourses). 8.3.7. Erosion and sedimentation into water bodies must be minimised through the effective stabilisation (gabions and Reno mattresses or similar) and the re-vegetation of any disturbed riverbanks. 8.3.8. Ensure that the temporary site camp and ablution facilities are established at least 32 m away from the banks of the major drainage lines.	▪ Monitor the excavations and stockpiling process throughout the construction phase via visual site inspections. Record non-compliance and incidents. ▪ Monitor via site audits and record non-compliance and incidents (i.e. by implementing walk through inspections). ▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement. ▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement. ▪ Monitor the placement of the site camp via visual inspections, and record and report any non-compliance.		
		8.3.9. Ensure that there is no ad-hoc crossing of channels by vehicles during the construction phase. Access routes across the site should be strictly demarcated and selected with a view to minimise impacts on drainage lines. 8.3.10. Ensure that no waste materials or sediments are left in the surrounding drainage lines (as a result of the construction). 8.3.11. Regular inspections of stormwater infrastructure should be undertaken to ensure that it is kept clear of all debris and weeds.	▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement. ▪ Check compliance with specified conditions of the Stormwater Management Plan and Method Statement. ▪ Monitor via site audits and record non-compliance and incidents (i.e. by implementing walk through inspections).	▪ Weekly or Bi-weekly ▪ Weekly or Bi-weekly ▪ Weekly	▪ ECO ▪ ECO ▪ Contractor and ECO
C. DECOMMISSIONING PHASE					

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
8.4. Ensure that the construction mitigation and management measures are adhered to during the decommissioning phase.					

9. EROSION MANAGEMENT PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. CONSTRUCTION PHASE					
9.1. Increased wind erosion and resultant deposition of dust.	Prevent wind erosion and resultant deposition of dust on surrounding indigenous vegetation.	9.1.1. Sand, stone and cement should be stored in demarcated areas, and covered or sealed to prevent wind erosion and resultant deposition of dust on the surrounding indigenous vegetation. 9.1.2. During construction, efforts should be made to retain as much natural vegetation as possible on the site, to reduce disturbed areas and maintain plant cover, thus reducing erosion risks. 9.1.3. All stockpiles must be protected from erosion and stored on flat areas where run-off will be minimised. Erosion and sedimentation into water bodies must be minimised through effective stabilisation.	▪ Undertake regular inspections to verify that sand, stone and cement are stored and handled as instructed. ▪ Monitor activities via site inspections and record and report non-compliance. ▪ Monitor the stockpiling process throughout the construction phase via visual site inspections. Record non-compliance and incidents.	▪ Daily ▪ Daily ▪ Daily	▪ ECO and Contractor ▪ ECO and Contractor ▪ ECO
9.2. Sedimentation of the surrounding drainage lines as a result of stormwater runoff and stockpiling of excavated material during the construction phase. The excavated material could potentially be washed into the drainage lines via stormwater. This could also impact on	Reduce sedimentation as a result of erosion caused by stockpiling and stormwater runoff.	9.2.1. All material that is excavated during the construction phase must be stored appropriately on site in order to minimise impacts on the surrounding aquatic environment. 9.2.2. Exposed soil surfaces should be graded to minimise runoff and increase infiltration. 9.2.3. Where possible, sandbags (or similar) should be placed at the bases of the stockpiled material in order to prevent erosion of the material. 9.2.4. Undertake periodic inspections and maintenance of soil erosion measures and	▪ Monitor activities via site inspections and record and report non-compliance.	▪ Daily	▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
avifauna.		stormwater control structures. 9.2.5. Stockpiles must be located at least 32 m away from the drainage lines, on flat areas where run-off will be minimised. 9.2.6. During periods of strong winds and heavy rain (in line with relevant rainfall patterns), the stockpiles should be covered with appropriate material (e.g. cloth, tarpaulin etc.).			
B. OPERATIONAL PHASE					
9.3. Excessive loss of natural vegetation in the development footprint area and resulting impacts on Species of Special Concern (SSC), faunal habitat and habitat fragmentation.	Prevent loss of natural vegetation and minimise habitat fragmentation and the loss of connectivity as a result of erosion.	9.3.1. To prevent erosion, indigenous grasses that seed themselves should (where possible) be left to form a ground cover and kept short. 9.3.2. The use of silt fences, sand bags or other suitable methods must be implemented in areas that are susceptible to erosion. Other erosion control measures that can be implemented are as follows: 1) Brush packing with cleared vegetation, 2) Planting of vegetation, 3) Hydro seeding/hand sowing. All erosion control mechanisms need to be regularly maintained. 9.3.3. Conduct regular monitoring for erosion to ensure that no erosion problems are occurring at the site as a result of the roads and other infrastructure. Ensure that all erosion problems are rectified as soon as possible.	▪ ECO to advise on seed to be used. ▪ Monitor efficiency of erosion control measures. ▪ Undertake regular monitoring for erosion to ensure is reduced and rectified as soon as possible.	▪ Prior to re-vegetation. ▪ Weekly or monthly ▪ Monthly	▪ Project Owner ▪ Project Owner ▪ Project Owner
9.4. Increased wind erosion and resultant deposition of dust.	Prevent wind erosion and resultant deposition of dust on surrounding indigenous vegetation.	9.4.1. 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.	▪ Include periodic site inspections in environmental performance reporting that inspects the effectiveness and integrity of the run-off control system and specifically records occurrence or non-occurrence of any erosion on site	▪ Quarterly	▪ Project Owner

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.		
C. DECOMMISSIONING PHASE					
9.5. No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. Monitoring: Final external audit of area to confirm that area is rehabilitated to an acceptable level (once off event to be conducted by ECO).					

10. HAZARDOUS SUBSTANCES LEAKAGE OR SPILLAGE MONITORING SYSTEM

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. CONSTRUCTION PHASE					
10.1. Contamination of soil and risk of damage to vegetation and/or fauna through spillage of concrete and cement.	To control concrete and cement batching activities in order to reduce spillages and resulting contamination of soil, groundwater and the vegetation and/or fauna.	10.1.1. If any concrete mixing takes placed on site, this must be carried out in a clearly marked, designated area at the site camp on an impermeable surface (such as on boards or plastic sheeting and/or within a bunded area with an impermeable surface). 10.1.2. Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains. 10.1.3. A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted. 10.1.4. Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licenced disposal facility. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes. 10.1.5. Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site. Empty cement bags must be collected from the construction area at the end of every day. Sand and aggregates containing cement must be kept damp to prevent the generation of dust. 10.1.6. Any excess sand, stone and cement must be removed from site at the completion of the construction period and disposed at a licenced waste disposal facility. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes.	▪ Monitor the handling and storage of sand, stone and cement as instructed. ▪ Monitor the handling and storage of sand, stone and cement as instructed. ▪ Monitor the handling and storage of sand, stone and cement as instructed. ▪ Monitor the handling and storage of sand, stone and cement as instructed. ▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. ▪ Monitor the handling and storage of sand, stone and cement as instructed. ▪ Monitor the handling and storage of sand, stone and cement as instructed. ▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	▪ Daily ▪ Daily ▪ Daily ▪ Daily ▪ Monthly ▪ Daily ▪ Daily ▪ Monthly	▪ Project Owner, Contractor and ECO ▪ Project Owner, Contractor and ECO ▪ Project Owner, Contractor and ECO ▪ Project Owner, Contractor and ECO ▪ ECO ▪ Project Owner, Contractor and ECO ▪ Project Owner, Contractor and ECO ▪ ECO
10.2. Contamination of soil and	To control and eliminate fuel	10.2.1. Ensure that adequate containment structures are	▪ Monitor the storage and	▪ Weekly	▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
risk of damage to vegetation and/or fauna through spillage of fuels and oils.	and oil spillages which may result in soil contamination and damage to vegetation and/or fauna.	provided for the temporary storage of liquid dangerous goods and hazardous materials on site (such as chemicals, oil, fuel, hydraulic fluids, lubricating oils etc.). Appropriate bund areas must be provided for the storage of these materials at the site camp. Bund areas should contain an impervious surface in order to prevent spillages from entering the ground. Bund areas should have a capacity of 110 % of the volume of the largest tank in the bund (tanks include storage of fuel/diesel). It must be ensured that all hazardous storage containers and storage areas comply with the relevant South African Bureau of Standards (SABS) standards to prevent leakage. 10.2.2. Monitor and inspect construction equipment and vehicles to ensure that no fuel spillage takes place. Ensure that drip trays are provided for construction equipment and vehicles as required. 10.2.3. Contractor to compile a Method Statement for refuelling activities under normal and emergency situations. If on-site servicing and refuelling is required in emergency situations, a designated area must be created at the construction site camp for this purpose (i.e. refuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into topsoil). Drip trays or similar impervious materials must be used during these procedures. All vehicles must be regularly inspected for leaks. 10.2.4. Spilled fuel, oil or grease must be retrieved and the contaminated soil removed, cleaned and replaced or treated accordingly. 10.2.5. Contaminated soil to be collected by the Contractor (under observation of the ECO) and disposed of at a	handling of dangerous goods and hazardous materials on site via site audits and record non-compliance and incidents. ▪ Monitor the construction equipment and vehicles and monitor the occurrence of spills and the management process thereof. ▪ Record all spills and lessons learnt. ▪ Verify if a Method Statement is compiled by reviewing approved and signed off reports. ▪ Monitor the refuelling/ servicing process and record the occurrence of any spillages. ▪ Monitor the handling and storage of fuels and oils via site audits and monitor if spillages have taken place and if so, are removed correctly. Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. ▪ Monitor the correct removal of contaminated soil. Monitor waste disposal slips and	▪ Daily ▪ During spill events ▪ Once-off prior to commencement of construction. ▪ During emergency refuelling and servicing activities. ▪ Daily (or during spills) ▪ Daily (or during spills)	▪ Contractor and ECO ▪ ECO ▪ ECO ▪ Contractor and ECO ▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		registered waste facility designated for this purpose. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes.	waybills via site audits and record non-compliance and incidents.		
		10.2.6. A Spill Response Method Statement must be compiled by the Contractor for the construction phase in order to manage potential spill events. 10.2.7. The Contractor must ensure that adequate spill containment and clean-up equipment are provided on site for use during spill events. 10.2.8. Portable bioremediation kit (to remedy chemical spills) is to be held on site and used as required. 10.2.9. In case of a spillage of hazardous chemicals where contamination of soil occurs, depending on the degree and level of contamination, excavation and removal to a hazardous waste disposal facility could be necessary. If the spillage is widespread and the soil is considered to be significantly contaminated, a specialist will need to be immediately appointed to address the spillage. This will usually entail the collection of samples of the contaminated soil followed by analysis in terms of the 2014 National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (i.e. GN 331). If the soil is determined to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant, including notifying the Minister of Environmental Affairs of the significant contamination. 10.2.10. The Contractor must record and document all significant spill events.	▪ Compile a Spill Response Method Statement. ▪ Audit signed and approved Spill Response Method Statement. ▪ Monitor via site audits and record incidents and non-compliance. ▪ Ensure that a well-maintained portable bioremediation kit is available on site and that construction personnel and contractors are aware of its location and instructions ▪ Ensure that a suitably qualified specialist is appointed to collect and analyse the contaminated soil samples in terms of the 2014 Norms and Standards (i.e. GN 331) in order to determine if the soil is significantly contaminated or not. ▪ If the contaminated soil is considered to be significantly contaminated, then compliance with Part 8 of the NEMWA should be achieved by the Applicant.	▪ Once-off (and thereafter updated as required during the construction phase). ▪ Once-off (and thereafter as required during the construction phase). ▪ Daily/Weekly ▪ Daily ▪ During spill events ▪ During spill events	▪ Contractor and Project Owner ▪ ECO ▪ ECO and Contractor ▪ Contractor and ECO ▪ Project Owner ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			▪ Monitor documentation and records of significant spill events via audits and record non-compliance and incidents.		
B. DECOMMISSIONING PHASE					
10.3. No specific impacts are associated with the decommissioning phase other than those from the operational phase that will still be relevant for the duration of the decommissioning phase due to on-going occupation of the area.					

11. ENVIRONMENTAL AWARENESS AND FIRE MANAGEMENT PLAN

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. DESIGN PHASE					
11.1. Potential impacts resulting from the lack of overall compliance with the conditions of the EA (issued by the DEA).	Ensure compliance with all environmental conditions of approval (issued by DEA as part of the EA).	11.1.1. Audit the implementation of the EMPr requirements. 11.1.2. Establish clear and transparent reporting of the activities undertaken with regard to all recommendations included in the EMPr.	▪ Audit report on compliance with actions and monitoring requirements. ▪ Audit report on compliance with actions and monitoring requirements.	▪ Weekly ▪ Based on EA conditions	▪ Project Owner ▪ Project Owner and ECO
B. CONSTRUCTION PHASE					
11.2. Potential risk of fire due to construction activities or behaviour of staff on site during the construction phase.	Prevent fire on site resulting from workers smoking or starting fires (i.e. cooking, heating purposes).	11.2.1. Designate smoking areas, as well as areas for cooking, where the fire hazard could be regarded as insignificant. 11.2.2. Educate workers on the dangers of open and/or unattended fires.	▪ Ad-hoc checks to ensure workers are smoking or cooking in designated areas only. ▪ Ensure fire safety requirements are well understood and respected by construction personnel. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Daily ▪ Ongoing. ▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ ECO and Contractor ▪ ECO and Contractor ▪ Contractor/ ECO ▪ ECO
		11.2.3. Open fires must be prohibited. No informal fires should be permitted in or near the construction areas. Appropriate fire safety training should also be provided to staff that are to be on the site for the duration of the construction phase. 11.2.4. Ensure that cooking takes place in a designated area shown on the site map. Ensure that no firewood or kindling may be gathered from the site or surrounds. 11.2.5. Fire-fighting equipment must be made	▪ Ensure fire safety requirements are well understood and respected by construction personnel. Provide basic fire safety training. ▪ Check compliance with specified conditions using a report card, and allocate fines when necessary. ▪ Ensure fire safety requirements are well understood and respected by workers. ▪ Assurance of functionality of fire extinguishers via inspections and	▪ On-going ▪ On-going ▪ On-going ▪ Bi-annually	▪ ECO and Contractor ▪ ECO and Contractors ▪ ECO and Contractor ▪ Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		available at appropriate locations on the construction site.	certification by an accredited fire service company.		
11.3. Inappropriate behaviour of civil contractors and sub-contractors during the construction phase.	Prevent unnecessary impacts on the surrounding environment by ensuring that contractors are aware of the requirements of the EMPr. Ensure that contractors and sub-contractors do not induce impacts on the surrounding environment as a result of unplanned pollution on site. Ensure that actions by on-site contractors and sub-contractors and workers are properly managed in order to minimise impacts to surrounding environment.	11.3.1. Ensure that the EMPr and the EA (should it be granted by the DEA), are included in all tender documentation and contractors and sub-contractors contracts. 11.3.2. Contractors and sub-contractors must use the ablution facilities situated in a designated area within the site; and no bathing/washing should be permitted outside the designated area. 11.3.3. All litter will be deposited in a clearly labelled, closed, animal-proof disposal bin in the construction area; particular attention needs to be paid to food waste. 11.3.4. No person other than a qualified specialist or personnel authorised by the Project Owner, will disturb or remove plants outside the demarcated construction area. 11.3.5. No person other than a qualified specialist or personnel authorised by the Project Owner, will disturb animals on the site. 11.3.6. Educate workers on site about suitable behaviour on site and initiate environmental awareness. Staff must be informed that no trapping, snaring or feeding of any animal will be allowed.	▪ Check compliance with specified conditions using a report card, and allocate fines when necessary. ▪ Check compliance with specified conditions using a report card, and allocate fines when necessary. ▪ Check compliance with specified conditions using a report card, and allocate fines when necessary. ▪ Check compliance with specified conditions using a report card, and allocate fines when necessary. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ On-going ▪ On-going ▪ On-going ▪ On-going ▪ On-going ▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ ECO and Contractors ▪ ECO and Contractors ▪ ECO and Contractors ▪ ECO and Contractors ▪ ECO and Contractors ▪ Contractor/ ECO ▪ ECO
11.4. Inappropriate planning of site camp establishment.	Ensure that environmental issues are taken into consideration in the planning for site establishment.	11.4.1. All construction activities, materials, equipment and personnel must be restricted to the actual construction area specified (as required to undertake the construction work). The construction area must be demarcated by the Contractor.	▪ Monitor compliance and record non-compliance and incidents. ▪ Monitor compliance and record non-compliance and incidents. ▪ Monitor compliance and record non-compliance and incidents.	▪ Before construction ▪ Before construction ▪ Before construction	▪ ECO ▪ ECO ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		11.4.2. The Contractor should install and maintain Construction Site Information Boards in the position, quantity, design and dimensions specified by the Project Owner. 11.4.3. General building materials should be stored in appropriate designated areas on site such that there will be no runoff from these areas towards sensitive systems. The site camp must be removed after construction.			
11.5. Increased animal road mortality.	Reduction in animal mortality.	11.5.1. The construction staff should be made aware of the presence of fauna and within the proposed project area. The construction personnel and staff must also be made aware of the general speed limits on site and must be alert at all times for potential crossings, and should be trained on how to react in these situations. 11.5.2. To ensure that animals are not attracted to the site (and potentially resulting in increased road mortality), the waste collection bins and skips should be covered with suitable material, where appropriate, and the site camp must be kept clean on a daily basis. 11.5.3. Establish a monitoring programme to record the number of faunal road mortalities and collisions. If it is established that the number of collisions and faunal fatalities increase within an area, particularly with regards to smaller species (reptiles), then measures such as exclusion fences within these areas only should be considered.	▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers. ▪ Monitor the activities via visual inspections, and record and report any non-compliance. ▪ Appropriate monitoring and recording should be undertaken. ▪ Exclusion fences should be considered, if needed to direct animals to safe road crossings.	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly ▪ Daily ▪ Weekly ▪ As required	▪ Contractor/ ECO ▪ ECO ▪ Contractor and ECO ▪ ECO ▪ ECO and Contractor
11.6. Increased energy	Reduce energy consumption	11.6.1. Encourage the use of energy saving equipment	▪ Contractor to monitor energy usage via	▪ Monthly	▪ Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
consumption during the construction phase.	where possible.	at the site camp site (such as low voltage lights and low pressure taps) and promote recycling. Construction personnel must be made aware of energy conservation practices as part of the Environmental Awareness Training programme.	▪ audits. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ Contractor/ ECO ▪ ECO
11.7. Impact on the regional water balance as a result of increased water usage.	Reduce water usage during the construction phase.	11.7.1. Water conservation should be practiced as follows: ▪ Cleaning methods utilised for cleaning vehicles, floors, etc. should aim to minimise water use (e.g. sweep before wash-down). ▪ Ensure that regular audits of water systems are conducted to identify possible water leakages. 11.7.2. Avoid the use of potable water for dust suppression during the construction phase and consider the use of alternative approved sources, where possible. 11.7.3. Make construction personnel aware of the importance of limiting water wastage, as well as reducing water use.	▪ Monitor via site audits and record non-compliance and incidents. ▪ Carry out Environmental Awareness Training with a discussion on water usage and conservation. ▪ Conduct audits of the signed attendance registers.	▪ Monthly ▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ ECO ▪ Contractor/ ECO ▪ ECO
C. DECOMMISSIONING PHASE					
11.8. Ensure that the construction mitigation and management measures are adhered to during the decommissioning phase.					

12. SPECIFIC PROJECT RELATED ENVIRONMENTAL IMPACTS

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
A. DESIGN PHASE					
A.1. TERRESTRIAL ECOLOGY IMPACTS					
12.1. Potential impact on terrestrial ecology as a result of the proposed infrastructure.	To reduce the impact on terrestrial ecology as a result of vegetation clearing for project infrastructure.	12.1.1. Ensure that a Rehabilitation Plan is compiled that identifies tasks and procedures to be instituted at specific sites where transformation of habitat has arisen. 12.1.2. Detailed design and incorporation of habitat and features into the routing of the proposed transmission line.	▪ Ensure that this is taken into consideration during the planning and design phase, and that a suitable specialist is appointed to compile a Rehabilitation Plan. Review signed minutes of meetings or signed reports. ▪ Ensure that this is taken into consideration during the planning and design phase.	▪ Once-off during design cycle and before construction commences.	▪ Project Owner and Appointed Specialist ▪ Project Owner/ECO
12.2. Potential impact on vegetation and fauna Species of Conservation Concern (SCC).	To reduce potential impact on SCC.	12.2.1. Fine-scale habitat and SCC population mapping within Kap Vley section to inform the final routing and pylon placement to ensure that impact on these features can be minimised through avoidance at the design stage. 12.2.2. No development of roads or pylons within No-Go areas for fauna and flora. Avoidance of identified areas of high faunal and floral importance at the design stage. 12.2.3. Preconstruction walk-through of the development footprint to further refine the layout and reduce impacts on SCC through micro-siting of the pylons and access roads.	▪ Ensure that this is taken into consideration during the planning and design phase, and that an Ecologist is appointed to undertake the mapping for the final routing and pylon placement. ▪ Ensure that this is taken into consideration during the planning and design phase. ▪ Appoint an Ecologist to do a preconstruction walk-through.	▪ Once-off during design cycle and before construction commences.	▪ Project Owner and appointed Ecologist ▪ Project Owner/ECO ▪ Project Owner and appointed Ecologist
A.2. IMPACT ON BIRDS					
12.3. Impact on birds.	To reduce disturbance on birds	12.3.1. Ensure that the proposed power line design includes the	▪ Ensure that this is taken into	▪ Once-off before	▪ Ornithologist and

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
	and collisions with the earthwire of the proposed transmission line.	best available anti -bird collision line marking devices in order to make the cables more visible to birds, as recommended by the Avifauna Specialist. 12.3.2. Use only a bird-friendly pylon structure. 12.3.3. The proposed tower/pylon structure has not been decided in detail. It will however be either concrete or steel monopole. It is critically important that sufficient clearance be allowed between phase-phase and phase-earth hardware on the structure. For large eagles these clearances should be a minimum of 1.8 m.	consideration during the planning and design phase. ▪ Ensure that the design phase takes cognizance of the Specialists' recommendations.	construction commences. ▪ Once-off before construction commences.	Project Owner ▪ Ornithologist and Project Owner
A.3. AQUATIC ECOLOGY (FRESHWATER) IMPACTS					
12.4. Impact on surface water resources	To reduce the impact of the proposed development on the surrounding drainage lines and freshwater features	12.4.1. Ensure that the sensitivity maps guide the design and layout of the proposed development. In terms of the applicable legislation, a 32 m zone of regulation in terms of the NEMA is stipulated around all freshwater features; and these should be respected where possible and as much as feasible. 12.4.2. Avoid placing pylons in identified sensitive dry and ephemeral watercourses, drainage lines and associated buffers. (The powerline pylons have a span distance of 150 m, and must be placed to avoid the non-perennial Buffels River and its associated ephemeral wetlands). 12.4.3. Routing should follow existing linear infrastructure and disturbance corridors (e.g. roads) where possible. (Alternative 1 follows existing linear infrastructure and disturbance corridors, and is preferred). 12.4.4. In terms of Section 21 (c) and (i) of the National Water Act (Act 36 of 1998) (NWA), the relevant authorisation must be obtained from the Department of Water and Sanitation (DWS) for any and all activities that take place within the	▪ Ensure that the 32 m zone of regulation is taken into consideration in the final layout of the proposed electrical infrastructure. Ensure that this is taken into account, where possible and as feasible (as recommended in the Dry and Ephemeral Specialist Study), and that the recommended mitigation measures are implemented as required. ▪ Ensure that the requirements of the DWS are considered during the planning and design phase and prior to construction. Ensure that the application for a Water Use Licence (WULA) is submitted and approved prior to the	▪ Once-off prior to the commencement of construction. ▪ Once-off prior to the commencement of construction, in consultation with the DWS (based on the requirements for a WULA). ▪ Once-off prior to the commencement of construction, in consultation with the DWS (based on the requirements for a WULA). ▪ Once-off prior to the commencement of construction, in	▪ Project Owner and ECO ▪ Project Owner and ECO ▪ Contractors and ECO ▪ Project Owner and ECO ▪ Project Owner and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		watercourses. It is recommended that the relevant DWS officials be consulted in this regard to ensure that all legislative requirements are complied with. Overall, the relevant authorisations required for must be obtained in terms of Section 21 (c) and (i) of the NWA, and in terms of Regulation 509 of 2016 as it pertains to the NWA. 12.4.5. Maintenance of a high level of housekeeping on route of the proposed transmission line during the construction phase.	commencement of construction (if required), based on the requirements of the DWS. ▪ Ensure that the recommendations in the Dry and Ephemeral Watercourse study are implemented regarding the avoidance of placing the pylons in the dry and ephemeral watercourses (particularly the Buffels River). ▪ The recommendation regarding the routing along existing linear infrastructure and disturbance corridors must be adhered to. ▪ Inspection of drainage features immediately outside of the footprint of the proposed transmission line and undertake removal of solid waste and litter on a regular basis.	consultation with the DWS (based on the requirements for a WULA). ▪ Ongoing	
A.4. VISUAL IMPACTS					
12.5. Potential visual intrusion of construction activities on existing views of sensitive visual receptors.	Reduce visual intrusion of construction activities project wide.	12.5.1. Ensure plans are in place to minimise fire and dust generation. 12.5.2. Ensure plans are in place to rehabilitate temporary cleared areas as soon as possible. 12.5.3. Ensure that the laydown area is not located in an area that is highly sensitive for visual receptors, 12.5.4. Ensure plans are in place to control and minimise erosion	▪ Ensure that this is taken into consideration during the planning and design phase by reviewing signed minutes of meetings or signed reports.	▪ Once-off during design cycle and before construction commences.	▪ Project Owner ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		risks. 12.5.5. Structure style (e.g. power line pylons/towers) should be the same as for other similar developments along the same route where possible (taking into consideration other specialist recommendations and specifications).			
A.5. HERITAGE IMPACTS (PALAEONTOLOGY, ARCHAEOLOGY AND CULTURAL LANDSCAPE)					
12.6. Impacts on archaeological remains and palaeontological material.	Achieve a layout that minimizes the potential impacts to archaeological remains and palaeontological material.	12.6.1. Ensure that the project layout avoids significant palaeontological and archaeological sites that were identified in the Heritage Impact Assessment (Appendix E6 of the BA Report). These sites should be identified on project maps and regarded as no-go zones with buffers of at least 30 m around all associated features.	▪ Take cognizance of the archaeological remains and palaeontological material reported in the HIA when designing layout and routing. ▪ Ensure and verify that the significant palaeontological and archaeological sites identified in the Heritage Impact Assessment (Appendix E6 of the BA Report) are included on project maps and regarded as no-go zones with buffers during the planning and design phase. Review the site layout plan, and signed minutes of meetings or signed reports.	▪ Once-off ▪ Once-off	▪ Project Owner ▪ ECO
B. CONSTRUCTION PHASE					
B.1. TERRESTRIAL ECOLOGICAL IMPACTS (FAUNA AND FLORA)					
12.7. Impact on plant SCC through habitat loss as a result of construction activities.	Avoid and/or reduce impacts on plant SCC.	12.7.1. No development roads or pylons within No-Go areas. 12.7.2. Preconstruction walk-through of the development footprint to further refine the layout and reduce impacts on SCC through micro-siting of the pylons and access roads. 12.7.3. Demarcate all areas to be cleared with construction tape or	▪ Ensure that this is taken into consideration during the construction phase. ▪ Appoint an Ecologist to undertake the preconstruction	▪ In the construction phase before construction activities commence. ▪ Before construction	▪ Contractor and ECO ▪ Appointed Ecologist ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		other appropriate and effective means. However caution should be exercised to avoid using material that might entangle fauna.	walk-through. ▪ Carry out visual inspections and site audits to verify if construction activities are restricted to demarcated areas and record and report any non-compliance.	activities commence. ▪ Weekly	
12.8. Impacts on fauna through habitat loss as a result of construction activities.	Avoid or reduce impacts on fauna.	12.8.1. Ensure that lay-down and other temporary infrastructure is within medium- or low- sensitivity areas, preferably previously transformed areas if possible. 12.8.2. Search and rescue for reptiles and other vulnerable species during construction, before areas are cleared. 12.8.3. During construction any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person. 12.8.4. Environmental induction for all staff and contractors on-site. 12.8.5. 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 snakes and tortoises and rabbits or hares. Speed limits should apply within the facility as well as on the public gravel access roads to the site. 12.8.6. No holes or trenches should be left open for extended periods as fauna will fall in and be trapped. 12.8.7. If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which should be directed downwards.	▪ Ensure that this is taken into consideration during the construction phase. ▪ Appoint an Ecologist to undertake search and rescue before areas are cleared. ▪ Ensure the removal of fauna is taking place as indicated. Carry out visual inspections and site audits to monitor this and record and report non-compliance. ▪ Ensure all staff and contractors receive environmental induction. ▪ Carry out visual inspections and site audits to monitor this and record and report non-compliance. ▪ Carry out visual inspections and site audits to monitor this and record and report non-compliance. ▪ Carry out visual inspections and site audits to monitor this and record and report non-	▪ Once-off before construction activities commence. ▪ Before areas are cleared for construction. ▪ On-going ▪ When staff are appointed before commencing with construction activities. ▪ Ongoing ▪ Ongoing ▪ Monthly	▪ Contractor and ECO ▪ Appointed Ecologist ▪ ECO or suitably qualified person. ▪ ECO ▪ Contractor and ECO ▪ Contractor and ECO ▪ Contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			compliance.		
B.2. BIRD IMPACTS					
12.9. Disturbance of birds and displacement effects.	To reduce disturbance of birds, in particular breeding birds.	12.9.1. A site-specific avifaunal walk-through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to construction, so as to ensure that no sensitive bird species have started breeding on or near site. 12.9.2. Buffer nest sites. 12.9.3. Reduce disturbance by adhering to OEMP; on-site manager / ECO to be trained to ID priority species and signs of breeding; monitor raptor nest breeding success and conduct post-construction monitoring.	▪ If any such sites are found case specific mitigation measures will need to be designed. ▪ Ensure that on-site manager/ECO receive training to ID priority species and signs of breeding.	▪ Once-off prior to construction. ▪ Once-off prior to construction. .	▪ Ornithologist ▪ Ornithologist
12.10. Bird collision with transmission line.	To reduce the risk of bird collisions.	12.10.1. New powerline to be buried where possible. 12.10.2. The transmission line should be fitted with the best available (at the time of construction) anti bird collision line marking devices in order to make the overhead cables more visible to birds. More specifically: • Devices should be fitted on the entire length of the power line as collision risk is high all along the alignment for nomadic species such as Ludwig's Bustard. • Devices should be fitted on the earth wire/s. • On each span, the full span should be fitted with marking devices (i.e. not only the middle 60% as done previously by Eskom). Research has shown that collisions occur even close to pylons (Shaw, 2013). • Light and dark colour devices should be alternated so as to provide contrast against both dark and light backgrounds. • These devices should be fitted as soon as the earth wires are strung as collision risk begins	▪ Verify that this is undertaken by reviewing the signed approved designs.	▪ Once-off after construction and erection of powerlines.	▪ Project Owner and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		immediately, not only once the line is commissioned and live. • The power line owner will be responsible for ensuring that the marking devices remain in place and effective on the power line for its' full lifespan. Any device failures must be rectified immediately by replacement with new devices.			
12.11. Electrocution of birds on transmission line.	Prevent any electrocutions of avifauna during construction of the proposed transmission line.	12.11.1. The proposed tower/pylon structure has not been decided in detail. It will however be either concrete or steel monopole. It is critically important that sufficient clearance be allowed between phase-phase and phase-earth hardware on the structure. For large eagles these clearances should be a minimum of 1.8 m.	▪ Ensure that this is taken into consideration during the planning and design phase.	▪ Once-off before construction.	▪ Project Owner, ECO and Contractor
B.3. BAT IMPACTS					
12.12. Roost destruction and bat mortality as a result of removal of buildings, trees or rocky outcrops (bat roosts)	Avoid the destruction of roosts and bat mortality as a result of construction activities.	12.12.1. Develop and Implement the Construction Phase EMP. All contractors are to adhere to the CEMP and should apply good environmental practice during construction. 12.12.2. The grid connection infrastructure must be designed and constructed in such a way as to avoid the destruction of potential roosts, particularly trees, rocky crevices (if blasting is required) and buildings. 12.12.3. No construction activities with the potential to physically affect any bat roosts will be permitted without the express permission of a suitably qualified bat specialist following appropriate investigation and mitigation. 12.12.4. It is recommended that a bat specialist surveys the locations of pylons, for the presence of occupied roosts before any construction activities commence and once the preliminary design and layout of the site is complete. 12.12.5. If occupied roosts are confirmed these should be buffered based on best practice guidelines at the time.	▪ Oversee activities to ensure that the Construction EMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. ▪ Ensure that the construction area and footprint is kept to a minimum. Carry out regular site inspections to verify the limits of the construction area to ensure unnecessary disturbance is avoided. ▪ Appoint a bat specialist to do a preconstruction walk-through. ▪ Ensure that bat roosts are avoided and buffered by doing	▪ On a daily basis ▪ Weekly ▪ Once-off prior to the completion of construction. ▪ Weekly	▪ ECO ▪ ECO and Contractor ▪ Bat specialist ▪ ECO and Contactor ▪ Manager or Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			visual inspections and site audits to monitor compliance.		
B.4. AQUATIC ECOLOGY (FRESHWATER) IMPACTS					
12.13. Impact on surface water resources.	To reduce the impact of the proposed development on the surrounding surface water features and rivers.	12.13.1. Use existing Buffels River crossing for vehicles, including stringing vehicles. 12.13.2. Avoid clearance of vegetation for the powerline servitude, minimise clearance of vegetation to the pylon foundations. 12.13.3. Phased clearance of the area in order to reduce the amount and duration of bare soil exposure. 12.13.4. Permit only essential construction personnel within 32m of the freshwater habitat, if absolutely necessary that they enter the regulatory zone. 12.13.5. Limit the footprint area of the construction activities to what is only essential in order to minimise environmental damage. 12.13.6. Implement effective waste management in order to prevent construction related waste from entering the freshwater environments. 12.13.7. Rehabilitate all wetland and riparian habitat areas affected by the proposed electrical infrastructure to ensure that the ecology of these areas is re-instated during all phases. 12.13.8. As far as possible, all rehabilitation activities should occur in the low flow season, during the drier summer months. 12.13.9. As much vegetation growth as possible should be promoted within the proposed electrical infrastructure 12.13.10. Commence with restoration of disturbed, cleared land as soon as possible e.g. as soon as non-permanent construction gear and infrastructure are removed). 12.13.11. Implement net barriers, active rehabilitation and other erosion control measures as needed, especially for pylons placed on steeper slopes. 12.13.12. Riparian vegetation cover should be monitored to ensure	▪ Carry out visual inspections and site audits to verify if these management actions are undertaken, and record and report any non-compliance. ▪ Ensure rehabilitation specialist is appointed to implement and monitor rehabilitation success.	▪ Weekly ▪ Ongoing through-out construction.	▪ ECO ▪ Project Owner ▪ Rehabilitation specialist

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		that sufficient vegetation is present to bind the bankside soils and prevent bankside erosion and incision. 12.13.13. It is recommended that a detailed rehabilitation plan be developed by a suitably qualified ecologist in order to address specific rehabilitation requirements.			
B.5. VISUAL IMPACTS					
12.14. Potential visual intrusion of construction activities on existing views of sensitive visual receptors.	Prevent unnecessary visual clutter and focusing attention of surrounding visual receptors on the proposed development.	12.14.1. Parking areas should be demarcated and strictly controlled so that vehicles are limited to specific areas only. 12.14.2. Where possible construction camps and laydown areas should be located (where sensitive visual receptors are least likely to be affected): • In low visibility areas (e.g. avoid ridgelines and open plains); • Previously disturbed areas (e.g. clearings created by farmers for other purposes which are no longer being used); and/or • Areas near derelict farmsteads (taking into consideration the findings of the Heritage Impact Assessment as well as other assessments that may be relevant), particularly where existing trees can be used to screen these areas from views. 12.14.3. Night time construction should be avoided where possible (however some construction work on electrical components may need to occur after dark). 12.14.4. Night lighting of the construction sites should be minimised within requirements of safety and efficiency. 12.14.5. Maintain good housekeeping on site to avoid litter and minimize waste. 12.14.6. Monitor construction sites for strict adherence to demarcated boundaries and minimise areas of vegetation,	▪ Carry out visual inspections to ensure that good housekeeping are maintained and record and report any non-compliance. ▪ ▪ Carry out visual inspections to ensure the construction parking area is demarcated clearly, and record and report any non-compliance. ▪ Carry out visual inspections to ensure strict control over the parking of construction vehicles and access routes in order to restrict activities to within demarcated areas. ▪ Ensure that this is taken into consideration for the siting of the proposed construction site camp and laydown area. Carry out visual inspections to ensure the construction camp and laydown area are demarcated clearly, and record and report any non-compliance. ▪ Carry out visual inspections to	▪ Weekly ▪ Weekly ▪ Weekly ▪ Weekly ▪ Weekly ▪ Weekly or bi-weekly ▪ Daily ▪ Daily ▪ Daily ▪ Daily ▪ Daily ▪ Daily and as complaints arise. ▪ Daily ▪ Daily ▪ Daily	▪ ECO ▪ ECO ▪ ECO ▪ ECO ▪ ECO ▪ ECO ▪ Contractor and ECO ▪ Construction Manager and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		ground and surface disturbance. Existing clearings should be used where possible and where required. 12.14.7. Monitor that existing roads will be used for access as far as possible and that construction of new access roads is minimised. 12.14.8. Monitor that topsoil from the site is stripped, stockpiled, and stabilised before excavating earth for the proposed construction. 12.14.9. Monitor that vegetation material from vegetation removal is mulched and spread over fresh soil disturbances to aid in the rehabilitation process. 12.14.10. Monitor adherence to lighting plan. 12.14.11. Monitor adherence to rehabilitation plan (i.e. where cleared areas are rehabilitated as soon as possible). 12.14.12. Monitor adherence to erosion control plan. 12.14.13. Monitor adherence to dust and fire control plans.	ensure strict control over the boundary of the site camp and laydown area in order to restrict activities to within demarcated areas. ▪ Construction operation times to be monitored and managed (as well as included in the tender contract). ▪ Complaints about night lights should be investigated and documented in a register. ▪ Carry out site visits and inspections of the construction sites and ensure good housekeeping is maintained. Record and report any non-compliance. ▪ Carry out site visits and record and report any non-compliance. ▪ Carry out site visits and inspections of the access routes. Record and report any non-compliance. ▪ Carry out site visits and inspections of the topsoil management process. Record and report any non-compliance. ▪ Carry out site visits and inspections of the re-vegetation		

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
			process. Record and report any non-compliance. ▪ Complaints about night lights should be investigated and documented in a register. Investigate any complaints about night lights and document it in a register. ▪ Visit sites requiring rehabilitation. ▪ Carry out site visits and record and report any non-compliance. ▪ Carry out site visits and record and report any non-compliance.		
B.6. HERITAGE IMPACTS (PALAEONTOLOGY, ARCHAEOLOGY AND CULTURAL LANDSCAPE) (These are direct and cumulative impacts)					
12.15. Destruction of archaeological remains or graves as a result of the construction of the proposed transmission line. Direct impacts to archaeological resources may also occur when construction vehicles move through the area and when foundation	Minimise the chances of significant archaeological sites being disturbed. Minimise the chances of significant palaeontological material being disturbed. Minimise the chances of impacts to other heritage resources located outside of the proposed route of the electrical grid infrastructure.	12.15.1. The Contractor and ECO must be informed of the possibility of any heritage material (i.e. ensure that all personnel are aware of the potential of encountering graves and what to do if this occurs (i.e. to report any suspicious stone features prior to disturbance)). 12.15.2. Ensure that a suitably qualified archaeologist is appointed to carry out a pre-construction survey of the sections of the final alignment that were not surveyed in order to locate any sites that need to be avoided or mitigated. Note that this requirement pertains to un-surveyed parts of the assessed routes as well as to any alterations to the routing made after completion of the Heritage Impact Assessment. 12.15.3. The probability of uncovering graves during construction anywhere in the surrounding landscape is extremely unlikely. If any of the graves or potential graves found on	▪ Carry out Environmental Awareness Training to ensure that the Contractors are informed of the possible type of heritage features that may be encountered during the construction phase. ▪ Appoint a suitably qualified archaeologist to conduct a pre-construction survey. ▪ Appoint a professional archaeologist to conduct a test excavation to determine if the sites are graves. Conduct an audit to verify that the	▪ Once-off training before construction commences. ▪ Once-off, 6 months prior to start of construction. ▪ As potential graves are encountered ▪ Once-off, prior to start of construction. ▪ Once-off, prior to start of construction. ▪ Once-off, prior to start of construction and weekly during	▪ Contractor/ECO ▪ Project Owner, ECO and Archaeologist ▪ Project Owner ▪ ECO ▪ ECO and Archaeologist ▪ ECO ▪ ECO ▪ Contractor and ECO ▪ Project Owner ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
excavations are made. Direct impacts to palaeontological material.		site cannot be avoided then an archaeologist should be contracted to conduct a test excavation to determine the status of the feature. If it is determined to be a grave, then exhumation would need to occur (if necessary) with the permission of SAHRA (and in accordance with any requirements that SAHRA might impose at the time). Record significant sites within the project footprint that cannot be avoided. 12.15.4. Avoid and protect all identified archaeological and palaeontological sites if possible. Ensure that all sensitive areas are cordoned off and protected prior to the start of construction with the buffers as stated in the Heritage Impact Assessment. 12.15.5. The no-go sites should be examined periodically by the ECO during the construction phase to ensure that they are being avoided. 12.15.6. If any archaeological or palaeontological material is encountered during any phase of the project, work in the immediate area should be halted, and the find should be protected *in situ* and reported to an appropriate specialist and/or to SAHRA so that a decision can be made as to how to proceed (i.e. it may require inspection by an archaeologist or palaeontologist). Such heritage is the property of the state and may require excavation and curation in an approved institution. Sufficient time should be allowed to remove/collect such material. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit, must be alerted immediately. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required. 12.15.7. Ensure that no activity takes place outside of the authorized	necessary permits are obtained by the archaeologist for the test excavation, if required. ▪ Ensure that this is taken into consideration by reviewing signed minutes of meetings or signed reports. ▪ Monitor and verify if any significant sites are found within the project footprint that cannot be avoided, subsequent to the pre-construction survey. Ensure that this is taken into consideration in the site plan. ▪ Identify and cordon off sites with appropriate barriers. Carry out visual inspections and site visits to ensure strict control over the demarcation of no-go areas. Record and report any non-compliance. ▪ Carry out visual inspections and site visits to ensure strict control over the demarcation of no-go areas. Record and report any non-compliance. ▪ Monitor excavations and construction activities for archaeological materials via visual inspections and report the finds accordingly.	construction. ▪ Weekly ▪ Daily or during excavations. ▪ As required/necessary during the construction phase. ▪ Weekly	

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		construction footprint (and construction vehicles should remain within the construction corridor).	▪ Contact the heritage authorities and the identified archaeologist if any heritage features are uncovered. ▪ Carry out visual inspections to ensure strict control over the behaviour of construction staff in order to restrict activities to within demarcated areas.		
12.16. Alteration of the cultural landscape as a result of the construction of the proposed transmission line electrical infrastructure. The cultural landscape will be impacted through the presence of incompatible structures (i.e. the proposed power line and pylons) and the construction vehicles in the rural landscape.	Minimise the chances of the cultural landscape being disturbed.	12.16.1. Ensure use of existing roads as far as possible. 12.16.2. Minimise overall footprint. 12.16.3. Minimise fencing in communal lands. 12.16.4. Minimise landscape scarring from cut and fill operations.	▪ Ensure that this is taken into consideration by reviewing signed minutes of meetings or signed reports, and the approved site layout. ▪ Ensure that these recommendations are adhered to.	▪ Once-off, prior to start of construction. ▪ During the construction phase.	▪ ECO and Project Owner ▪ ECO and Project Owner
12.17. Disturbance, damage or destruction of scientifically important fossils at or	Reporting, conservation, recording and judicious sampling of scientifically important fossil material exposed during the construction	12.17.1. Reporting chance fossil finds to SAHRA for possible professional mitigation. 12.17.2. Recording and sampling of fossil material and associated geological data (only necessary for chance fossil finds made during the proposed development).	▪ Monitoring of all substantial excavations into sedimentary bedrocks for fossil material (e.g. vertebrate bones & teeth, fossilized wood, shells)	▪ Throughout the construction phase. ▪ Throughout the construction phase. ▪ Following alert of	▪ ECO ▪ ECO ▪ Qualified palaeontologist appointed and

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
beneath the ground surface as a result of surface clearance and excavations.	phase of development (The paleontological sensitivity of the site is reported as Very Low in the Palaeontological Study).		▪ Safeguarding of chance fossil finds, preferably in situ.in the original assessment. ▪ Application by a qualified palaeontologist for fossil collection permit from SAHRA. ▪ Palaeontologist to undertake field study of fossil finds in situ on site. Photography and sampling of important finds. ▪ Curation of fossils collected in an approved repository (museum/of significant chance fossil finds.	chance fossil finds on site (It is important to note that there is no need for on-site palaeontological monitoring unless new fossil finds are made during development).	commissioned by the Project Owner ▪ Qualified palaeontologist appointed and commissioned by the Project Owner ▪ Qualified palaeontologist appointed and commissioned by the Project Owner
B.7. AGRICULTURE AND SOIL POTENTIAL IMPACTS					
12.18. Erosion caused by the change in land surface characteristics	Reduce erosion.	12.18.1. Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at points where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.	▪ Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.	▪ Monthly during the construction phase.	▪ ECO
12.19. Loss of topsoil as a result of construction activities that disturb soil	Reduce loss of topsoil.	12.19.1. Maintain where possible all vegetation cover and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion. 12.19.2. If an activity will mechanically disturb the soil below surface	▪ Establish an effective record keeping system for each area where soil is disturbed for constructional and	▪ As needed, dependent on the specifics of the construction activities.	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
profile.		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. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. Any subsurface spoils from excavations must be disposed of where they will not bury the topsoil of agricultural land.	decommissioning purposes. Recommendations for the recording system are included in the EMPr.		
12.20. Degradation of veld vegetation as a result of traffic and dust generation.	Avoid or minimise degradation of veld vegetation as a result of traffic and dust generation.	12.20.1. Restrict vehicle access to approved roads and areas only. 12.20.2. Control dust generation during construction activities by implementing standard construction site dust control measures of damping down with water where dust generation occurs.	Undertake a periodic site inspection during construction to check for vehicle tracks beyond the approved vehicle areas.		
B.8. SOCIO-ECONOMIC IMPACTS					
12.21. Employment opportunities	Create local employment opportunities.	12.21.1. Implement a 'locals first' policy with regard to labour needs. 12.21.2. Where possible, subcontract to local construction companies. 12.21.3. Consultation with local authorities is essential so as to manage job creation expectations and ensure that all eligible workers in the primary study area are informed of the opportunities.	▪ Verify that local labour is, as far as practically possible, being used.	▪ Three times during the estimated 12 month construction period (i.e. at 3 months, 6 months, and 9 months).	▪ Construction Manager and ECO
B.9. NOISE IMPACTS					
12.22. Noise pollution stemming from construction activities.	Limit the increase in ambient sound levels as a result of increased noise levels during construction.	12.22.1. Ensure equivalent A-weighted daytime noise levels below 52 dBA at potentially sensitive receptors. 12.22.2. Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA; 12.22.3. Prevent the generation of disturbing or nuisance noises; 12.22.4. Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors. 12.22.5. Ensuring compliance with the National Noise Control	▪ Monitor compliance with National Noise Control Standards and Regulations. ▪ Ensure equivalent weighted daytime noise levels below 52 dBA at potentially sensitive receptors. ▪ Ensure that maximum noise	▪ Ongoing through-out the construction phase.	▪ Project developer ▪ Contractor ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		Regulations. 12.22.6. Avoid construction activities during night-time.	levels at potentially sensitive receptors be less than 65 dBA. ▪ Prevent the generation of disturbing or nuisance noises; ▪ Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors. ▪ Ensuring compliance with the National Noise Control Regulations.		
B.10. WASTE MANAGEMENT					
12.23. Pollution of the surrounding environment (including drainage features) as a result of the handling, temporary stockpiling and disposal of general waste.	Reduce environmental impacts such as soil, surface water and groundwater contamination as a result of incorrect storage, handling and disposal of general waste. Minimise the production of waste. Prevent environmental problems (e.g. pollution / change in soil pH) due to solid and liquid wastes disposed of on the site. Ensure compliance with waste management legislation.	12.23.1. General waste (i.e. construction waste, building rubble, discarded concrete, bricks, tiles, wood, glass, window panes, air conditioners, plastic, metal, excavated material, packaging material, paper and domestic waste etc.) generated during the construction phase should be stockpiled temporarily (i.e. once-off) on site in a designated area within suitable waste collection bins and skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate.	▪ Monitor the strategic placement of the temporary, designated waste stockpiling area at the site camp via visual inspections, and record and report any non-compliance. ▪ Monitor the temporary storage and handling of general waste on site via site audits and record non-compliance and incidents (i.e. conduct visual inspections of the temporary waste storage area).	▪ Once-off prior to the commencement of the construction phase and as required as the construction phase process evolves. ▪ Daily	▪ ECO and Contractor ▪ ECO
		12.23.2. Should the on-site stockpiling of general waste exceed 100 m^3 and a period of 90 days, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) must be adhered to.	▪ Record the amount of general waste that is temporarily stockpiled at the designated area on site, as well as the duration and record non-compliance and incidents. ▪ Monitor the duration and	▪ Daily ▪ Weekly ▪ Monthly	▪ Contractor ▪ ECO ▪ Project Owner.

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
			amounts of general waste that is temporarily stockpiled at the designated area on site via site audits and record non-compliance and incidents (i.e. conduct visual inspections of the temporary waste storage area). ▪ Audit compliance with the Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) if the storage amounts are exceeded (i.e. only if required).		
		12.23.3. Ensure that the designated stockpiling area for general waste (i.e. skips and waste collection bins) is inspected on a daily basis to verify its condition and integrity, particularly after rainfall events.	▪ Monitor the temporary, designated waste stockpiling area at the site camp, as well as the handling of general waste on site via site audits and record non-compliance and incidents.	▪ Daily	▪ ECO
		12.23.4. Ensure that general waste generated during the construction phase is removed from the site on a regular basis, and safely disposed of at an appropriate, licenced waste disposal facility by an approved waste management Contractor. Waste disposal slips or waybills should be kept on file as proof of disposal. As a general principle, waste manifests must be obtained to prove legal disposal of waste.	▪ Ensure that a suitable Waste Management Contractor is appointed to remove and dispose the general waste at an appropriate, licenced waste disposal facility. ▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	▪ Once-off prior to the construction phase. ▪ Weekly	▪ Project Owner/ Contractor ▪ ECO
		12.23.5. Ensure that the construction site is kept clean at all times	▪ Monitor the condition of the	▪ Daily	▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		and that construction personnel are made aware of correct waste disposal methods. Littering must be prevented through effective site camp management.	site camp throughout the construction phase via visual site inspections. Record non-compliance and incidents. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ ECO and Contractor ▪ ECO
		12.23.6. Sufficient general waste disposal bins must also be provided for use by construction personnel throughout the site. These bins must be emptied on a regular basis.	▪ Monitor general waste generation by construction staff and collection via audits throughout the construction phase.	▪ Daily or Weekly	▪ ECO and Contractor.
		12.23.7. Ensure that all general waste emanating from the construction phase is removed from site prior to the commencement of the rehabilitation and operational phases.	▪ Undertake a final inspection at the end of the construction phase in order to verify and ensure that all general waste is removed from site and correctly disposed, prior to the commencement of the rehabilitation and operational phases.	▪ At the end of the construction phase.	▪ ECO and Contractor.
		12.23.8. Promote waste reduction, re-use, and recycling opportunities on site during the construction phase.	▪ Monitor waste generation and collection throughout construction. ▪ Investigate if any complaints have been expressed by the surrounding community regarding waste handling.	▪ Weekly or bi-weekly	▪ ECO and Contractor
		12.23.9. Ensure an adequate and sustainable use of resources.	▪ Monitor waste generation and collection throughout construction.	▪ Weekly or bi-weekly	▪ ECO and Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		12.23.10. Control and implement waste management plans provided by contractors. Ensure that relevant legislative requirements are respected.	▪ Control of waste management practices throughout construction phase	▪ Weekly or bi-weekly	▪ ECO and Contractor
		12.23.11. Normal sewage management practices should be implemented. These include ensuring that portable sanitation facilities are regularly emptied and the resulting sewage is contained and transported safely (by an appointed (suitable) service provider) for correct disposal at an appropriate, licenced facility. Proof of disposal (in the form of waste disposal slips or waybills) should be retained on file for auditing purposes. No waste water must be discharged to the natural environment. 12.23.12. As part of the Environmental Awareness Training, all construction personnel should be made aware of the sewage management practices.	▪ Monitor the placement of sanitation facilities during the construction phase via visual site inspections. Record non-compliance and incidents. ▪ Ensure that a suitable Contractor is appointed to remove and dispose the sewage at an appropriate, licenced facility. ▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents. ▪ Carry out Environmental Awareness Training. ▪ Conduct audits of the signed attendance registers.	▪ Weekly ▪ During construction ▪ Weekly ▪ Once-off training and ensure that all new staff are inducted. ▪ Monthly	▪ ECO and Contractor ▪ ECO ▪ ECO ▪ ECO and Contractor ▪ ECO
12.24. Pollution of the surrounding environment as a result of the handling, temporary stockpiling and disposal of hazardous waste.	Reduce environmental impacts such as soil, surface water and groundwater contamination as a result of incorrect storage, handling and disposal of hazardous waste.	12.24.1. Hazardous waste (i.e. empty tins, oils, fuel spillages, spilled materials and chemicals etc.) generated during the construction phase should be stockpiled temporarily (i.e. once-off) on site in a designated area in suitable waste collection bins and leak-proof storage skips (or similar). Waste collection bins and skips should be covered with suitable material, where appropriate. Hazardous waste must be stored separately from all other general waste. The designated stockpiling area must be labelled correctly.	▪ Monitor the strategic placement of the temporary, designated waste stockpiling area at the site camp via visual inspections, and record and report any non-compliance. ▪ Monitor the temporary storage and handling of hazardous waste on site via site audits and record non-compliance and incidents (i.e. conduct visual	▪ Once-off prior to the commencement of the construction phase and as required as the construction process evolves. ▪ Daily	▪ ECO and Contractor ▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			inspections of the temporary waste storage area).		
		12.24.2. Should the on-site stockpiling of hazardous waste exceed 80 m^3, then the National Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) must be adhered to.	▪ Record the amount of hazardous waste that is temporarily stockpiled at the designated area on site, as well as the duration and record non-compliance and incidents. ▪ Monitor the duration and amounts of hazardous waste that is temporarily stockpiled at the designated area on site via site audits and record non-compliance and incidents (i.e. conduct visual inspections of the temporary waste storage area). ▪ Audit compliance with the Norms and Standards for the Storage of Waste (published on 29 November 2013 under GN 926) if the storage amounts are exceeded (i.e. only if required).	▪ Daily ▪ Weekly ▪ Monthly	▪ Contractor ▪ ECO ▪ Project Owner
		12.24.3. Ensure that the designated stockpiling area for hazardous waste (i.e. leak proof skips and waste collection bins) is inspected on a daily basis to verify its condition and integrity, particularly after rainfall events.	▪ Monitor the temporary, designated waste stockpiling area at the site camp, as well as the handling of hazardous waste on site via site audits and record non-compliance and incidents.	▪ Daily	▪ ECO
		12.24.4. Ensure that all hazardous waste is removed from the site on a regular basis, and safely disposed at an appropriate,	▪ Ensure that a suitable Waste Management Contractor is	▪ Once-off prior to the construction phase.	▪ Project Owner/ Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		licenced hazardous waste disposal facility by an approved waste management Contractor.	appointed to remove and dispose the hazardous waste at an appropriate, licenced hazardous waste disposal facility. ▪ Monitor waste disposal slips and waybills via site audits and record non-compliance and incidents.	▪ Weekly	▪ ECO
		12.24.5. All liquid waste (used oil, paints, lubricating compounds and grease) to be packaged and disposed of by appropriate means.	▪ Waste removal and disposal to be monitored throughout construction.	▪ Weekly or bi-weekly	▪ ECO and Contractor
		12.24.6. Adequate containers for the cleaning of equipment and materials (paint, solvent) must be provided as to avoid spillages.	▪ Waste removal and disposal to be monitored throughout construction.	▪ Weekly or bi-weekly	▪ ECO and Contractor
		12.24.7. Waste water from construction and painting activities must be collected in a designated container and disposed of at a suitable disposal point off site.	▪ Waste removal and disposal to be monitored throughout construction.	▪ Weekly or bi-weekly	▪ ECO and Contractor
		12.24.8. Control and implement waste management plans provided by contractors. Ensure that relevant legislative requirements are respected.	▪ Control of waste management practices throughout construction phase.	▪ Weekly or bi-weekly	▪ ECO and Contractor
C. OPERATIONAL PHASE					
C.1. TERRESTRIAL ECOLOGICAL IMPACTS					
12.25. Increased soil erosion due to disturbance	Avoid or reduce soil erosion.	12.25.1. Erosion management at the site should take place according to the Rehabilitation Plan (Section 5) and the Erosion Management Plan (Section 9). 12.25.2. All hardened roads and other surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. 12.25.3. Regular monitoring for erosion along the power line route after construction to ensure that no erosion problems have	▪ Monitor the erosion on site during operations, as well as the implementation and effectiveness of the Rehabilitation Plan and the Erosion Management Plan (such as the use of gabions and geofabric materials or similar)	▪ Ongoing and as required	▪ Facility Manager and Environmental Manager/ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		developed as result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project. 12.25.4. All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. 12.25.5. All cleared areas should be revegetated with indigenous perennial species from the local area. 12.25.6. Avoid areas of high wind erosion vulnerability as much as possible. 12.25.7. Use net barriers, geotextiles, active rehabilitation and other measures during and after construction to minimise sand movement at the site.	at appropriate points. ▪ Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring. ▪ Undertake visual inspections and site audits to monitor if the mitigation measures are adhered to.		
12.26. Impacts on CBAs as a result of habitat loss and disturbance	Avoid or reduce impacts on CBAs.	12.26.1. Avoid impact to restricted and specialised habitats such as quartz patches or active dune fields.	▪ Undertake periodic site inspections to monitor if specialised habitats are avoided during operation phase.	▪ Ongoing during the operational phase.	▪ Facility Manager and Environmental Manager/ECO
C.2. BIRD IMPACTS					
12.27. Bird collision with transmission line.	To reduce the risk of bird collisions.	12.27.1. The transmission line should be fitted with the best available (at the time of construction) anti- bird collision line marking devices in order to make the overhead cables more visible to birds. More specifically: • Devices should be fitted on the entire length of the power line as collision risk is high all along the alignment for nomadic species such as Ludwig's Bustard. • Devices should be fitted on the earth wire/s.	▪ Verify that this is undertaken by reviewing the signed approved designs.	▪ Once-off	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		• On each span, the full span should be fitted with marking devices (i.e. not only the middle 60% as done previously by Eskom). Research has shown that collisions occur even close to pylons (Shaw, 2013). • Light and dark colour devices should be alternated so as to provide contrast against both dark and light backgrounds. • These devices should be fitted as soon as the earth wires are strung as collision risk begins immediately, not only once the line is commissioned and live. 12.27.2. The power line owner will be responsible for ensuring that the marking devices remain in place and effective on the power line for its' full lifespan. Any device failures must be rectified immediately by replacement with new devices.			
12.28. Electrocution of birds on transmission line and on-site substation.	Prevent any electrocutions of avifauna during the operation of the proposed transmission line.	12.28.1. The proposed tower/pylon structure has not been decided in detail. It will however be either concrete or steel monopole. It is critically important that sufficient clearance be allowed between phase-phase and phase-earth hardware on the structure. For large eagles these clearances should be a minimum of 1.8m.	▪ Ensure that this is taken into consideration during the planning and design phase.	▪ Once-off before construction.	▪ Project Owner, ECO and Contractor
12.29. Bird nesting on transmission line.	To reduce conflict with infrastructure management.	12.29.1. Nest management on a case by case under the supervision of an Ornithologist, and in conformance with all relevant national and provincial legislation. 12.29.2. The operational phase EMP must include provision for application to the provincial authority for permits for any necessary nest management.	▪ Nest relocation or removal should be done under permit from the provincial authority.	▪ As required	▪ ECO
C.3. IMPACTS ON DRY AND EPHEMERAL WATERCOURSES					
12.30. Altered drainage	To avoid or reduce impact on	12.30.1. Use existing Buffels River crossing for all vehicles.	▪ Undertake periodic site	▪ Through-out the	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
patterns, increased runoff, erosion and sedimentation of surrounding ecosystems.	watercourses.	12.30.2. Avoid clearance of vegetation for the powerline servitude for maintenance. 12.30.3. Service vehicles should keep to the servitude and follow existing roads and tracks where possible.	inspections, especially after rainfall events, to verify and inspect the effectiveness and integrity of the storm water runoff control system and to specifically record the occurrence of any erosion on site or downstream. ▪ Correct or improve the runoff control system in the event of any erosion occurring.	operational phase as required.	
C.4. VISUAL IMPACTS					
12.31. Visual intrusion of transmission line on ridgelines.	Reduce visual intrusion of transmission line on ridgeline	12.31.1. Avoidance of ridgelines where possible.	▪ Conduct visual inspections to ensure that ridgelines are avoided.	▪ Weekly	▪ ECO and Contractor
12.32. Visual effect of access roads.	Reduce visual clutter of infrastructure on the open landscape	12.32.1. Use existing roads where possible.	▪ Conduct visual inspections to ensure that ridgelines are avoided.	▪ Weekly	▪ ECO and Contractor
C.5. AGRICULTURE AND SOIL POTENTIAL IMPACTS					
12.33. Erosion caused by the change in land surface characteristics	Reduce erosion.	12.33.1. Implement an effective system of storm water run-off control using bunds and ditches, where it is required - that is at points where water accumulation might occur. The system must effectively collect and safely disseminate any run-off water from all hardened surfaces and it must prevent any potential down slope erosion.	▪ Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control system and to specifically record the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion	▪ As required.	ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
			occurring.		
C.6. HERITAGE IMPACTS (PALAEONTOLOGY, ARCHAEOLOGY AND CULTURAL LANDSCAPE)					
12.34. Destruction of archaeological remains as a result of the existence and maintenance of the proposed transmission line, on-site substation and service road.	Minimise the chances of significant archaeological sites and/or graves being disturbed.	12.34.1. Ensure that all vehicles remain on the service road at all times and ensure that no activity takes place outside of the authorized operational footprint. Keep traffic on site to a minimum.	▪ Carry out visual inspections to ensure strict control over the behaviour of operational staff in order to restrict activities to within demarcated areas.	▪ Monthly	▪ ECO
12.35. Destruction of palaeontological material as a result of the existence and maintenance of the proposed transmission line, on-site substation and service road.	Minimise the chances of significant fossil material or palaeontological sites being disturbed.	12.35.1. Ensure that all vehicles remain on the service road at all times and ensure that no activity takes place outside of the authorized operational footprint.	▪ Carry out visual inspections to ensure strict control over the behaviour of operational staff in order to restrict activities to within demarcated areas.	▪ Weekly	▪ ECO
D. DECOMMISSIONING PHASE					
D.1. TERRESTRIAL ECOLGICAL IMPACTS					
12.36. Increased soil erosion due to habitat loss and disturbance.	Minimise soil erosion during decommissioning activities.	12.36.1. All hard infrastructure should be removed and the footprint areas rehabilitated with locally-sourced perennial species. 12.36.2. The use of net barriers, geotextiles, active rehabilitation and other measures after decommissioning to minimise sand movement and enhance revegetation at the site. 12.36.3. Monitoring of rehabilitation success at the site for at least 5 years after decommissioning. 12.36.4. All erosion problems observed should be rectified as soon	▪ Develop and Implementation of Decommissioning EMPr and oversee activities to ensure that it is implemented and enforced, via site audits and inspections. Record and report any non-compliance. ▪ Appoint a suitably qualified	▪ Ongoing through-out the decommissioning phase. ▪ Before decommissioning commences. ▪ Before rehabilitation commences.	▪ Project Applicant ▪ Suitably qualified contractor ▪ Rehabilitation specialist ▪ Contractor and Rehabilitation specialist

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		as possible, using the appropriate erosion control structures and revegetation techniques.	contractor to undertake and oversee the decommissioning of transmission lines. ▪ Appoint a suitably qualified specialist to monitor rehabilitation via site audits and site inspections to ensure compliance. ▪ Ensure erosion problems are rectified as soon as possible. Record and report any non-compliance.	▪ Erosion problems to be rectified as soon as possible.	
12.37. Increased alien plant invasion due to habitat loss and disturbance.	Minimise alien plant invasion during decommissioning activities.	12.37.1. Alien management plan to be implemented during the decommissioning phase of the development, which makes provision for regular alien clearing and monitoring for at least 5 years after decommissioning. 12.37.2. Active rehabilitation and revegetation of previously disturbed areas with indigenous species selected from the local environment. 12.37.3. Wherever excavation is necessary for decommissioning, topsoil should be set aside and replaced after decommissioning activities are complete to encourage natural regeneration of the local indigenous species. 12.37.4. Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned. 12.37.5. Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	▪ Compile and implement alien management plan to monitor and clear aliens for five years post the decommissioning phase. ▪ Implement the Plant Rehabilitation Plan (Section 5) to ensure that rehabilitation is effective. ▪ Appoint contractor to implement clearing of aliens in terms of the alien management plan in the long-term as required. ▪ Implement the Alien Invasive Vegetation Management Plan (Section 4) of this EMPR.	▪ Regular monitoring of alien plants within disturbed areas for at least five years after decommissioning or until alien invasives are no longer a problem at the site. ▪ Weed eradication exercise to be undertaken every 6 months for a period of 5 years following decommissioning.	▪ Project Developer ▪ Contractor ▪ ECO
D.2. BIRD IMPACTS					

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
12.38. Disturbance of avifauna and displacement effects.	To reduce impact on avifauna.	12.38.1. A site specific avifaunal walk-through should be conducted by a qualified ornithologist as part of the site specific EMP just prior to decommissioning, so as to ensure that no sensitive bird species have started breeding on or near site. 12.38.2. Amendments to decommissioning schedule required if any of the Red Data species are confirmed to be breeding. Decommissioning activities within 500 m of the breeding site must cease, and an avifaunal specialist may advise changes to the schedule.	▪ If any such sites are found case specific mitigation measures will need to be designed. ▪ Appoint an Ornithologist if breeding sites are found within 500 m from decommissioning activities.	▪ Once-off prior to the start of decommissioning. ▪ At the time when this occurs.	▪ ECO and Ornithologist ▪ ECO and Ornithologist
D.3. IMPACTS ON DRY AND EPHEMERAL WATERCOURSES					
12.39. Altered drainage patterns, increased runoff, erosion and sedimentation of surrounding ecosystems due to land and vegetation clearance.	As far as possible, avoid identified sensitive dry and ephemeral watercourses, drainage lines and associated buffers. (The current layout already avoids the identified drainage lines).	12.39.1. Use existing Buffels River crossing for all vehicles. 12.39.2. During decommissioning activities, avoid identified sensitive dry and ephemeral watercourses, drainage lines and associated buffers as far as possible. 12.39.3. Commence with restoration of disturbed, cleared land as soon as permanent structures have been removed. 12.39.4. Ecology specialist/ECO to monitor progress and success of rehabilitation.	▪ Carry out visual inspections to ensure strict control over the behaviour of staff in order to restrict activities to within demarcated areas. Record non-compliance and incidents. ▪ Monitor the decommissioning period to verify if this is being undertaken (where possible). ▪ Monitor if restoration of disturbed areas are effected as soon as permanent structures are removed. ▪ Appoint an Ecology Specialist.	▪ Ongoing ▪ Restoration activities to commence as soon as structures have been removed. ▪ Rehabilitation monitoring to take place during rehabilitation.	▪ ECO ▪ Contractor/ Project Developer ▪ Ecology specialist
D.4. VISUAL IMPACTS					
12.40. Potential visual intrusion of decommissioning activities on existing views of sensitive visual receptors.	Prevent unnecessary visual clutter and focusing attention of surrounding visual receptors on the proposed development.	12.40.1. Disturbed and transformed areas should be contoured to approximate naturally occurring slopes to avoid lines and forms that will contrast with the existing landscapes. 12.40.2. Edges of re-vegetated areas should be feathered to reduce form and line contrasts with surrounding undisturbed landscape.	▪ Conduct visual inspections to ensure that landscaping is following the rehabilitation plan.	▪ Weekly	▪ ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		12.40.3. Where possible decommissioning camps and laydown areas should be located (where sensitive visual receptors are least likely to be affected): • In low visibility areas (e.g. avoid ridgelines and open plains); • Previously disturbed areas (e.g. clearings created by farmers for other purposes which are no longer being used); and/or • Areas near derelict farmsteads (taking into consideration the findings of the Heritage Impact Assessment as well as other assessments that may be relevant), particularly where existing trees can be used to screen these areas from views.	▪ Ensure that this is taken into consideration for the siting of the proposed site camp and laydown area. Carry out visual inspections to ensure the site camp and laydown area are demarcated clearly, and record and report any non-compliance. ▪ Carry out visual inspections to ensure strict control over the boundary of the site camp and laydown area in order to restrict activities to within demarcated areas.	▪ Weekly ▪ Weekly	▪ ECO ▪ ECO
		12.40.4. Stockpiled topsoil should be reapplied to disturbed areas and these areas should be re-vegetated using a mix of indigenous species in such a way that the areas will form as little contrast in form, line, colour and texture with the surrounding undisturbed landscape.	▪ Site visits to ensure that stockpiled topsoil (or appropriate soil for vegetation when stockpiled topsoil is exhausted) is used.	▪ Weekly	▪ ECO
		12.40.5. Night lighting of decommissioning sites should be minimised within requirements of safety and efficiency.	▪ Complaints about night lights should be investigated and documented in a register.	▪ Weekly or bi-weekly	▪ ECO
		12.40.6. Working at night should be avoided where possible.	▪ Operation times for decommissioning activities to be monitored and managed (as well as included in the tender contract).	▪ Weekly	▪ ECO
	Reduce the visual impact of decommissioning activities project wide	12.40.7. Maintain good housekeeping on site to avoid litter and minimize waste. 12.40.8. Monitor sites for strict adherence to demarcated boundaries and minimise areas of vegetation, ground and	▪ Carry out site visits and inspections of the sites and ensure good housekeeping is maintained. Record and report	▪ Daily ▪ Daily ▪ Daily ▪ Daily	▪ Decommissioning Manager and ECO

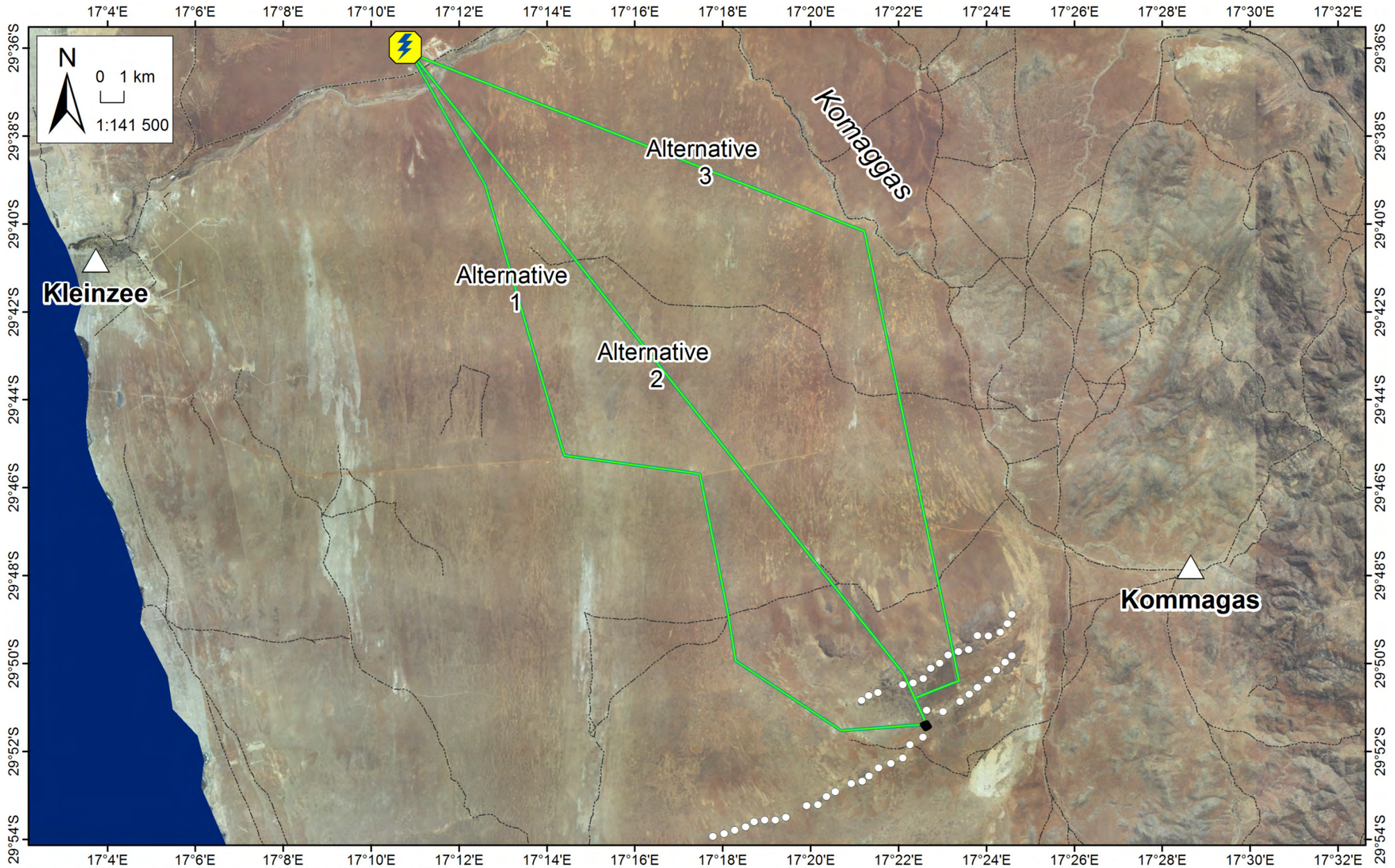
Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
		surface disturbance. Existing clearings should be used where possible and where required. 12.40.9. Monitor that existing roads will be used for access as far as possible. 12.40.10. Monitor that topsoil from the site is stripped, stockpiled, and stabilised before excavating earth. 12.40.11. Monitor that vegetation material from vegetation removal is mulched and spread over fresh soil disturbances to aid in the rehabilitation process. 12.40.12. Monitor adherence to lighting plan. 12.40.13. Monitor adherence to rehabilitation plan (i.e. where cleared areas are rehabilitated as soon as possible). 12.40.14. Monitor adherence to erosion control plan. 12.40.15. Monitor adherence to dust and fire control plans.	any non-compliance. ▪ Carry out site visits and record and report any non-compliance. ▪ Carry out site visits and inspections of the access routes. Record and report any non-compliance. ▪ Carry out site visits and inspections of the topsoil management process. Record and report any non-compliance. ▪ Carry out site visits and inspections of the re-vegetation process. Record and report any non-compliance. ▪ Complaints about night lights should be investigated and documented in a register. Investigate any complaints about night lights and document it in a register. ▪ Visit sites requiring rehabilitation. ▪ Carry out site visits and record and report any non-compliance. ▪ Carry out site visits and record and report any non-compliance.	▪ Daily ▪ Daily and as complaints arise. ▪ Daily ▪ Daily ▪ Daily	
D.5. HERITAGE IMPACTS (PALAEONTOLOGY, ARCHAEOLOGY AND CULTURAL LANDSCAPE)					

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
12.41. Destruction of archaeological remains as a result of the removal of the proposed transmission line, on-site substation and rehabilitation of the service road.	Minimise the chances of significant archaeological sites and/or graves being disturbed.	12.41.1. Ensure that all vehicles remain on the service road at all times and ensure that no activity takes place outside of the decommissioning footprint.	▪ Carry out visual inspections to ensure strict control over the behaviour of decommissioning contractors and staff in order to restrict activities to within demarcated areas.	▪ Weekly	▪ ECO and Contractor
12.42. Alteration of the cultural landscape as a result of the removal of the proposed transmission line, on-site substation and rehabilitation of the service road.	Minimise the impact on the cultural landscape as a result of the presence of vehicles in the rural landscape during the decommissioning process.	12.42.1. Ensure that rehabilitation is effective and that no landscape scarring remains visible from long distances.	▪ Carry out visual inspections to ensure that the rehabilitation process is effective and record and report any non-compliance.	▪ Weekly	▪ ECO and Contractor
12.43. Destruction of palaeontological material as a result of the removal of the proposed transmission line, on-site substation and rehabilitation of the service road.	Minimise the chances of significant fossil material or palaeontological sites being disturbed.	12.43.1. Ensure that all vehicles remain on the service road at all times and ensure that no activity takes place outside of the decommissioning footprint. 12.43.2. Report chance finds.	▪ Carry out visual inspections to ensure strict control over the behaviour of decommissioning contractors and staff in order to restrict activities to within demarcated areas. ▪ Ensure that chance finds are reported to the relevant Heritage authorities.	▪ Weekly ▪ At the time when this occurs.	▪ ECO and Contractor ▪ ECO and Contractor
D.6. AGRICULTURAL AND SOIL POTENTIAL IMPACTS					
12.44. Loss of topsoil due to poor topsoil management.	Ensure effective topsoil covering to conserve soil fertility on all disturbed areas, after they have	12.44.1. Strip, stockpile and re-spread topsoil during rehabilitation.	▪ Photograph the area on completion of rehabilitation and on an annual basis	▪ As needed, dependent on the specifics of decommissioning	▪ ECO ▪ Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
	been rehabilitated.		thereafter to show vegetation establishment and evaluate progress of restoration over time.	activities.	
12.45. Soil erosion due to alteration of the land surface characteristics	To reduce erosion on site and downstream of the site as a result run-off from the site, or due to wind erosion.	12.45.1. Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces of and prevents potential down slope erosion.	▪ Include periodic site inspection in environmental performance reporting that inspects the effectiveness and integrity of the run-off control system and specifically records the occurrence of any erosion on site or downstream. Corrective action must be implemented to the run-off control system in the event of any erosion occurring. ▪ Implement Stormwater Management Plan (Section 8) and the Erosion Management Plan (Section 9.	▪ Monthly during the decommissioning phase.	▪ ECO
D.7. NOISE IMPACTS					
12.46. Noise pollution stemming from decommissioning activities.	Limit the increase in ambient sound levels as a result of increased noise levels during decommissioning.	12.46.1. Ensure equivalent A-weighted daytime noise levels below 52 dBA at potentially sensitive receptors. 12.46.2. Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA; 12.46.3. Prevent the generation of disturbing or nuisance noises; 12.46.4. Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors. 12.46.5. Ensuring compliance with the National Noise Control Regulations. 12.46.6. Avoid decommissioning during night-time.	▪ Monitor compliance with National Noise Control Standards and Regulations. ▪ Ensure equivalent weighted daytime noise levels below 52 dBA at potentially sensitive receptors. ▪ Ensure that maximum noise levels at potentially sensitive receptors be less than 65 dBA.	▪ Ongoing through-out the decommissioning phase.	▪ Contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	**Frequency**	**Responsibility**
			▪ Prevent the generation of disturbing or nuisance noises; ▪ Ensure acceptable noise levels at surrounding stakeholders and potentially sensitive receptors. ▪ Ensuring compliance with the National Noise Control Regulations.		
D.8. WASTE MANAGEMENT					
12.47. Generation of waste due to disassembly of the transmission line and associated structures.	Avoid substantial negative impacts at the decommissioning phase due to insufficient planning.	12.47.1. Suitable receptacles must be provided for the temporary storage of various waste types such as scrap metal and concrete, until it is removed to the nearest licensed landfill.	▪ Audit the implementation of mitigation measures recommended for the decommissioning phase.	▪ During the decommissioning phase	▪ ECO
		12.47.2. Waste separation is encouraged and therefore receptacles should be labelled to reflect the different waste types.	▪ Audit the implementation of mitigation measures recommended for the decommissioning phase.	▪ During the decommissioning phase	▪ ECO
		12.47.3. Ensure that the construction mitigation and management measures are adhered to during the decommissioning phase.	▪ Audit the implementation of mitigation measures recommended for the decommissioning phase.	▪ During the decommissioning phase	▪ ECO

APPENDIX A – SITE LAYOUT MAP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Alternative 3
Komaggas
Alternative 1
Alternative 2
Kleinzee
Kommagas
juwi Kap Vley Powerline Routing
Eskom Gromis substation
Existing roads
132 kv Powerline
132 kV powerline routing options
On-site substation
Wind turbines
Coordinate System: GCS WGS 1984
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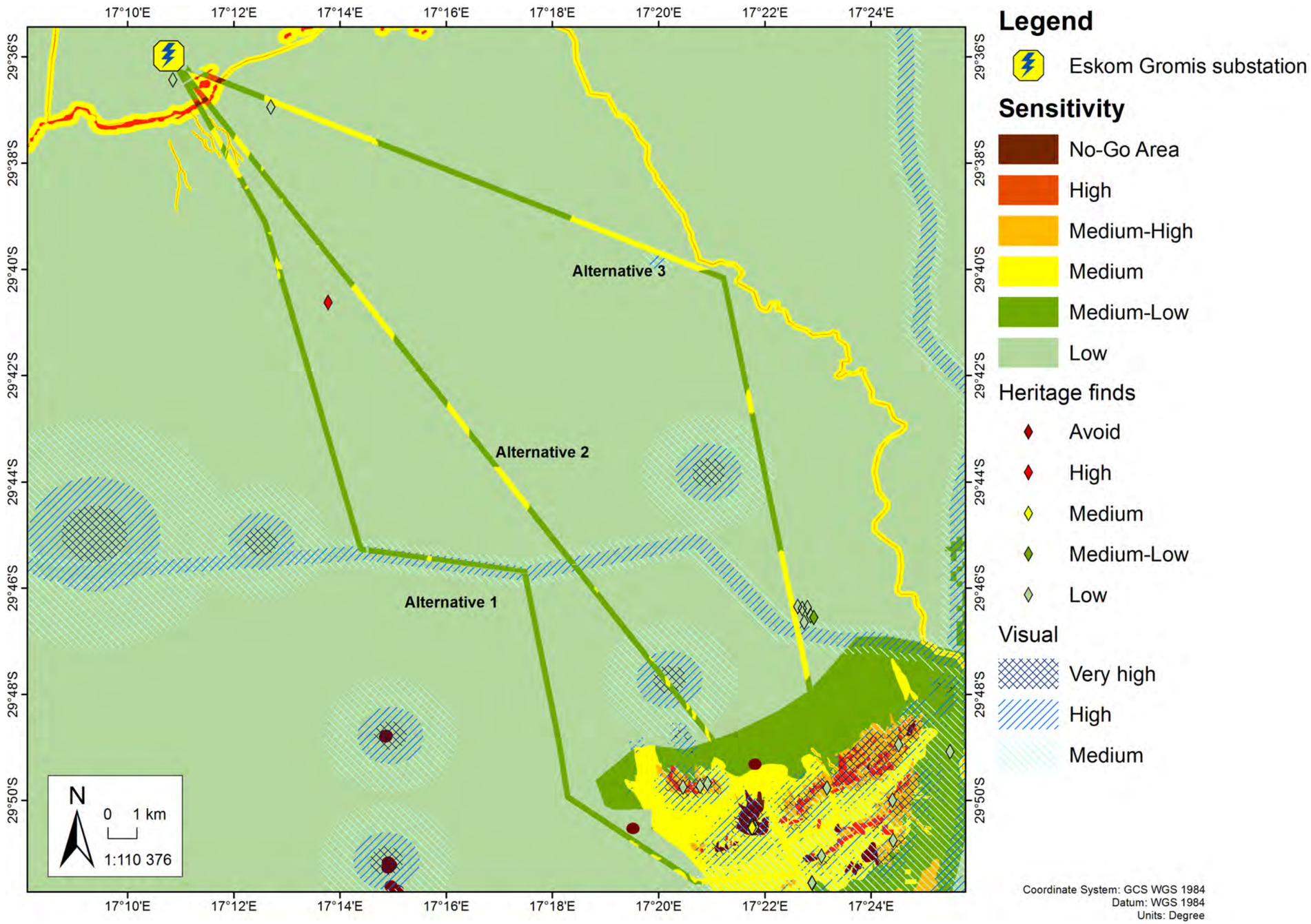
Units: Degree

APPENDIX B –ENVIRONMENTAL SENSITIVITY MAP



Environmental Sensitivity Map (with visual layer)