April 2022

FINAL ESIA REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF THE PROPOSED 100MW WIND AND 100MW PV SOLAR POWER PLANT NEAR ROSH PINAH

Volume 1: Main Report

ENVIRO DYNAMICS
Environmental Management Consultants

NamPower
Powering the Nation and beyond

PROJECT NAME	Environmental and Social Impact Assessment for the Proposed Wind and Solar Park near Rosh Pinah, Namibia
REPORT	Final Assessment Report
STAGE OF REPORT	Final to DEA
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Background

As part of the strategy to fulfil Namibia's energy demand, NamPower is considering the development of a 100 MW Wind Power Farm north of Rosh Pinah with an option of adding a 100 MW Solar Photovoltaic (PV) Power Plant in future, hereinafter referred to in this document as "the Project". The development of the proposed project will be executed in different phases, with an initial phase to develop a 40 MW Wind Power Plant to be owned and operated by NamPower. Enviro Dynamics cc has been awarded the contract to perform the Environmental and Social Impact Assessment (ESIA) on behalf of NamPower as an independent Environmental Assessment Practitioner (EAP).

The site is located approximately 30km north of Rosh Pinah in the //Kharas Region, along the C13 national road from Rosh Pinah to Aus *(see Figure i).* Alternative areas have been considered for the placement of the turbines and the solar farm within this study area. The final sites and their boundaries were subject to environmental sensitivities, technical suitability and access to land.

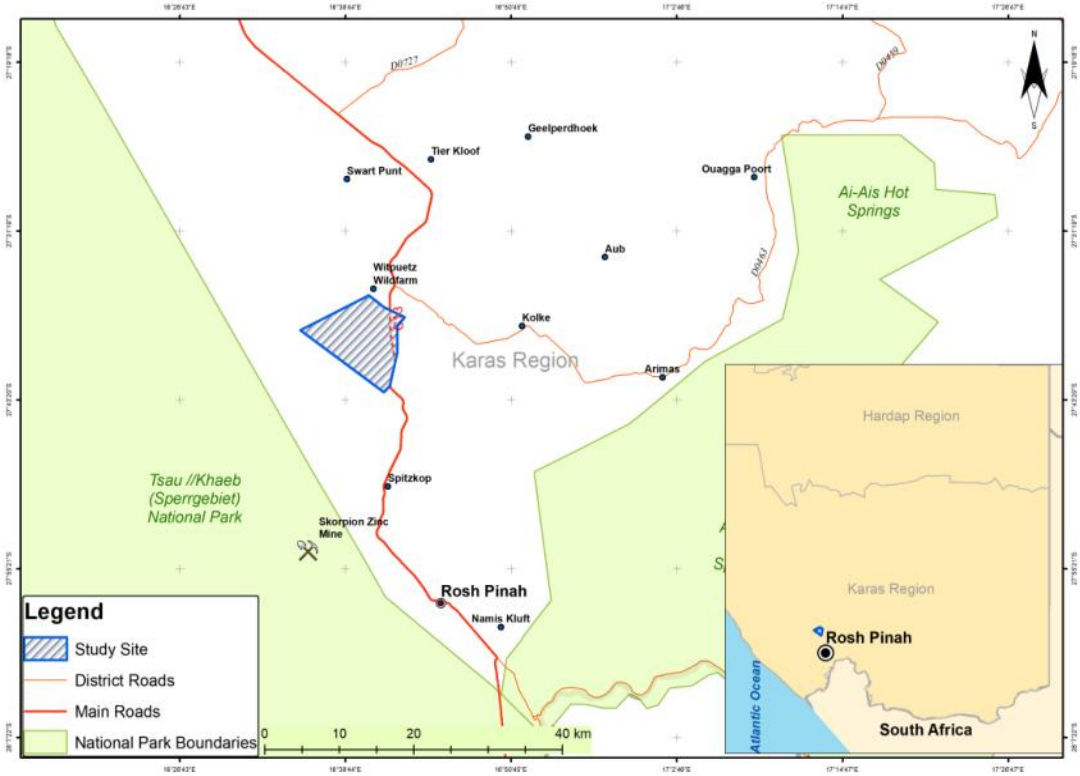

Figure i: Locality map of the sites for the proposed NamPower Wind Park near Rosh Pinah

Following screening and site selection considerations, the site with its boundaries and preliminary configuration of turbines and solar arrays, is shown in Figure ii below.

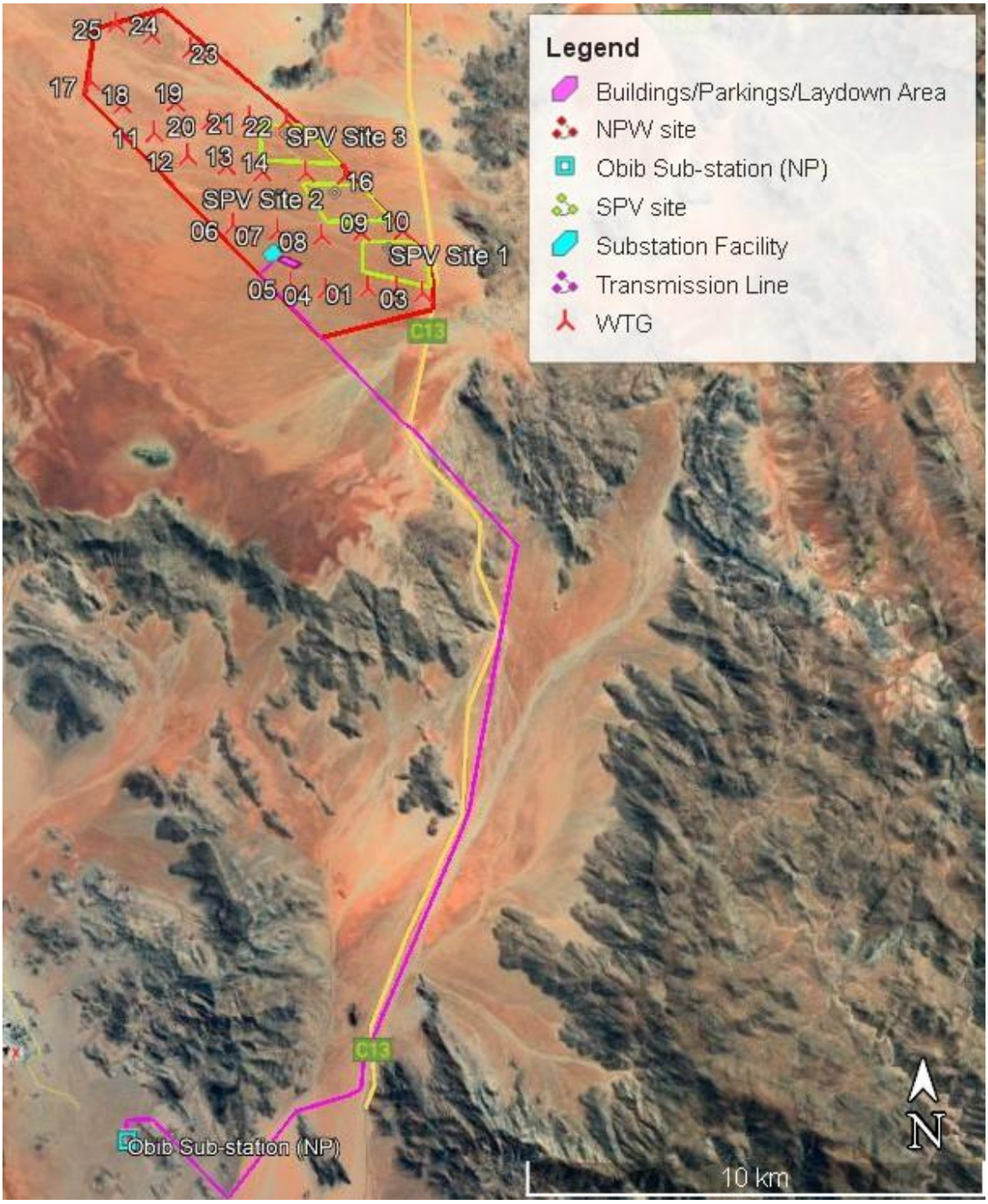

Figure ii: Final site selected with proposed transmission line corridor.

Terms of Reference

The Consultant shall perform all the necessary requirements of the Environmental Management Act (2007) and its Regulations (2012), as well as of the KfW Sustainability Guidelines and the World Bank Environmental and Social Framework (ESF) in performing this assessment.

Legal requirements and relevant standards

A study was conducted of all the environmental legal requirements which have a bearing on this assessment. This report sets out the applicable parts, including National legislation and International treaties which Namibia is signatory to. It also sets out the requirements of the World Bank (Environmental and Social Standards, ESS). Legal and permit requirements are contained in the Environmental and Social Management Plan (ESMP) for this project.

Stakeholder engagement process

Stakeholder engagement was carried out to fulfil the requirements of the Namibian Regulations and of the ESS. Overall, stakeholders welcome this project in an otherwise difficult economic climate. Specific comments were incorporated into the documents. This report will be made available to stakeholders for comment and their inputs will be incorporated into the reports where relevant.

Impact assessment based on selected site

The final impact assessment reported on in this document was based on this previous work, i.e. assuming that sensitive areas will be avoided. The significant impacts in need of careful avoidance and management are as follows:

- *Socio-economic impacts* are positive for Namibia as the project will move the country toward a more sustainable energy mix, free from reliance on South Africa for its power. There will be some, yet limited contribution towards Rosh Pinah and the region's economy. Negative socio-economic impacts, including potential labour influx and increased pressure on Rosh Pinah's infrastructure, can be addressed by communication and management through the relevant stakeholders. There should be ongoing stakeholder engagement and a grievance mechanism allowed for during construction and operation.
- *Habitat modification and destruction to make way for the project footprint.* This impact is often much larger than needed due to unplanned and unsupervised activities. This is particularly relevant in Namibia where construction and associated activities are generally characterised by excessive destruction caused by negligence. The fact that the study area is particularly sensitive to disturbance due to its locality in the Succulent Karoo Biome, harbouring many endemic and restricted range plant species, and some 26 priority bird species sensitive to the project, makes the avoidance of collateral damage to the habitat of crucial importance. The footprints of the wind turbines are relatively small, but destruction can be significant if clearing is done indiscriminately, particularly if vehicle movement between the turbine footprints is not carefully planned. With the additional significant footprint of the roads, the solar PV footprint and other infrastructure corridors, destruction is easy and can happen quickly, and will practically be irreversible as rehabilitation efforts can never fully replace what has been lost. Notably, the vegetation under the solar panels should not be removed. This should be clearly spelt out to the contractor

and to all involved and repeated to ensure it is understood. In Namibia it is normal practice to remove all vegetation in the way of a development. NamPower will have to make every effort to avoid collateral damage by ensuring supervision at the crucial periods of construction, notably when vegetation clearance is being contemplated. The Environmental Control Officer has to be present for this activity. Areas to be cleared need to be defined and only this vegetation should be removed, on the basis of the recommendations from the vegetation specialist in the ESMP.

- *Faunal diversity* is closely associated with the vegetation zones. It is especially rocky outcrops that are vulnerable to change (avoided by the site), but all three (3) biodiversity zones are of high significance and range restricted resulting in vulnerability to indiscriminate habitat destruction. Vulnerable species are Namaqua Chameleon, various range restricted tortoises and vegetation-dependent insects. Prohibiting habitat destruction by reducing project footprint is the most effective mitigation.
- *Loss of protected and endemic, range restricted plant species, habitat loss and modification and loss of archaeological sites* due to movement outside the designated site. The contractor should strictly prohibit movement outside of the project site and continually enforce this.
- *Traffic disruption during construction in Lüderitz as abnormal loads move from the harbour towards the site.* A route has been recommended to be followed by the abnormal load vehicles, which should be approved by the Roads Authority and the traffic police should direct traffic whilst moving through the town.
- *Bird collisions with project infrastructure, especially wind turbines and power line conductors*. Expected bird flight paths have been indicated and should be avoided where possible. Bird markers, arrangement of solar PV arrays and WTGs, as well as all other recommendations by the bird specialists should be implemented. Monitoring during and after construction is important to increase Namibia's understanding of bird-infrastructure collisions and to more specially tailor mitigation measures.
- *Escalation of waste during decommissioning*. The specific challenge in this regard is the sheer size of the rotor blades and other components, which makes it challenging to find a suitable waste disposal solution for them. It is recommended that the matter be further investigated closer to decommissioning (considering a plant lifetime of +-25 years) as the time for disposal draws near when the globe has hopefully advanced in dealing creatively with this challenge.
- Though *bat occurrence* is expected to be low, caution should be taken not to reduce or add to supporting habitat. Neither should artificial food and water sources be created of attracted to the wind turbines leading to excessive collisions.

- Visual impact of the Project, especially the wind turbines, is significant and markedly alters the visual landscape for it's visual class. The transmission line is visible for at least two thirds of the route, however it is located in the same corridor as an existing major transmission line and will not significantly alter the visual landscape beyond what is allowed in its landscape class. Using colour schemes that blend with the environment (with a blue tone) will assist in reducing the visual impact of the Project elements.

  Other more general construction impacts are addressed in the ESMP.

Cumulative Impact

Even though the project is located in a relatively sensitive area, the expected impacts of the project can remain within limits of acceptable change given its relatively small scale within the Succulent Karroo Biome and sensitivity zones in which it is located. The workforce is also relatively small. Management strategies would have to be targeted and committed to limit this change, particularly those related to limiting footprint and avoiding collateral damage.

Of some concern is the cumulative effect of this project combined with other wind developments in the next-door //Tsau Khaeb National Park, as well as the wind resource that will probably be further developed in the vicinity of this project to capitalise on the local wind resource. While the wind resource is limited in the local area (see Figure iii), it is extended in the //Tsau Khaeb National Park, but covers the same biome. It is therefore recommended that a Strategic Environmental Assessment (SEA) be conducted for wind development in Namibia to address matters of strategic concern, including impact on habitat, vegetation, tourism, archaeology and socio-economic impact.

While these issues may be manageable on an individual project basis and are being assessed for each project independently, resulting in relatively acceptable change expected for each, this may well not be the case if projects are considered jointly. The individual developer such as NamPower could contribute toward such a study, commensurate with their contribution to the cumulative footprint. Each individual developer can however not be held responsible for assessing these cumulative impacts and the initiation and funding of such a study should therefore be driven by the regulator.

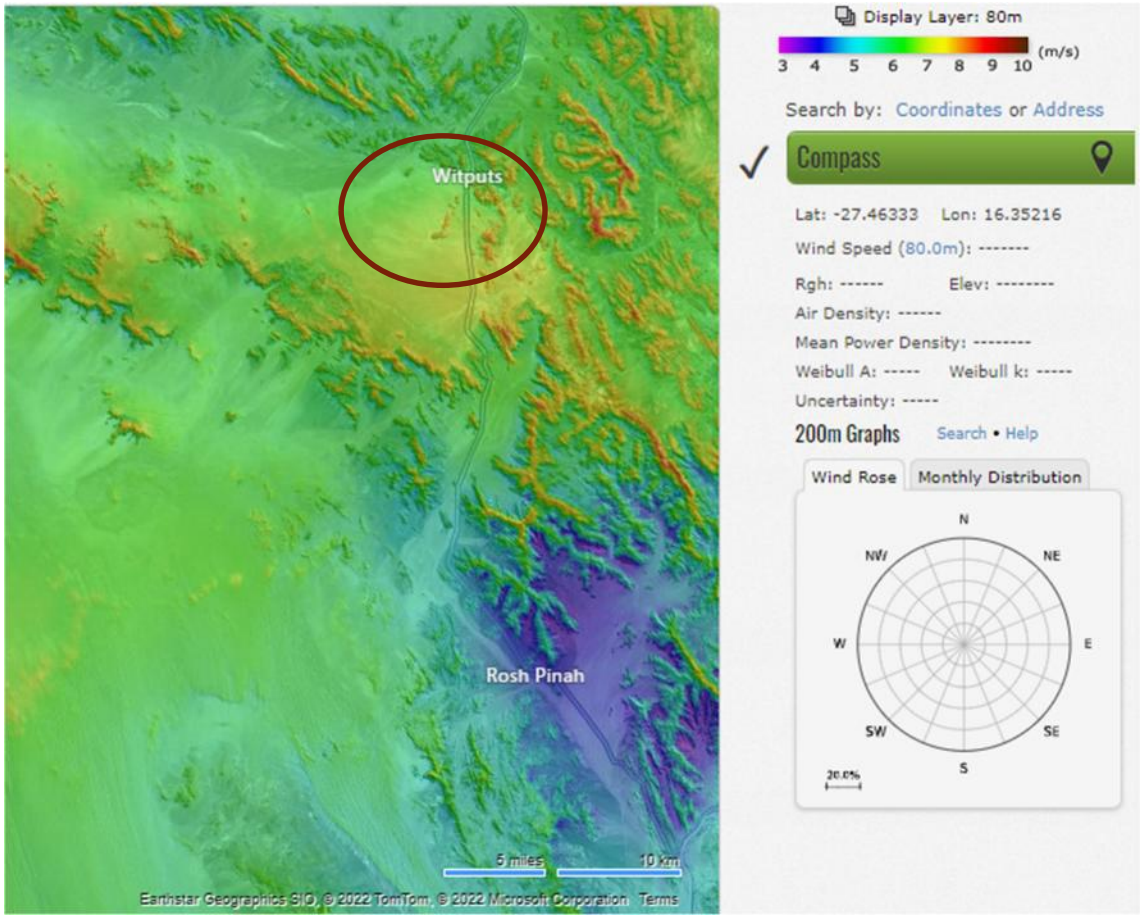

Figure iii: Power density map showing highest densities within the red circle at the project site in the Witputs valley (Source: NamPower).

Conclusion

The proposed 100MW NamPower Wind Project, including a potential additional future 100MW Solar Park and associated transmission lines and other infrastructure will offer increased power security and curb increases in future costs of energy for the country. It will also reduce the need to import ESKOM coal generated electricity followed by a reduced overall carbon footprint. It will also provide a welcome injection into the local and regional economy, in an otherwise strained economic climate.

Notwithstanding this, the project will be developed in a sensitive and unique biophysical setting. With the avoidance of sensitive ecological, technical and physical zones, the impacts expected from the project have been significantly reduced. Key impacts, including those expected on vegetation and birds are still expected to be significant. Above average commitment is required to manage these impacts and to avoid them from becoming unacceptable. Monitoring should continue to inform the management of impacts and to adapt strategies where necessary. The design measures, management regimes and monitoring requirements given in the ESMP are of utmost importance and should be structured into all communications and management platforms related to the project. With

this condition in place, it is recommended that Environmental Clearance be granted for the project.

It is further recommended that an SEA be initiated for the development of wind power in the TKNP, including these adjacent wind projects in the same biome, with contributions made by all the prospective wind power developers.

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LIST OF ACRONYMS

DR	District Road
ECC	Environmental Clearance Certificate
EAP	Environmental Assessment Practitioner
ECB	Electricity Control Board
EMA	Environmental Management Act
EHS	Environmental, Health and Social
EPLs	Exclusive Prospecting Licences
ESCP	Environmental and Social Commitment Plan
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standard
FI	Financial Intermediary
IAPs	Interested and Affected Parties
IBAs	Important Bird Areas
IUCN	International Union for Conservation of Nature
KfW	Kreditanstalt fuer Wiederaufbau
MAW & LR	Ministry of Agriculture, Water and Land Reform
MEF & T	Ministry of Environment, Forestry and Tourism
MME	Ministry of Mines and Energy
MW	Megawatt
NDP5	5th National Development Plan
NIRP	National Integrated Resource Plan
NUST	Namibia University of Science and Technology
NWP	NamPower Wind Project (the 40MW Rosh Pinah Wind Project)
OECD	Organisation for Economic Co-operation and Development
PV	Photovoltaic
SCADA	Supervisory Control and Data Acquisition
SEMS	Social and Environmental Management Systems
SDGs	Sustainable Development Goals
SPV	Solar Photovoltaic

UNEP	United National Environmental Programme
WP	Wind Park
TWG	Wind Turbine Generator

LIST OF APPENDICES

1 INTRODUCTION

1.1 BACKGROUND

As part of the strategy to fulfil Namibia's energy demand, NamPower is considering the development of a Wind Power Plant north of Rosh Pinah, with an option to include a 100 MW Solar Photovoltaic (PV) Power Plant, referred to in this document as "the Project". An Environmental and Social Impact Assessment (ESIA) is part of the legal requirements to implement the project.

Enviro Dynamics cc has been awarded the contract to perform this assignment on behalf of NamPower as an independent Environmental Assessment Practitioner (EAP).

1.2 LOCALITY AND PROCESS UNDERTAKEN SO FAR

The study area is located approximately 30km north of Rosh Pinah in the //Kharas Region, along the C13 national road from Rosh Pinah to Aus *(see* Figure 1*).* NamPower previously considered localities across the country for the project and selected three alternative sites (see Site Selection Report, Appendix A).

The Rosh Pinah site was selected as a preferred location since it would complement the coastal wind regime where other winds power projects are currently being developed whilst still supporting early evening peak requirements. Enviro Dynamics embarked on a process of investigating a wider area, as shown on the map presented in Figure 1, in order to find the most suitable area. Specialist baseline studies were commissioned to investigate the sensitivities of the studied area, in order to position the site to avoid or minimise sensitivities such as disturbances to birds, vegetation, archaeology, and the landscape. The final preferred area was also subjected to technical suitability and access to land.

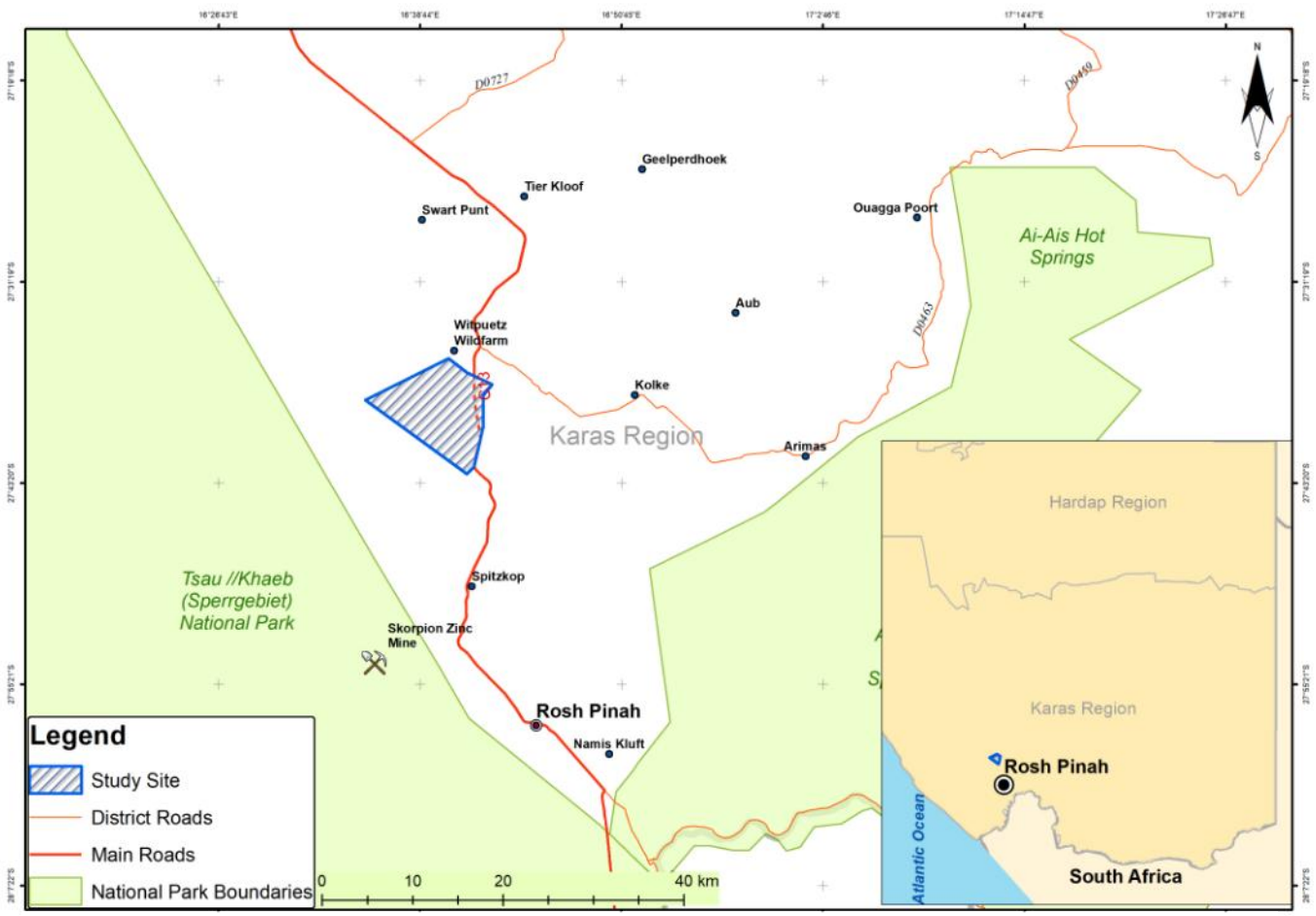


Figure 1: Locality map of the wider study area for the proposed NamPower Wind Project near Rosh Pinah

Following the screening process, a preferred site and route for the transmission line was selected, as shown in Figure 2 and Figure 3 below. The route for the transmission line has not been subjected to alternatives, since the best practice is considered for the line to be routed along existing corridors where possible. In this case, the route for the power line follows an existing 66kV transmission line servitude.

The eventual assessment (the focus of this report) focusses on the selected site for the wind and solar park and the transmission line route.

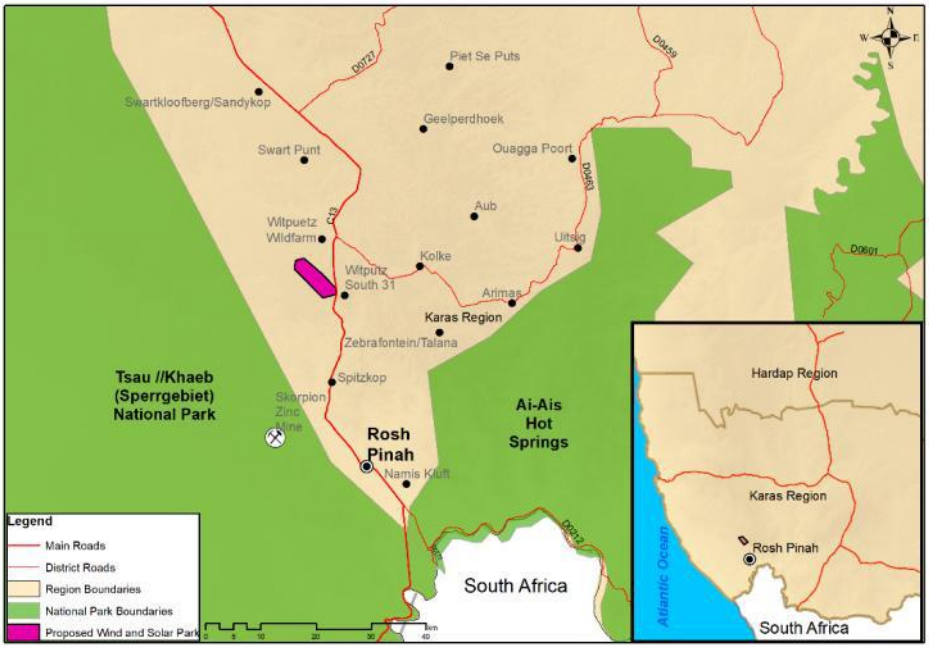


Figure 2: Locality of selected site near Rosh Pinah

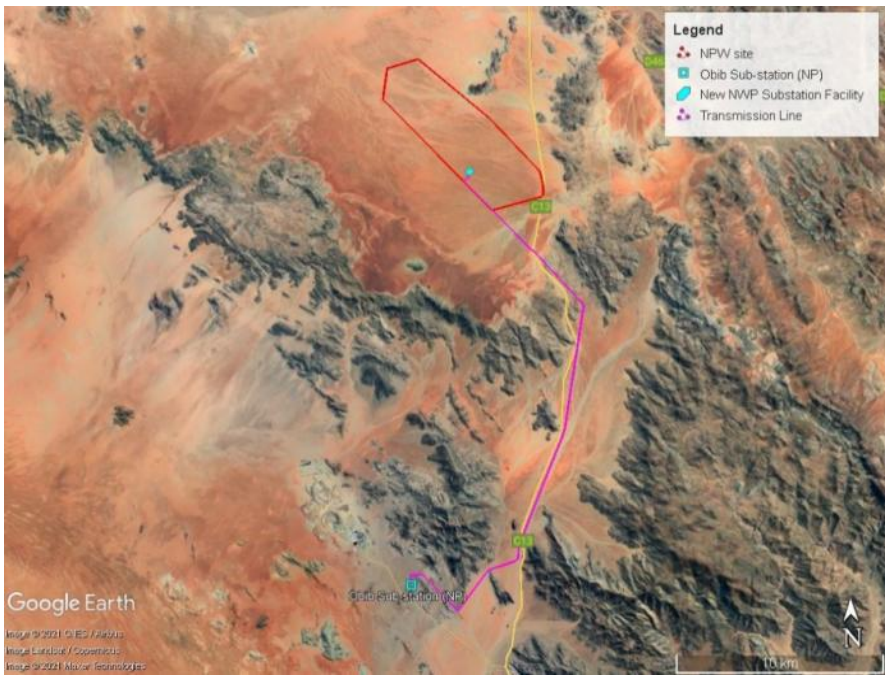


Figure 3: Google image of selected site and transmission line

1.3 TERMS OF REFERENCE

According to the Terms of Reference for this ESIA, the Consultant is to "investigate (by means of a thorough literature review, site and stakeholder scoping, public participation process, etc.) the main environmental and social impacts and risks associated with all life-cycle phases of the Project".

In order to meet the requirements of Section 15 of the Namibian Environmental Management Regulations (2012), this assessment report sets out the following:

1) Introduce the report and the Environmental Assessment Practitioner who conducts this ESIA and who prepared this report (Section 1).

2) Describe the background, need and desirability, as well as the details of the proposed NamPower Wind Project, including the proposed wind and solar park, and transmission line and associated infrastructure (Section 2).

3) Describe the alternatives to the proposed project, and a comparative assessment of the alternatives identified during the assessment process (Section 3).

4) Describe the laws and standards that have been considered during the assessment process (Section 4).

5) Describe the geographical, physical, biological, social, economic and cultural aspects of the environment and how they may be affected by the project (Section 5).

6) Detail the public consultation process conducted in terms of Regulation 7(1) of the Namibian legislation (termed stakeholder engagement process in line with the Environmental and Social Standards- ESS of the World Bank, being adhered to as well) in connection with the application (Section 6).

7) Report on the assessment of potentially significant impacts that were identified and developed during the ESIA process, with a summary of the mitigation measures, which are more fully described in the ESMP (Section 7).

8) A description of limitations, gaps in knowledge, uncertainties, conclusions and recommendations (Section 8).

The Terms of Reference further specified that the ESIA should be conducted in line with the World Bank Standards for conducting environmental and social assessment. These requirements are described in Section 4 and referred to throughout the assessment and in the specialist reports.

1.4 THE ENVIRONMENTAL ASSESSMENT PROFESSIONALS (EAPS) ON THE TEAM

Norman and Stephanie van Zyl are qualified and experienced EAPs, each with more than 20 years of experience in project development related work. They both have experience with ESIAs for wind parks in the Tsau//Khaeb National Park as well as work in the project area (mainly work for Skorpion mine site and associated Exclusive Prospecting Licences (EPLs) on farms in the vicinity). The specialists that are involved in this assignment are as follows:

Dr. Ann and Mike Scott (Africa Conservation Services)	Avifauna
Dr. John Irish	Biodiversity (excluding bats and avifauna)
Dr. Caroline Lötter (Inkululeko Wildlife Services)	Bat Impact Assessment
Ms. Coleen Mannheimer	Vegetation Impact Assessment
Dr. John Kinahan (Quaternary Research Services)	Archaeology Impact Assessment
Mr. Norman van Zyl (Enviro Dynamics)	Visual Impact Assessment
Ms. Stephanie van Zyl (Enviro Dynamics)	Socio-economic Impact Assessment
Mr. Greg van Toorn (Innnovative Transport Solutions)	Traffic Impact Assessment
Dr. Peter Tarr (SAIEA)	Internal Review (World Bank Compliance)

The Curriculum Vitae (CVs) of the Team are attached as Appendix B.

1.5 METHODOLOGY OF THE ESIA PROCESS

The overall work plan for the ESIA process is shown in Figure 4. A screening and scoping process was initiated prior to the public consultation process, in order to confirm the site first. The list of issues to be investigated were adapted following the public consultation.

The methodology for the ESIA study is shortly as follows:

- A screening process to identify the sensitivities on site and feed these into the site selection process.
- A description of the project based on information received from NamPower.
- A study of legal requirements and standards including a gap analysis of the World Bank ESF requirements vs. local legal requirements.
- A study of the biophysical and social baseline of the area, using available secondary information, augmenting this with fieldwork where necessary. The fieldwork includes monitoring in different seasons prior to construction for birds and bats and will be followed up with monitoring during construction.
- Stakeholder engagement based on a mapping exercise of the key stakeholder representatives of the project, using a combination of electronic media, a public meeting and focal meetings.
- An impact assessment using a standard impact assessment methodology completed by all specialists. During this process, the important aspects of the project are compared to the sensitivities on the site, and the significance of the impacts are determined. This feeds into modifications of the designs, localities and technology where appropriate, and to a mitigation hierarchy being applied during the management of the project, provided in the ESMP.
- Consideration to alternatives (sites, technology, designs) were being integrated during the process.

- Consideration to cumulative impact.
- Preparation of reports, which include a scoping report, public engagement report, ESIA report and ESMP report. The latter three reports will be circulated to the stakeholders for comment.

The overall schedule of the ESIA process is as follows in Table 1:

Table 1: Schedule of the ESIA process

	April-May 2020	May-Jun 2020	Jul-Dec 2020	Jan-Jun 2021	Jul-Sept 2021	Sept-Oct 2021	Nov-April 2021-2022
Screening							
Baseline deskwork and fieldwork (Vegetation and archaeology) and reporting							
Scoping Report							
Public Engagement							
Avifauna pre-construction monitoring (quarterly)							
Bat pre-construction monitoring commenced							
Specialist impact assessments and reporting							
ESIA and ESMP Reports							

Note: the light brown column represents a halt in the programme in order to finalise the agreement with the landowner.

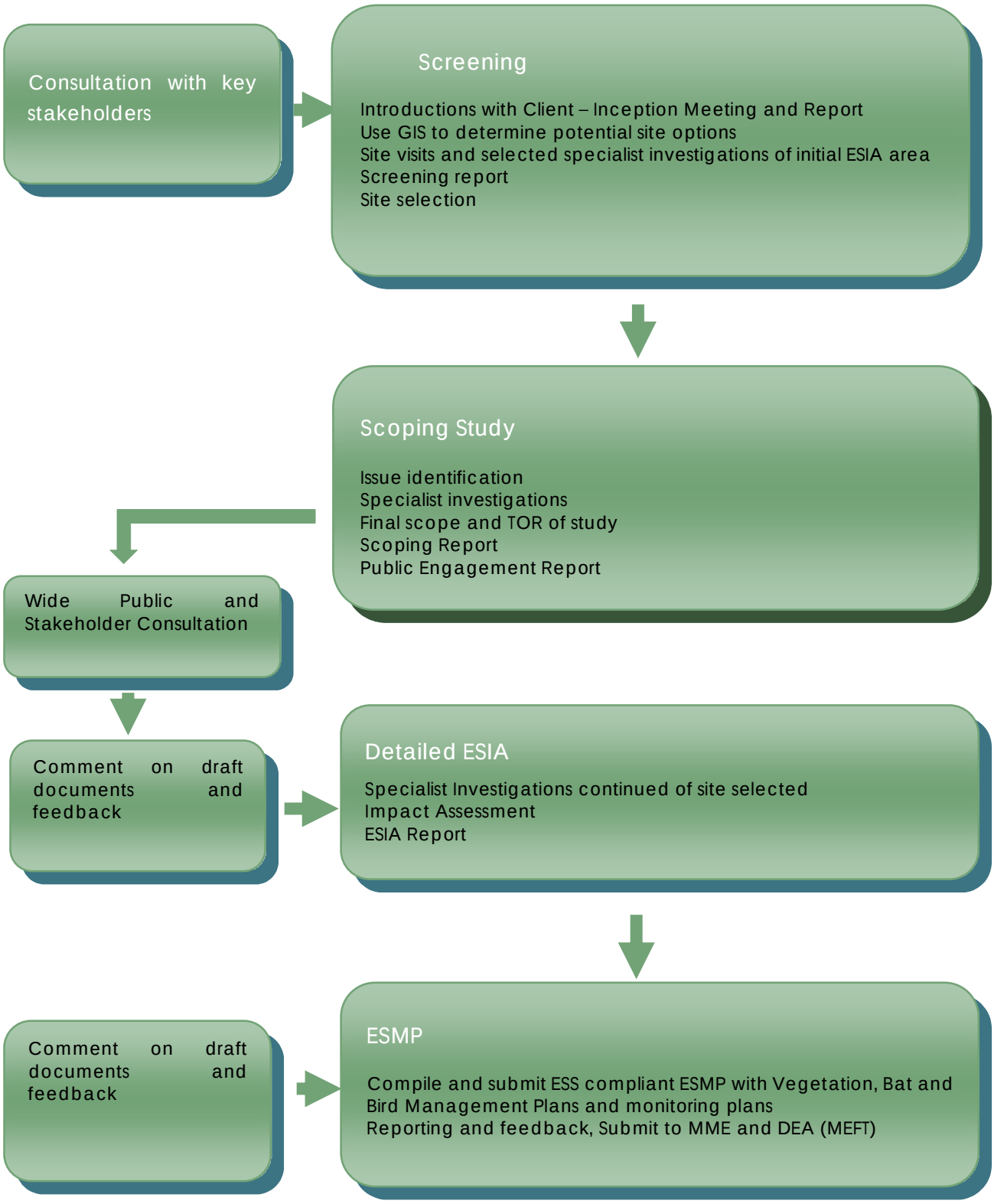


Figure 4: Work Plan showing the overall process of the ESIA

1.6 ENVIRONMENTAL CLEARANCE CERTIFIICATE APPLICATION

This assessment report serves to apply for an Environmental Clearance Certificate (ECC), in terms of the listed activities in the Regulations (2012) of the Environmental Management Act (2012). The listed activities applied for are (according to Section 1 of the Schedule of Listed Activities:

‘‘ 1. The construction of facilities for -

(a) the generation of electricity;

(b) the transmission and supply of electricity; ‘’’’

The listed activities therefore applied for are:

- The proposed Wind Power Park
- The proposed Solar PV Park; and
- The proposed transmission line with a newly built site substation.

These proposed activities are collectively referred to as the NamPower Wind Project in this report. They are described in detail in Section 2.

2 THE PROPOSED NAMPOWER WIND PROJECT

2.1 INTRODUCTION

The proposed 100 MW NamPower Wind Project is an alternative energy development based primarily on wind electricity generation with an option to add a 100MW solar electricity generation in future.

The proposed project will be developed in different phases, with an initial phase being a 40 MW to 50 MW Wind Park to be owned and operated by NamPower.

NamPower is committed to supporting and achieving the government objectives as set out in the national planning policies, and in particular the National Integrated Resource Plan (NIRP), the 5th National Development Plan (NDP5) and the Harambee Prosperity Plan (HPP) II.

Considering Namibia's ideal conditions and achieving the government objectives set out in NIRP and NamPower' strategic roadmap to expand the penetration of renewable energy sources within the national energy mix; wind and solar power plants are considered ideal for providing energy at competitive tariffs in Namibia. The NamPower business case and motivation for the project is further expanded on in its Project Fact Sheet (Appendix C).

Besides other locations being considered, Rosh Pinah has been selected as a preferred area, due to:

- its relatively good inland wind resource, especially its capacity to generate electricity during peak times (winter months),
- the fact that the area is relatively flat, and
- that it is near a strong transmission network.

The project also envisages the additions of other renewable energy technologies on the site, such as solar photovoltaics (PV).

The proposed Wind Park will comprise of an estimated 25 wind turbine locations. The project lifetime being planned for is 25 years.

2.2 WIND TURBINES

The wind park, overall size of 2420ha, will consist of an estimated of up to 25 wind turbine locations distributed to optimize technical efficiency yet avoiding environmental sensitivities as far as practically possible. Phase 1 of the project will require 9 to 16 wind turbines.

Horizontal-Axis Wind Turbines (HAWTs) will be used, which are of the most common generator types. Each unit will consist of conical tubular tower type with a 3-blade rotor which are between 140m to 245m high at blade tip height, with a rotor diameter of up to 170m. Figure 5 below depicts a typical wind turbine.

Each wind turbine requires a foundation of approximately 50m x 50m each.

The overall footprint per wind turbine is approximately 4 650 m² during construction, with a reduction to ~ 2 300 m² during operation. This may depend on the land-use requirements of the selected WTG model.

Depending on the final design, the wind park is expected to generate approximately 2 – 6 MW per wind turbine. The size and number of wind turbines are dependent on the measured wind resource and the final selected turbine supplier.

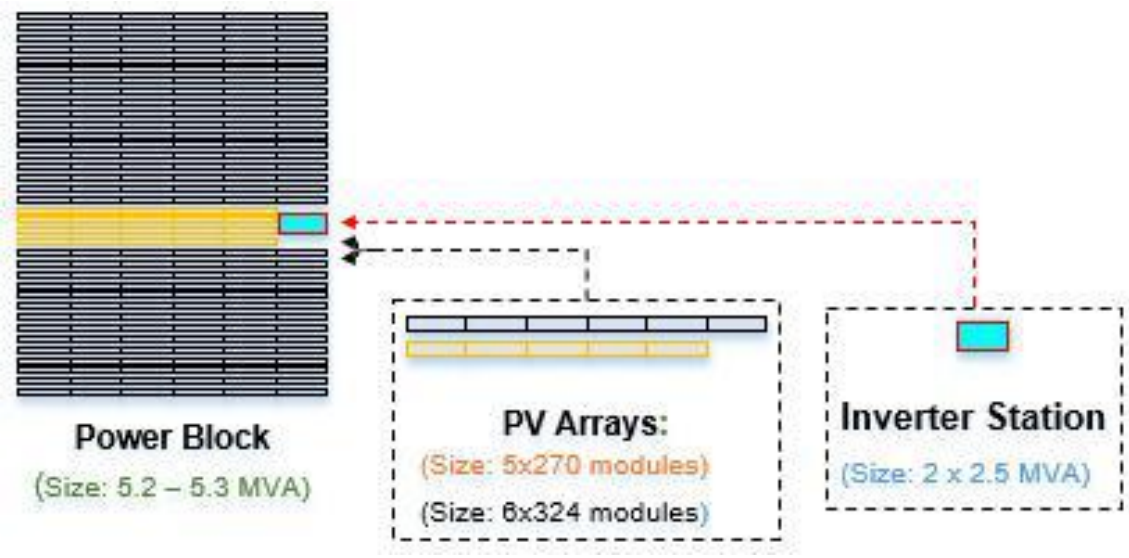
The placing of the wind turbines will be in clusters to avoid identified sensitive zones. Each WTG generator housing will require aviation safety lighting with a white colour scheme on the entire wind turbine frame.

Figure 5: Photographs of similar turbines (existing turbines Lüderitz – Ombepo Project)

Solar PV array

The three solar PV (SPV) fields will cover up to 325 ha to provide up to 100MW.

Each SPV field will have 25 power blocks, each will be a 5 MVA (2 x 2.5 MVA inverters) Medium Voltage (MV) Power Station (Figure 6).



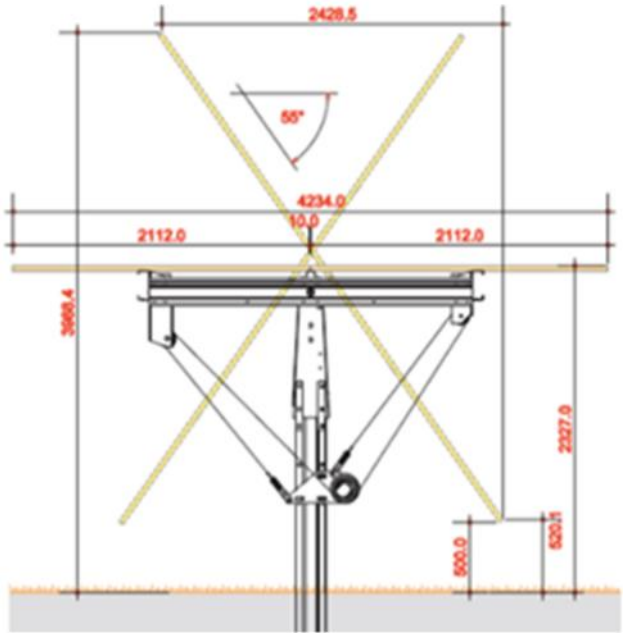


Figure 6: Solar PV layout and details (source: NWP – Rosh Pinah EISA information list, solar installation)

The SPV array will be mounted on single-axis trackers of approx. 2.5m height with an open space between panels of approx. 7.6m to allow for vehicle access (Figure 6). Each tracker will accommodate up to six (6) panels.

2.3 INFRASTRUCTURE

The electrical power produced from each wind turbine will be transformed to 33 kV and evacuated to the new site substation via an underground internal electrical grid system.

A new 33kV/66kV substation will be built on the project site.

The existing 66 kV Namib-Obib transmission line is a wooden five-pole (Kamerad) structure of 13 m high and span length ~200 m and runs parallel to the site from the north-west (at the Namib Substation near Lüderitz) to the south-east at Skorpion Mine (Obib substation).

A new 66kV transmission line will be constructed from the new 33kV/66kV project substation up to the existing Obib Substation, which will follow this existing 66kV transmission line route (Figure 7). The new transmission line tower structure will consist of:

- Monopole steel frame, 17.4 m high (approx.).
- Conductors at 13 m and 15.2 m.
- A span of 180 m between structures.
- Four (4) stay wires per pole.

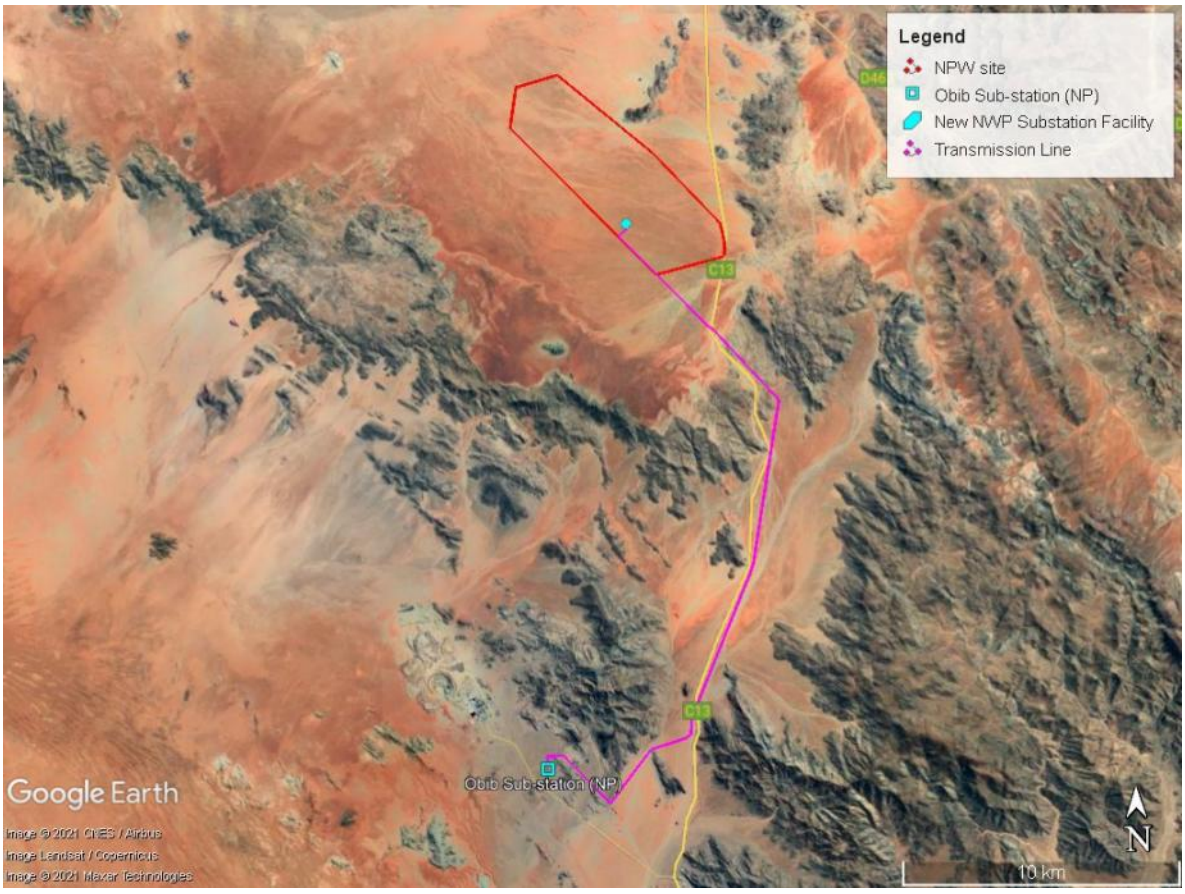


Figure 7: Transmission line corridor.

A new 19 kV SWER line (single wire earth return) of 6 - 7 km may be required to supply the farmhouse.

On site, simple gravel roads to and within the Project site will be sufficient for the construction and maintenance of the project. The roads will be constructed according to the road requirements given by the manufacturer of the specific wind turbine to accommodate movement of special vehicles only on prepared road areas. This will include existing tracks that will be upgraded for use.

At each wind turbine a 35m x 50m crane pad will be required, falling under the overall footprint.

A construction laydown area and construction administration facility of 100,000 m^2 will be required, with a 10,000m^2 parking area. No accommodation will be allowed on site and personnel will be transported by bus. Rosh Pinah will be able to provide the necessary accommodation or services for temporary accommodation facilities.

No fencing is foreseen except for the security fence around each solar PV field, the site substation and facilities (300m x 300m).

Sewage will be managed with a 6m^3 conservancy tank during construction and a 3m^3 conservancy tank that will be regularly pumped and discharged at a formal sewage facility.

An estimated total of 35 kilo m^3 of water is required during construction and 1 kilo m^3 per annum during operation. Water will be store in two 10m^3 tanks on site. Water will be used in the cleaning process of the Solar PV panels.

2.4 PROJECT TIMELINE

The wind park component of the project will be constructed over a period of at least twenty (20) months. It is envisaged to start with construction towards the fourth quarter of 2022. The operational life cycle of the project is 25 years.

2.5 CONSTRUCTION AND OPERATION PROCESS

The construction process will be as follows:

- The roads and platforms (hardstands) for the wind turbines will be constructed first, then followed by the turbine and crane foundations.
- The components of the wind turbines, as depicted in Figure 8 below, will be transported to site from the Lüderitz harbour.
- The tower sections will be assembled on site.
- The nacelle will be installed on the top of the tower and the rotor with blades will be connected to it.
- The substation buildings and storage facilities, followed by the internal cabling will also form part of the construction scope of works, and will be completed parallel to the construction of the turbines.

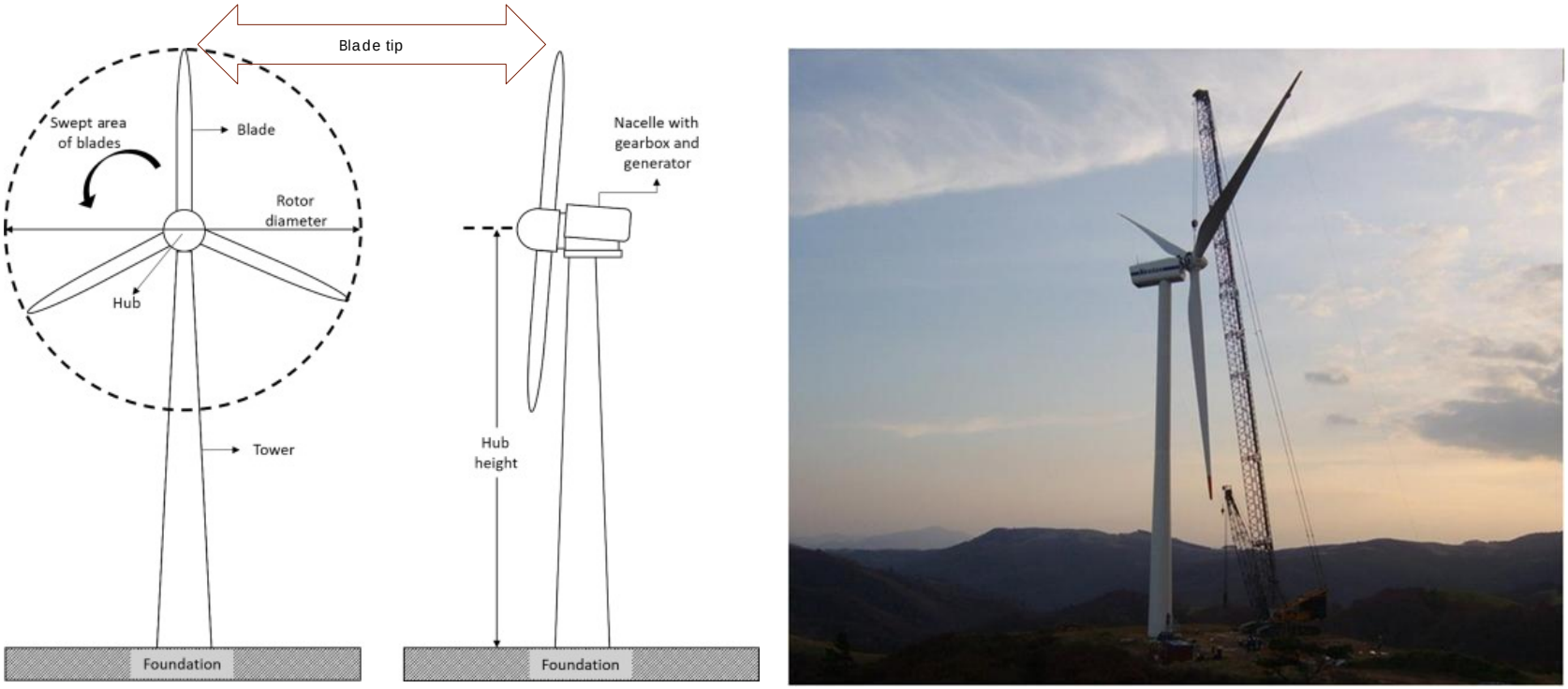


Figure 8: *Parts of Wind Turbine Generator (https://www.sciencedirect.com/topics/engineering/horizontal-axis-wind-turbine) (left; Wind Turbine Installation (right)*

These steps will take place in parallel, such that commissioning can commence when the turbines have been erected.

NamPower estimates that the project will require the following:

- One 600~700-tonne main crawler crane and 2 or 3 hydraulic crane (50 to 100 tons).
- Heavy equipment such as excavators, bulldozer, graders, compactors, and trailers are required during construction and transportation.
- A site layout depicting the typical components on the terrain will be provided during the ESIA process.
- An overhead 19kV single phase SWER power line will be built from the substation to the homestead on the Farm Witputz.
- The new 66 kV transmission line will run parallel to the exiting one from site to the Obib substation, but the exact route will be considered during the ESIA.
- Once the wind turbines have been constructed and the overhead transmission line is built, and the electrical equipment at the site substation (power transformers, switchgear, protection and metering panels, etc.) has been installed, commissioning works will commence.
- The decommissioning phase of the project, which is theoretically after the planned life span of the project, i.e. 25 years, will consist of the removal of the project components described above, involving the disassembly of the turbines, transporting them to a designated disposal site/to a destination for recycling, and removal of all the buildings, transmission line, etc. on site. It also involves administratively closing off the project and changing/ending the contracts with the employees. The final criteria and requirements for the decommissioning is best determined at that time in order to make a better assessment of the conditions and technologies available at that stage.

2.6 THE WORKFORCE

Depending on the construction progress, the number of people involved in the construction will vary between 70 to 150 people during the construction phase of which 70% will be unskilled workers. Unskilled and semi-skilled labour will be drawn from the local community, as well as the region, if local resources are not available.

It is estimated that about eight (8) people will be required for the normal Operation and Maintenance (O&M) period of the wind power plant, which is expected to occur for a minimum period of 25 years.

The NamPower (NP) Contractor Management SHEW Requirements Procedure will form part of the EPC contract during construction and operation of facility.

2.7 PROJECT ASPECTS COVERED BY THIS ESIA

The ESIA will address the following facilities that will required on the site:

- The internal access and service roads;
- The transmission line from the site up to the Obib substation;
- The internal transmission network;
- The platforms and foundations for the wind turbines;
- The wind turbines;
- The Solar PV fields and facilities.
- The substation, office and storage facilities on site;
- Water and sanitation facilities for all phases;
- Waste management for all phases;
- The construction processes and resources required; and
- The movement of goods and materials to the site.

The ESIA considers the construction and operation phases of the project. It also includes some consideration to the decommissioning phase, but this phase needs to be more fully developed as the ECC is renewed for a more comprehensive and updated plan for decommissioning.

3 PROJECT ALTERNATIVES

This chapter explains the alternatives to the project and alternatives within the project. Alternatives to the project, which would satisfy the demand for power, involve alternative power generation projects. Within the project there are alternative sites considered, as well as various technology options. These are being discussed in this section.

3.1 NO-PROJECT ALTERNATIVE

Should NamPower opt to keep the status quo, not generating the planned power, and remain dependent on Namibia's power demand from South Africa, the following consequences may be expected:

- South Africa may not be able to deliver Namibia's power demand into the future, causing a power deficit in the country.
- Such a deficit in turn would hamper development and make Namibia unattractive as an investment destination, negatively influencing socio-economic growth.
- Namibia will have little control over future price increases, whereas local generation of power has a better prospect of remaining relatively affordable.

It is therefore necessary and desirable that power be generated locally.

3.2 ALTERNATIVE POWER GENERATION TECHNOLOGIES

As explained in Section 2, NamPower desires to allow for a portion of the power it generates, to be from the renewable energy mix. Various technologies are being considered as part of the energy mix, but should NamPower exclude renewable energy as an option, then the following consequences would ensue:

- NamPower would forfeit the opportunity to utilise the readily available renewable wind and solar resources in Namibia.
- The country would have to develop more non-renewable energy projects, which would cause a comparatively much larger carbon footprint and contribution to the depletion of non-renewable resources. Non-renewable projects such as coal fired power stations, have comparatively more significant impacts on the environment. Non-renewable resources are not available in Namibia and need to be imported.
- Developing countries are increasingly facing an energy crisis. Internationally, solar and wind as renewable energy generation options are being promoted for such countries and are considered to be superior

environmentally to conventional non-renewable projects. The estimated coefficient of wind energy on carbon emissions is significant, and its impact of carbon emissions is positive.[1] A carbon footprint study was done for the proposed NamPower Lüderitz Wind Power Project (Tarr-Graham, 2021 which indicated that the carbon footprint for the project itself is negligible and that it would improve the carbon balance of Namibia. Similar results are expected for this project.

3.3 NAMPOWER MACRO LEVEL SITE ALTERNATIVES

In order to ensure that the location was suitable for the project a 2018 Site Selection Report, Appendix A, considered the wind resource at various locations in Namibia.

The criteria used to evaluate suitability for wind generation are presented in Table 2:

Table 2: Site evelation key criteria

	Key Criteria	Description	Weight
1	Wind Resource	Does the potential site have a good wind resource? Score is allocated based on the estimated capacity factor calculated from a typical Wind Turbine Generator (WTG) characteristic where the annual energy produced is calculated on the basis of the mean wind speed and the shape factor of the Weibull[2] Distribution (see Appendix A, Page 15 for scores)	0.35
2	Peak Generation	A binary approach was followed for these criteria: Does the site's peak production months fall between June to August? If yes, a score of 1 is allocated, if not, zero points are allocated.	0.25

[1] https://www.hindawi.com/journals/mpe/2021/3399049/?utm_source=google&utm_medium=cpc&utm_campaign=HDW_MRKT_GBL_SUB_ADWO_PAI_DYNA_JOUR_X&gclid=CjwKCAiAv_KMBhAzEiwAs-rX1lyfBPwH4bIqKikUmi01tLnmqEkKJQ3ux0H0XGJHbULWwrozTsFrjBoCSMkQAvD_BwE

[2] The Weibull Distribution determines the probability that a given wind speed value will occur over a given period.

3	Transmission Interconnection	The following factors are allocated equally to the scoring: distance from existing substation, evacuation capability, availability of fibre for Supervisory Control and Data Acquisition (SCADA) control.	0.1
4	Environmental Impact	Is the potential site located in a sensitive environmental area? Potential impact on the environment and the sensitivity of the environment to wind turbines, especially birds and bats or other endangered species.	0.2
5	Land availability and location	Is the potential site located in a protected area or mining area or on commercial farm land? Is there an existing suitable road infrastructure to site and distance to nearest port?	0.05
6	Proximity to airport	Is the potential site located close to an existing airport? (Due to hub-height of modern wind turbines, a wind farm close to an existing airport could potentially not be approved).	0.05

Fifteen (15) potential wind sites were identified. Two (2) sites were identified as fatally flawed based on sensitive environmental areas as well as being key tourist destinations.

Elizabeth Bay was identified as the preferred site, with a score of 5, and is being investigated by NamPower as another possibility for the erection of wind turbines. The current location at Rosh Pinah is ranked third (3rd) and was scored at 4.3. Although Aus North ranked second (2nd), with a scoring of 4.5, from the desktop study the site access was confirmed to be extremely difficult during the site visit conducted, and roads construction, transmission lines would make is prohibitively expensive. Consequently, NamPower opted to investigate the Rosh Pinah site rather than the Aus North site. The Rosh Pinah site would also serve as a good supplementary source to the Elizabeth Bay Site, because of its capacity to generate electricity during the winter season (peak times).

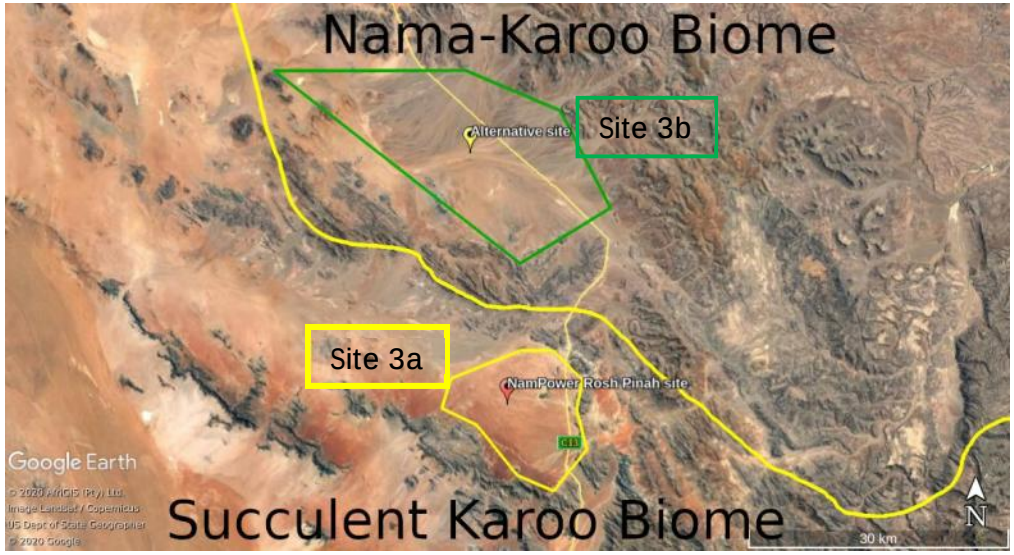
The current ESIA process considers the environmental impact criterium in further detail.

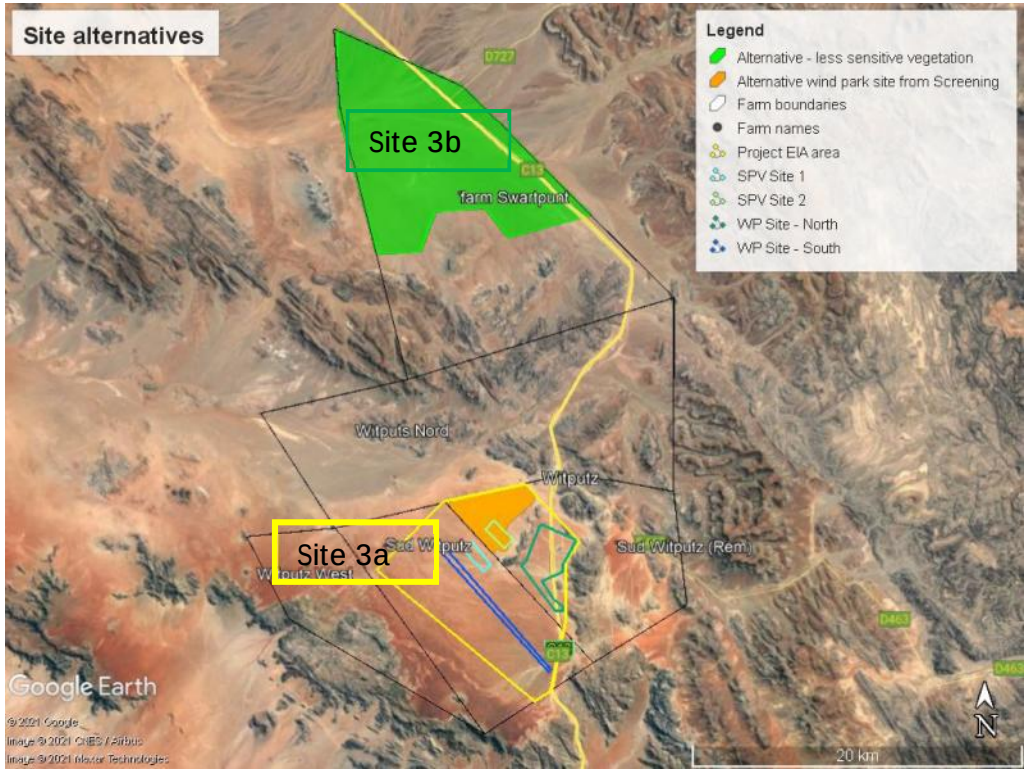
3.4 MICRO LEVEL SITE ALTERNATIVES

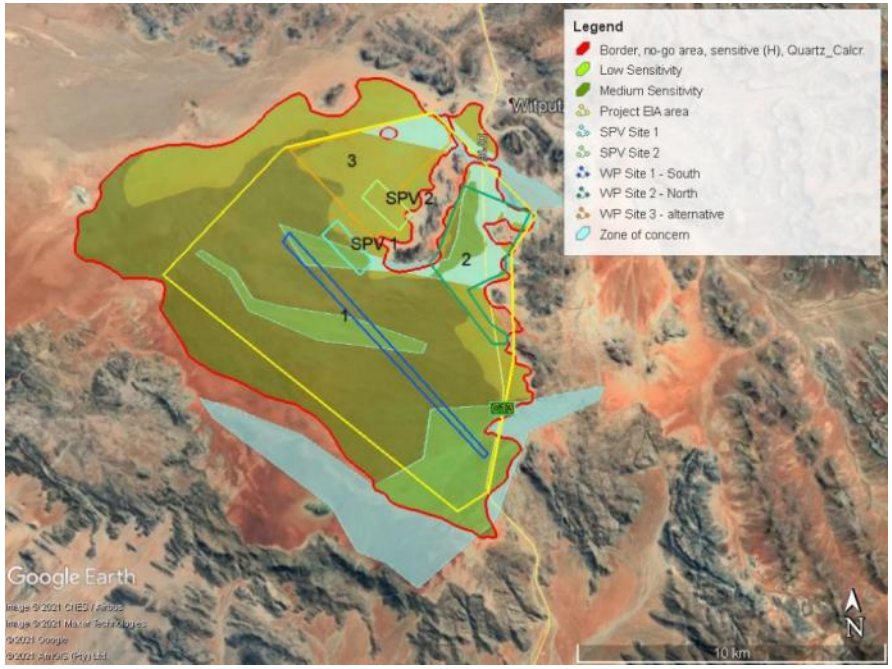
As explained in the screening report (Enviro Dynamics, 2021) and in the project description, Section 2, NamPower put forward two potential sites in the Witputz area for the establishment of the wind park. Upon finalising the screening

process, the ESIA team recommended that a third site, located north of the original two be considered. All three (3) sites are located on two adjacent farms. The site selection process in relation to the ESIA process can be described as follows in Table 3.

Table 3: Site alternatives considered throughout the ESIA process.

Phase	Work done and alternative sites considered	Outcome
Screening Desk study	Cursory investigation into the affected biome, habitats and sensitivities of the area. Figure 9 shows an alternative site recommended to move the project out of the Succulent Karroo Biome.  Figure 9: Initial alternative site recommended outside of the Succulent Karroo Biome	• An Alternative site North of original NamPower sites put forward as an initial alternative (Site 3b verses the original Site 3a, Figure 9), due to the biodiversity sensitivity of the southern area (falls within the Succulent Karoo Biome compared to the alternative site which falls within the Nama-Karoo Biome, a much less sensitive area (see Section 5.6). • The northern alternative cannot be considered as an option, since the wind power density, according to NamPower's satellite data source, is too low to be feasible (See Figures 14 and 15 below). (Note: the wind generation capacity in the project area is already marginal, and considered as a supplementary source, therefore the best wind density in the area is very important.)

Phase	Work done and alternative sites considered	Outcome
Screening Desk study	Desk studies on vegetation, fauna, bats, and birds done.  Figure 10: Alternatives considered during screening	• Following the rejection of the northern site, the team continued investigating the southern sites (within Site 3 a, Figure 10) provided by NamPower. • During the screening phase, the desk study provided an alternative localised site to be investigated, which at the time was preferable from a bird impact point of view. At the time of investigation, the habitat of the southern site seemed the least sensitive of the three original sites and was the most preferred from that perspective.
Scoping study	Baseline fieldwork of flora, full baseline desk study of fauna, and further baseline fieldwork	Discussed in this report (Section 5). Sensitivity zones determined for habitats to avoid sensitive habitats for

Phase	Work done and alternative sites considered	Outcome
	of birds, and the baseline fieldwork for archaeology done in addition to the above work. Figure 11 shows the sites and their sensitivities as identified once the above fieldwork was completed. (The original site identified by NamPower, Site 3 which formed part of a national site investigation, is the entire area in Figure 11. Alternative local areas have been located within this broader initiation area, labelled Sites 1, Site 2 and Site 3)  Figure 11: Sensitivities adapted during Scoping phase	fauna and flora, as per Figure 11 below. Archaeological sites were identified, and the impact is low across the entire area.
Site selection	The final site selection is described in Section 7of this report following the above work and considering commercial, technical and financial aspects.	The final site selection is described in Section 7 of this report and will be used as basis for developing further

Phase	Work done and alternative sites considered	Outcome
		refinements, a more detailed project description and impact assessment.

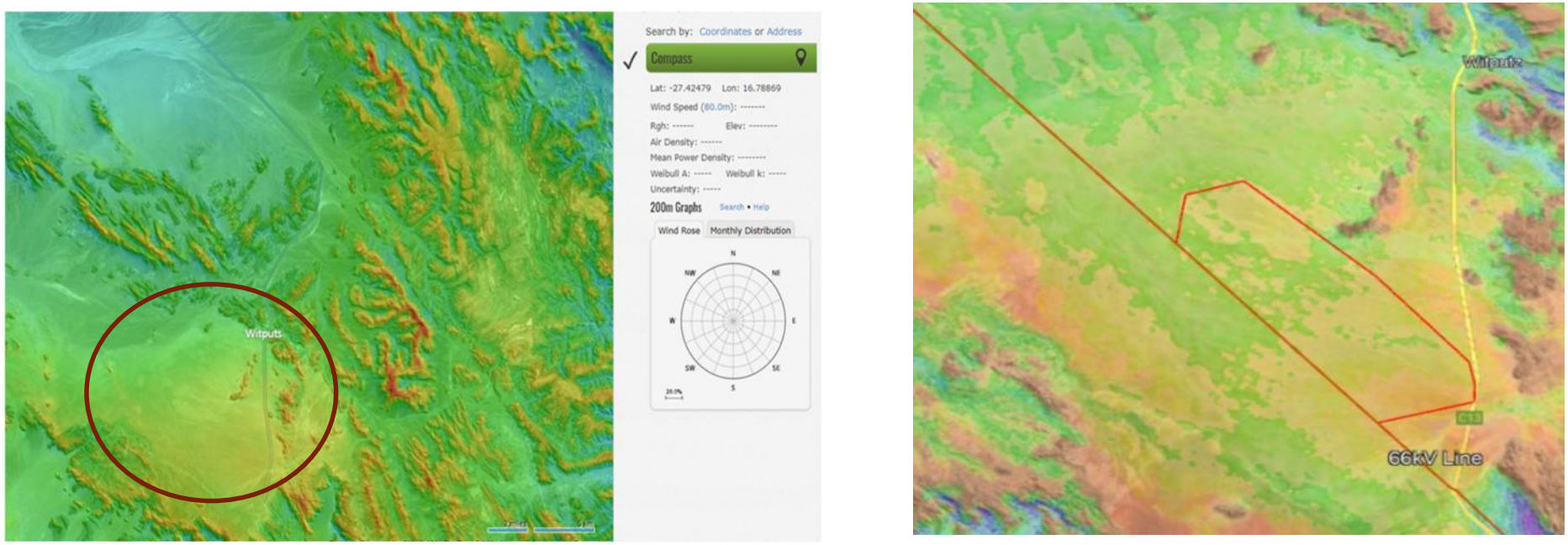


Figure 12: Wind density map of the Witputs area (left) and of the site (right) (Source: NamPower).

3.5 ALTERNATIVE WIND AND SOLAR TECHNOLOGIES

There are alternative wind and solar technologies such as solar panel and wind turbine alternatives. These are being and will finally be selected based on their expected technical performance in local conditions. Optimised technical performance will also have a positive environmental outcome since resources will be optimised.

4 LEGAL REQUIREMENTS AND RELEVANT STANDARDS

This section contains a summary with the salient legal implications of the project and includes information on the environmental and social legal requirements of applicable international funding and lending agents, focusing on the international principles they ascribe to, provided in Table 5 below.

4.1 NAMIBIAN LEGAL REQUIREMENTS

Table 4: Namibian legal and policy requirements

LEGISLATION/GUIDELINE/ POLICY	RELEVANT PROVISIONS	APPLICATION TO PROJECT
NATIONAL LEGISLATION AND GUIDELINES		
Environmental Management Act (7 of 2007)	• Requires that projects with significant environmental impact are subject to an environmental assessment process (Section 27). • Requires for adequate public participation during the environmental assessment process for Interested and Affected Parties (IAPs) to voice their opinions about a project (Section 2(b-c)).	Conduct public participation as part of the EIA process as described in the Act.[3]
EMA Regulations GN 28-30 (GG 4878) (February 2012)	Listed activities requiring an Environmental Clearance Certificate (Annexure): • The generation of electricity 1) (a) • The construction of facilities for the transmission and supply of electricity 1) (b) • The manufacturing, storage, handling or processing of a hazardous substance defined in the hazardous Substances Ordinance, 1974. 9) (1) • The storage and handling of dangerous goods, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic meters at any one location 9) (4) • The construction of masts of any material or type and of any height,10) (1) j	• Conduct public participation as part of the EIA process as described in the EMA's EIA Regulations • Conduct an EIA which covers all the components of the project which are listed in these regulations.
Electricity Act 4 of 2007	• Establishes the Electricity Control Board (ECB) for the provision of electricity and assurance of competitiveness in the industry and to promote private investment in the industry. • The Minister, through the ECB, issues licences with conditions on which electricity may be provided, (Section 20: 6) to 8)).	NamPower requires licences from the ECB for the generation, transmission, supply, distribution, and export of electricity (Section 17).

[3] The term "EIA" is used in the Namibian legislation. ESIA is the term used in the World Bank requirements and the latter term has been adopted for this study.

LEGISLATION/GUIDELINE/ POLICY	RELEVANT PROVISIONS	APPLICATION TO PROJECT
	• Requires that any generation and or distribution complies with laws relating to health, safety and environmental standards (s 18(4)(b) • In the event that exemption from acquiring a licence is granted, the Minister may impose conditions relating to public health safety or the protection of the environment, (Section 18:11b)) • Section 21 specifies that the licences should consider activities, which may adversely affect, or result in damage to the environment or rights of others, weighed against the advantages in general that would be derived from such application. The Minister or Board is empowered to request an EIA indicating: o The potential damage to or pollution of the environment and any steps taken by the applicant to minimise such damage and in terms of legislation, (Section 21: 2) a)), and o Take into consideration whether the granting or refusal of the application in question is in public interest Section 21: 2) b) iii) [4]	The license from ECB obliges NamPower to comply with all relevant provisions of the EMA and its regulations. NamPower to submit an EIA with its licence applications to the ECB, showing anticipated environmental impact, their significance and how NamPower intends addressing these impacts, as well as considerations to benefits vs costs for the country.
National Energy Policy, 2017[5]	Namibia's direction regarding the development and future of Namibia's energy sector Aims to: "ensure the development of Namibia's natural capital and its sustainable use for the benefit of the country's social, economic and environmental wellbeing", and it is an expression of Government's official energy-related position and strategic intent." For the electricity sector, the key policy thrusts are "the development of local generation capacity to improve security of supply through appropriate planning at national level, reviewing the present electricity market model, ensuring the on-going viability and development of the transmission and	

[4] Further details regarding the application of electricity distribution licences may be found in the act https://laws.parliament.na/cms_documents/electricity-9695853eda.pdf

[5] http://www.mme.gov.na/files/publications/fd8_National%20Energy%20Policy%20-%20July%202017.pdf

LEGISLATION/GUIDELINE/ POLICY	RELEVANT PROVISIONS	APPLICATION TO PROJECT
	distribution networks, strengthening the regulatory framework, and shaping the electricity mix of the future.'' • It recognises Namibia's wind potential - mostly along the country's coastline, which are useful for electricity generation. It states that commercial use of this resource is envisaged to commence soon. It adopts Goal 7 of the Sustainable Development Goals (SDGs) namely to ''ensure access to affordable, reliable, sustainable and modern energy for all.''	
National Renewable Energy Policy (2017)[6]	• To ''enable access to modern, clean, environmentally sustainable, and affordable energy services for all Namibians. • To make Renewable Energy a powerful tool for the Government to meet its short-term and long-term national development goals... • To make Namibia a regional leader in the development and deployment of Renewable Energy within southern Africa.	
Labour Act 11 of 2007	The Health and Safety regulations GN 156/1997 (GG 1617) to this act prescribe conditions at the workplace, and inter alia deal with the following: • Welfare and facilities at work-places, including lighting, floor space, ventilation, sanitary and washing facilities, usage and storage of volatile flammable substances, fire precautions, etc.; • Appointment of a Safety Officer (Section 6); • Hazardous Substances including precautionary measures related to their transport, labelling, storage, and handling. Exposure limits, monitoring requirements, and record keeping are also detailed (Section176-195);	These regulations prescribe Health and safety issues at the workplace, including construction and electrical safety.

[6] http://www.mme.gov.na/files/publications/03f_National%20Renewable%20Energy%20Policy%20-%20July%202017.pdf; the Policy has been drafted after taking cognizance of policies and legal instruments that are currently under development, particularly the Draft Electricity Bill; Draft Namibia Energy Regulatory Authority Bill; and the Draft Independent Power Producer (IPP) Market and Investment Framework, 2016

LEGISLATION/GUIDELINE/ POLICY	RELEVANT PROVISIONS	APPLICATION TO PROJECT
	• Physical hazards including noise, vibration, ionizing radiation, non-ionizing radiation, thermal requirements, illumination, windows and ventilation; • Requirements for protective equipment (Section 210-217); and • First aid and emergency arrangements (Section 228-242) • Sections 32 and 38 of the Act deal with overtime requirements, and persons living at the place of employment. • Sections 38 and 41 provide for the responsibility to ensure public and worker safety.	
The Hazardous Substances Ordinance 14 of 1974	Provides for the control of substances which may cause ill-health to human beings because of their toxic, irritant, strongly sensitizing or flammable nature or the generation of pressure. It also provides for the control of electronic products (contains or acts as part of an electric circuit, and emits electronic product shielding. Regulates the respective classes of hazardous materials.	
Forestry Act No 27 of 2004	Provision for the protection of various plant species.	Some species that occur in the area are protected under the Forestry Act.
National Heritage Act No 27 of 2004	• To provide for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. • Establishes a body to govern matters relating to places and objects of heritage significance – National Heritage Council. • Establishes a National Heritage Register.	• All heritage resources are to be identified and either protected or removed/mitigated with a permit from the National Monuments Council, before any development may take place • A heritage assessment was undertaken as part of the EIA process.
The atmospheric Pollution Prevention Ordinance 11 of 1976 (revised in 2006)	• Provides for the prevention of pollution to the atmosphere and for matters incidental thereto. The entire country is a controlled area for the purposes of the Ordinance (GN 309/1976)	• There will only be dust during construction of the wind project, and the project is located at least 2,5 km away from the nearest farm owner. Dust control measures are to be included in the ESMP.

LEGISLATION/GUIDELINE/ POLICY	RELEVANT PROVISIONS	APPLICATION TO PROJECT
	• Part 1V deals with dust – any person carrying on an activity which is liable to cause a nuisance to persons residing in the vicinity or to cause dust pollution to the atmosphere shall take steps to prevent such dust.	
Roads Ordinance 12 of 1972	• Provides for the establishment of the Roads Authority • Provides for standards for the construction of roads, access, etc. (Section 63)	• Proposed road designs and accesses to be submitted to the Roads Authority. • A traffic impact assessment was done as part of the ESIA.
Public Health Act 36 of 1919 and amendments	• Provisions for the prohibition of nuisance (Section 122) to prevent infectious disease; sewerage facilities to be constructed to avoid danger to health; prevention of pollution of water sources, prohibition against overcrowded dwellings, with adequate lighting and ventilation general prevention of disease. Dwelling and buildings to be construction according to prescribed standards of the authorities (in this case the Ministry of Health and Social Services) and a health certificate is required in this regard.	• Health Certificate from the Ministry of Health and Social Services (area falls outside the jurisdiction of the Rosh Pinah Local Authority)
The Minerals (Prospecting and Mining Act) 33 of 1992	• Particularly Section 67 describes the rights of holders of EPLs, namely to carry out a) prospecting operations in the prospecting area to which such licence relates; and b) to "remove any mineral or group of minerals other than a controlled mineral or sample…, for any purpose other than sale or disposal, from any place where it was found or incidentally won in the course of prospecting operations …to any other place within Namibia"	• The area needs to be investigated for the presence of any EPLs. NamPower needs to be in contact with the EPL holders to ascertain how the proposed project may affect the EPL activities there.

4.2 PROTECTED AREAS

The site does not fall within a protected area but lies very close to the border of the Tsau//Khaeb National Park. Although there are no direct legal obligations, the biodiversity principles that are applicable to the Park would also apply to and benefit the site, because the biome, habitat and biodiversity sensitivities are similar. Furthermore, there are linkages with the adjacent mentioned park and the /Ai-/Ais-Richtersveld Transfrontier Park to the east, in terms of wildlife movement. The impact of the project on these linkages need to be investigated.

4.3 INTERNATIONAL STANDARDS AND GUIDELINES

4.3.1 WORLD BANK GROUP ENVIRONMENTAL, HEALTH AND SAFETY GUIDELINES FOR WIND ENERGY[7]

The document provides Environmental, Health and Safety Guidelines for industry specific projects. This should be used in combination with the general World Bank Health and Safety Guidelines, which are also applicable. These sector specific and general guidelines should be used when the ESIA is conducted and the Social and Environmental Management Systems (SEMSs) are designed.

The Environmental, Health and Safety Guidelines for Wind Energy were updated in August 2015 and bear relevance on the project in the following way:

- In terms of biodiversity value, consideration is to be given of the proximity of the facility to sites of high biodiversity value in the region. From a vegetation perspective, the site is situated in the Succulent Karroo Biome, which is a biodiversity hotspot. This aspect was considered during the ESIA process.
- Pre-construction assessments should include a scoping and desktop study of biodiversity issues. This stage is used to identify habitats and species of concern to be included in further work. These specifications have been met by the fauna and flora specialists.
- This is to be followed up with appropriate baseline biodiversity surveys, and stages as early as possible. Studies should usually be considered for a period of at least one year where at-risk wildlife is identified. Such species are being considered in this study (see 5.7 and 5.9).

[7] *https://www.ifc.org/wps/wcm/connect/b82d0563-b39a-42a7-b94e-0b926b4a82f9/FINAL_Aug%2B2015_Wind%2BEnergy_EHS%2BGuideline.pdf?*

- Bats form a particular biodiversity concern and is covered in an acoustic study of one year and specialist impact assessment after a site survey.
    - Impact on viewscapes (visual Impact) should be considered (this requirement is reported on in Section 5.3 of the baseline description and is included in the impact assessment (Section 7).
    - Impacts cultural heritage, in this case archaeological finds, must be recorded (Section 5.10)
    - Noise impact should be considered, although at a preliminary level this impact on receptors is expected to be low due to the remote locality of the site (see further explanation in Section 5.11.6.
    - Traffic and abnormal traffic load issues should be considered (See Section 5.11.5).

The other guidelines in this publication have been scrutinised and the relevant ones should be incorporated into the ESMP for the project.

4.3.2 WORLD BANK ENVIRONMENTAL AND SOCIAL FRAMEWORK (WORLD BANK, 2018)

The Environmental and Social Framework (ESF) enables the World Bank and Borrowers to better manage environmental and social risks of projects and to improve development outcomes. The ESF consists of the following:

- the World Bank's Vision for Sustainable Development
- the World Bank's Environmental and Social Policy for Investment Project Financing (IPF), which sets out the requirements that apply to the Bank
- the 10 Environmental and Social Standards (ESS), which set out the requirements that apply to Borrowers
- Bank Directive: Environmental and Social Directive for Investment Project Financing
- Bank Directive on Addressing Risks and Impacts on Disadvantaged or Vulnerable Individuals or Groups

The ten (10) Environmental and Social Standards[8], are the following (Table 5):

8 https://www.worldbank.org/en/projects-operations/environmental-and-social-framework/brief/environmental-and-social-standards

Table 5: Summary of ESF of the World Bank and their applicability to the Rosh Pinah Wind and Solar Project

ESS No	ESS Name	Objectives	Applicability to this project
ESS1	Assessment and Management of Environmental and Social Risks and Impacts	• To identify, evaluate, and manage the environment and social risks and impacts of the project in a manner consistent with the ESSs. • • To adopt a mitigation hierarchy approach to: (a) Anticipate and avoid risks and impacts; (b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; (c) Once risks and impacts have been minimized or reduced, mitigate; and (d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible. • To adopt differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable, and they are not disadvantaged in sharing development benefits and opportunities resulting from the project. • To utilize national environmental and social institutions, systems, laws, regulations, and procedures in the assessment, development, and implementation of projects, whenever appropriate. • To promote improved environmental and social performance, in ways which recognize and enhance Borrower capacity.	Yes, ESIA and ESMP completed to fulfil these objectives. Project Proponent to include an Environmental and Social Commitment Plan (ESCP) with their contract with the Bank. Gaps between national legislation and ESS requirements listed below.
ESS2	Labor and Working Conditions	• To promote safety and health at work. • To promote the fair treatment, non-discrimination and equal opportunity of project workers. • To protect project workers, including vulnerable workers such as women, persons with disabilities, children (of working age, in accordance with this ESS and migrant workers, contracted workers, community workers and primary supply workers, as appropriate. • To prevent the use of all forms of forced labor and child labor. • To support the principles of freedom of association and collective bargaining of project workers in a manner consistent with national law. • To provide project workers with accessible means to raise workplace concerns.	Yes. Ensure these standards are incorporated into the labour documentation and contracts. Generally this ESS is captured in local legislation. ESS 2, Section 9 states that "The Borrower will develop and implement written labor management procedures applicable to the project. These procedures will set out the way in which project workers will be managed, in accordance with the requirements of national law and this ESS. The procedures will address the way in which this ESS will apply to different categories of

ESS No	ESS Name	Objectives	Applicability to this project
			project workers including direct workers, and the way in which the Borrower will require third parties to manage their workers..."in accordance with ESS2.
ESS3	Resource Efficiency and Pollution Prevention and Management	• To promote the sustainable use of resources, including energy, water and raw materials. • To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. • To avoid or minimize project-related emissions of short and long-lived climate pollutants. • To avoid or minimize generation of hazardous and non-hazardous waste. • To minimize and manage the risks and impacts associated with pesticide use.	Yes. These principles are to be considered during the ESIA and ESMP. Namibian has limited regulations regarding pollution prevention and waste management. Specific guidelines are provided in the ESS 3 which will be included in the ESMP.
ESS4	Community Health and Safety	• To anticipate and avoid adverse impacts on the health and safety of project-affected communities during the project life cycle from both routine and non-routine circumstances. • To promote quality and safety, and considerations relating to climate change, in the design and construction of infrastructure, including dams. • To avoid or minimize community exposure to project-related traffic and road safety risks, diseases and hazardous materials. • To have in place effective measures to address emergency events. • To ensure that the safeguarding of personnel and property is carried out in a manner that avoids or minimizes risks to the project-affected communities.	Yes. To check specific community health and safety impacts and include specific and general principles and measures in the ESMP. The ESS compares well to the Namibian Health and Safety Regulations, but specific gaps e.g. traffic impact, and emergency events will be considered during the ESIA and ESMP as appropriate.
ESS5	Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	• To avoid involuntary resettlement or, when unavoidable, minimize involuntary resettlement by exploring project design alternatives. • To avoid forced eviction. • To mitigate unavoidable adverse social and economic impacts from land acquisition or restrictions on land use by: (a)providing timely compensation for loss of assets at replacement, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.	An initial assessment of the project and its site shows that the land acquisition process was voluntary, there is no land use restriction and no involuntary resettlement involved (there are no inhabitants on the land). See Section 5.11.

ESS No	ESS Name	Objectives	Applicability to this project
		• To improve living conditions of poor or vulnerable persons who are physically displaced, through provision of adequate housing, access to services and facilities, and security of tenure. • To conceive and execute resettlement activities as sustainable development programs, providing sufficient investment resources to enable displaced persons to benefit directly from the project, as the nature of the project may warrant. • To ensure that resettlement activities are planned and implemented with appropriate disclosure of information, meaningful consultation, and the informed participation of those affected.	
ESS6	Biodiversity Conservation and Sustainable Management of Living Natural Resources	• To protect and conserve biodiversity and habitats. • To apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity. • To promote the sustainable management of living natural resources. • To support livelihoods of local communities, including Indigenous Peoples, and inclusive economic development, through the adoption of practices that integrate conservation needs and development priorities.	The project is situated in an area of high biodiversity value, and before the specialist study, was considered potentially critical habitat, therefore a critical habitat assessment was done as part of the ESIA Vegetation Impact Assessment. The areas that are considered critical habitat were completely avoided during the final selection of the site. According to ESS6, the Borrower "will also identify and assess potential project-related adverse impacts and apply the mitigation hierarchy so as to prevent or mitigate adverse impacts from projects that could compromise the integrity, conservation objectives or biodiversity importance of such an area." The ESIA and ESMP have covered these requirements (Sections 5 and 7). Namibian legislation does not require a critical habitat assessment, therefore this requirement was added to the scope of work.

ESS No	ESS Name	Objectives	Applicability to this project
ESS7	Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	• To ensure that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/ Sub-Saharan African Historically Underserved Traditional Local Communities. • To avoid adverse impacts of projects on Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, or when avoidance is not possible, to minimize, mitigate and/or compensate for such impacts. • To promote sustainable development benefits and opportunities for Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities in a manner that is accessible, culturally appropriate and inclusive. • To improve project design and promote local support by establishing and maintaining an ongoing relationship based on meaningful consultation with the Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities affected by a project throughout the project's life cycle. • To obtain the Free, Prior, and Informed Consent of affected Indigenous Peoples/ Sub-Saharan African Historically Underserved Traditional Local Communities in the three circumstances described in the ESS. • To recognize, respect and preserve the culture, knowledge, and practices of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities, and to provide them with an opportunity to adapt to changing conditions in a manner and in a timeframe acceptable to them.	Defined as "a distinct social and cultural group possessing the following characteristics in varying degrees: (a) Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others; and (b) Collective attachment to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation, as well as to the natural resources in these areas; and (c) Customary cultural, economic, social, or political institutions that are distinct or separate from those of the mainstream society or culture; and (d) A distinct language or dialect, often different from the official language or languages of the country or region in which they reside." There are no such groups directly affected by the project because the site is remote with no inhabitants on the land. Since it is commercial farming area and as confirmed during consultation with the local community, there are no nomadic movements in the area that could be established or that are known to occur there. The only potential indirect impacts may result during an unfair recruitment process towards such groups, although Namibian legislation already prohibits such and particular recruitment processes - should be prescribed in the ESMP, as well as in the labor management plan (also see Section 5.11).

ESS No	ESS Name	Objectives	Applicability to this project
ESS8	Cultural Heritage	• To protect cultural heritage from the adverse impacts of project activities and support its preservation. • To address cultural heritage as an integral aspect of sustainable development. • To promote meaningful consultation with stakeholders regarding cultural heritage. • To promote the equitable sharing of benefits from the use of cultural heritage. • WBESS 8 Item 5(a) (World Bank, 2018) lists ''changes in the physical environment'' as a potential risk or impact on cultural heritage. • The project should consider WBESS 8 (World Bank, 2018) in terms of: • Direct, indirect, and cumulative project-specific risks and impacts on cultural heritage. • Avoid impacts, or if not possible, identify and implement measures to address impacts in accordance to the mitigation hierarchy. • Relevant mitigation hierarchy steps include, for example, project relocation, project footprint modification, in situ conservation or documentation. • The mitigation measures should fit a monitoring system, implementation schedule and implementation budget. • Implementing globally recognized practices for investigation, and meaningful consultation with relevant stakeholders.	Cultural heritage in the area was investigated (See Section 5.10). Cultural heritage is covered in Namibia under the National Heritage Act (2004)
ESS9	Financial Intermediaries	• To set out how the FI will assess and manage environmental and social risks and impacts associated with the subprojects it finances. • To promote good environmental and social management practices in the subprojects the FI finances. • To promote good environmental and sound human resources management within the FI.	This ESS applies to Financial Intermediaries (FIs) that receive financial support from the Bank. FIs include public and private financial service providers, including national and regional development banks, which channel financial resources to a range of economic activities across industry sectors. ESS 9 is not applicable to this project.
ESS10	Stakeholder Engagement and Information Disclosure	• To establish a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders and build and maintain a constructive relationship with them, in particular project-affected parties.	ESS10 is applicable to all projects funded by the WB. Key components are the Stakeholder Engagement Plan (SEP), set up to identify stakeholders and to disclose

ESS No	ESS Name	Objectives	Applicability to this project
		• To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be taken into account in project design and environmental and social performance. • To promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them. • To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format. • To provide project-affected parties with accessible and inclusive means to raise issues and grievances, and allow Borrowers to respond to and manage such grievances.	information to them during the ESIA in a meaningful way, in order to inform the ESIA process. It also provides for stakeholder engagement and feedback during the project implementation and operation phases. It also provides for a grievance mechanism to be set up during the construction and operational phases. The Environmental Management Act requires public consultation but does not require a SEP, and feedback during implementation and operational phases, or grievance mechanisms. The SEP for the ESIA process is included in the stakeholder engagement report and applicable requirements such as a grievance mechanism are included in the ESMP (See (See Section 6).

4.4 KREDITANSTALT FÜR WIEDERAUFBAU (KFW)

As a general rule, KfW bases the project assessment on the regulations that apply in the country in which the project is to be implemented. These regulations must be consistent with international environmental, social, health, safety and labour standards.

Other KfW requirements include:

- Guidelines on Incorporating Human Rights Standards and Principles, Including Gender, in Programme Proposals for Bilateral German Technical and Financial Cooperation.
- The Fundamental Conventions of the International Labor Organization (ILO).
- UN Basic Principles and Guidelines on Development-based Evictions and Displacement (namely §§ 42, 49, 52, 54 and 60) and guidance provided within the IFC Handbook for Preparing a Resettlement Action Plan (2002) and World Bank Involuntary Resettlement Sourcebook (2004). A preliminary assessment deems these guidelines not to be applicable, but this will be confirmed during the ESIA.

4.5 INTERNATIONAL CONVENTIONS

Table 6 below lists the key international conventions related to the environmental aspects of the project.

Table 6: International conventions related to the project

Agreement / Convention	Relevance	Namibian Status
	CLIMATE CHANGE / AIR QUALITY	
United Nations Framework Convention on Climate Change (UNFCCC), 1994	Control of greenhouse gas emissions.	Ratified 12/06/1992 Entry into force 16/05/1995
Vienna Convention for the Protection of the Ozone Layer, 1985	Protection of the ozone layer.	Acceded and entry into force 20/09/1993
The Montreal Protocol on Substances that deplete the Ozone Layer (UNEP), 1987	Control the production of ozone depleting substances.	Acceded and entry into force 20/09/1993
Kyoto Protocol to the UNFCCC, 1997	Greenhouse gas emissions targets.	Acceded and entry into force 04/09/2003

Agreement / Convention	Relevance	Namibian Status
Paris Agreement to the UNFCCC, 2015	Greenhouse gas emissions targets and climate change commitments	Ratified 21/09/2016
BIODIVERSITY / PROTECTED AREAS		
Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention), 1971	The conservation and sustainable utilization of wetlands, i.e. to stem progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. There is no such wetland in the project area.	Acceded 23/081995 Entry into force 23/12/1995
United Nations Convention on Biological Diversity, 1992	Promotes development of national strategies for the conservation and sustainable use of biological diversity. Overarching standard for preserving biodiversity in Namibia.	Ratified 12/06/1992 Entry into force 16/051997
SADC Protocol on Wildlife Conservation and Law Enforcement, 1999	Ensure the conservation and sustainable development use of wildlife resources	Entry into force 30/11/2003
CULTURAL HERITAGE		
Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO), 2003	Safeguard the intangible cultural heritage and ensure respect for the intangible cultural heritage of the communities, groups and individuals. All forms of heritage to be identified and protection ensured where relevant, on the project.	Ratified and entry into force 19/09/2007

Agreement / Convention	Relevance	Namibian Status
Convention on the Protection and Promotion of the Diversity of Cultural Expressions (UNESCO), 2005	Protect and promote diversity of cultural expressions, encourage dialogue among cultures and promote respect for cultural diversity.	Ratified and entry into force 29/11/2006
ENERGY		
SADC Protocol on Energy, 1998	Cooperation in the development of energy to ensure security and reliability of energy supply and minimisation of costs, and environmentally sound principles.	Entry into force 17/04/1998

5 ENVIRONMENTAL AND SOCIAL BASELINE

This section presented a summary of the bio-physical and social status quo of the project site and potentially affected surrounds. Table 3 indicates that an iterative process was followed to consider alternative sites. Initially, very brief investigations led to a screening process of the sites. At that stage the specialists used secondary information and what they knew from work done in the area.

During the scoping phase, a good measure of fieldwork had already been completed. Once the site was selected, refinement was done of work for the specific area. This section summarised the findings for the site selected.

5.1 BASELINE OVERVIEW

The proposed wind generation project site lies in the //Kharas Region which borders the Atlantic Ocean to the west and the Northern Cape Province of South Africa to the south. The Orange River defines this southern border and it is the most accessible water resource to the Rosh Pinah Town and the mines in the area. The Neckertal and Hardap dams are other viable water sources in the region, but they do not supply water to the immediate project area. Groundwater from boreholes in the region have low to very low potential in the region.

The region is predominantly a small stock farming area. Irrigation farming along the Orange River has increased significantly in the last two decades. The region also hosts the Lüderitz harbour, an important port for the export of refined and unrefined minerals.

The region is hyper arid with a low average rainfall and high temperatures. It receives most of its moisture from the coast in the form of fog originating across the Benguela Current. The Succulent Karoo Biome, a biodiversity hotspot, is maintained by this air movement from the coast. The proposed wind generation project site is near the Tsau//Khaeb National Park (Sperrgebiet) and the Richtersveld Transfrontier National Park (see Figure 1). It is also located along the tourist route to these parks.

The closest town to the site is Rosh Pinah, an unproclaimed mining town whose economy largely revolves around the two nearby mines, Skorpion Zinc and Rosh Pinah Zinc. Rosh Pinah Zinc is currently on care and maintenance and the town and region experiences an economic decline with a general deficit of job opportunities.

5.2 CLIMATE

The climate is extremely arid and the ecosystem is driven by southerly winds, which reach average speeds of approximately 20 km/h.

The technical report for this project (Site Selection Report: Appendix A) provide detailed information on the wind conditions. However, it is important to note the

effect of the wind conditions in the area, which is a dominant feature affecting the landscape.

The eroding power and practical limitations caused by the wind and resulting wind-driven sand cannot be ignored. Physical components of the project will likely be affected by this, and construction and operation working hours influenced by windy days. Other practical considerations include extra stringent measures to constrain waste and stockpiles on site.

Mendelsohn et. al. (2003) provides an overview of the area's climate. The area receives less than 100mm annual rainfall occurring mainly during the summer (October to February).

Due to the close proximity to the Atlantic Ocean and its cold Benguela current, fog is recorded between 50 to 75 days per year. The average maximum temperature ranges between 28 °C and 30 °C, with an average minimum temperature of 6 °C to 8 °C. The combination of climatic conditions creates an ecology which is generally very sensitive and susceptible to change.

The current state of air quality near the proposed area is very good. There are no sources of air pollution other than windblown dust and emissions from vehicles passing on the C13, and both are negligible.

Sensitivities related to climate

Table 7 below provides a summary of sensitivities related to climate in the study area:

Table 7: Sensitivities related to climate

SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
Aridity	High vulnerability of the area to surface disturbance with little resilience to withstand or adapt to change. High vulnerability of water sources to increased usage.	Increased pressure on local water sources, although the operational phase has a limited water demand. Long term or permanent surface disturbance and habitat modification.
Strong winds	Moderate vulnerability of equipment and infrastructure to winds.	Decreased lifespan and high maintenance requirements of equipment and infrastructure. Above average windblown debris and waste, and increased need for coverage of

		stockpiles, waste disposal areas, etc.

5.3 PHYSICAL GEOGRAPHY

5.3.1 VISUAL LANDSCAPE

A Visual Impact Assessment (VIA) was prepared for this ESIA (Appendix D) by Norman van Zyl, from which a baseline summary is presented in this section. The visual landscape towards the NWP wind and solar PV park and separately the transmission line, will determine the sensitivity of the potential viewpoints from which the wind park is visible. The visual landscape varies little for potential viewpoints and is described as:

1. pristine semi-desert features consisting of open plains with large vistas of medium mountain ranges with rock features; and
2. visible vegetation is limited with low stand and sparse thorn trees and quiver trees.

The potential viewpoints that were identified as sensitive receptors only occur along the C13 main road and two farm houses east of the NWP site. The C13 section exposed to the wind park is approximately 20.5 km.

The viewshed is therefore relatively short to the east as well as along the north-south axis of the C13, but especially long to the west, of the C13 (see Figure 13).

The north-south and east sight distances are fairly limited by the terrain curvature as well as mountain ranges.

The viewshed to the west is vast and sight distances of up to 70 km is possible. This is a high value view that is currently undisturbed.

The transmission line valley has a relatively short but imposing viewshed, in which the surrounding mountain terrain is dominant (Figure 13)

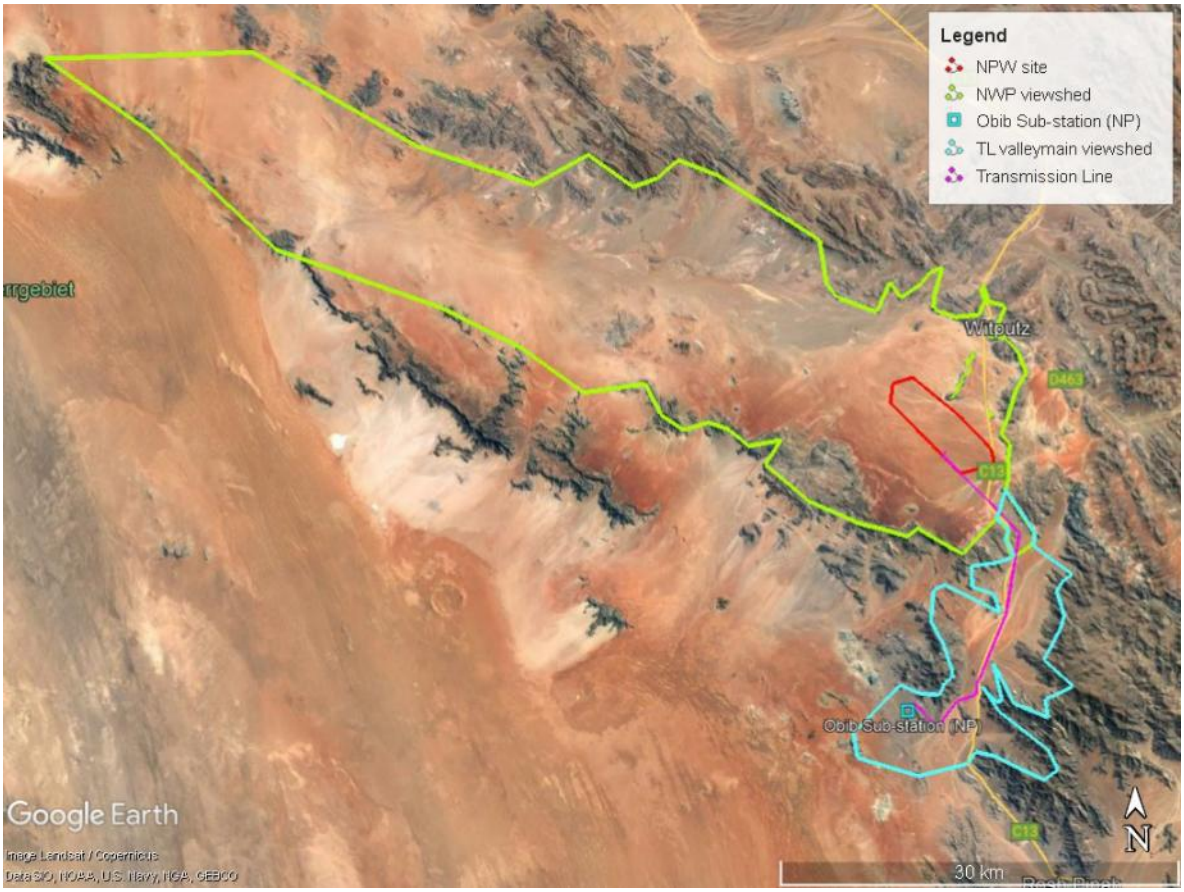


Figure 13: *Viewshed analysis*

A set of arbitrary viewpoints have been selected along the route to determine visibility as well as an estimate of view distance. The Viewpoint Catalogue was determined and discussed in Appendix 4 of the Visual Impact Assessment Report as well as the Scoping Report (Figure 14).

Figure 14 shows the selected viewpoint areas from which the wind and solar PV park and the transmission line will be potentially visible along the C13.

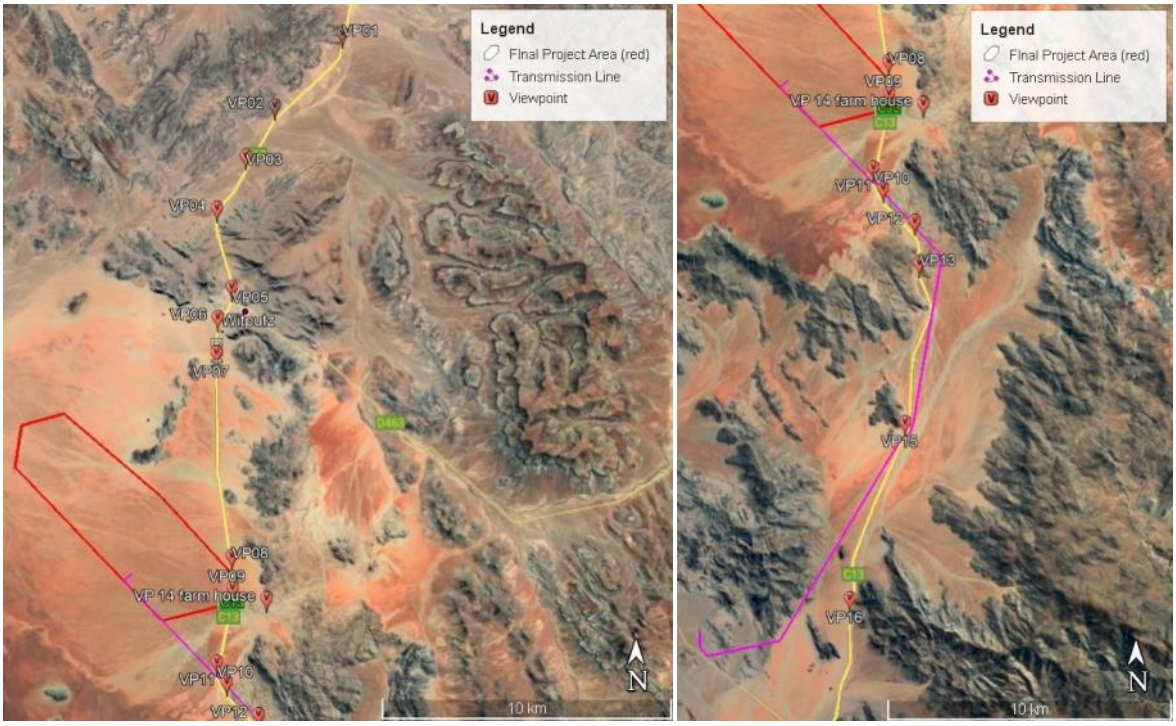


Figure 14: Areas of potential visibility

The various forms of scenery must be classified to understand the potential value of each type of scenery and provide a tool to determine what scenery is of importance.

The inventory is limited to:

1. the view from the potential viewpoints identified; and
2. sense of place due to meaningful panoramic views (Table 8 and Table 9 below summarises the types of sceneries and the classification of the NWP as well as the transmission line.

The Retention Class standard of the NWP requires that the element not rate lower than -2 in the VIA. This means that the project activity or element may be evident but should not attract attention and should remain subordinate to the existing visual resources. The project elements should repeat the form, line, colour, texture, scale, and composition characteristics of the visual landscape resource.

The Partial Retention Class standard of the transmission line require that the element not rate lower than -5 in the VIA. This means that the project activity or element may be evident and begin to attract attention but should remain subordinate to the existing visual resources. The project elements may differ from the form, line, colour, texture, scale, and composition characteristics of the visual landscape resource but should still be compatible.

Table 8: Visual Resource Inventory and Classification of the NamPower Wind Project

Terrain	Description	Distinct (3)	Average (2)	Minimal (1)
Water	None -arid terrain	-	-	1
Landform	Plains with medium sized mountains on the view peripheral.	3	-	-
Vegetation	Limited visible vegetation in the landscape view. Sparse shrub contributing to the arid visual effect.	-	2	-
Land use	Private farmland /tourism route.	-	2	-
User activity	Private farmland /tourism route.	3	-	-
Special consideration	Sense of place due to long panoramic views.	3	-	-
TOTALS		9	4	1
Total Assessment Value (17+: preservation, 14+: retention, 11+: partial retention, 8+: modification, 7-: rehabilitation		14		
Management Class		Require Retention		

Typical landscape in the valley to the west towards the wind and solar PV park.

Table 9: Visual Resource Inventory and Classification of the Transmission Line

Terrain	Description	Distinct (3)	Average (2)	Minimal (1)
Water	None -arid terrain	-	-	1
Landform	Medium sized mountains form the view peripheral.	3	-	-
Vegetation	Limited visible vegetation in the landscape view. Sparse shrub contributing to the arid visual effect.	-	2	-
Land use	Private farmland /tourism route.	-	2	-
User activity	Private farmland /tourism route /multiple existing TL routes.	-	2	-
Special consideration	Sense of place due to imposing mountain views.	3	-	-
TOTALS		6	6	1
Total Assessment Value (17+: preservation, 14+: retention, 11+: partial retention, 8+: modification, 7-: rehabilitation		13		
Management Class		Requires Partial Retention		

Typical landscape in the valley that the Transmission lines use.

Next the visibility significance was assessed by determining the perceived height of each of the two elements namely the transmission line, and wind turbines (being the worst case and therefore include solar PV) on the NWP site.

Low visibility will not significantly interfere with the value of the visual landscape, medium visibility can be balanced in the visual landscape, whereas high visibility will dominate the visual landscape.

The views from viewpoints 08 to 11 (on the C13 route) and viewpoint 14 (two farmhouses) will be significantly compromised. This represents approximately 11 km of the C13 route as well as the western view of the two farmhouses.

Significant convex curvature may mean that the visibility significance rating for Viewpoints 11 and 12 may be medium and low, respectively. The Viewpoints that rate high in visibility significance for the NWP are VP08, 09, 10 and 14.

The transmission line visibility will be medium to high along the C13 route (for VP 10 to 13, 15 and 16). The transmission line follows a very similar route from the wind park up to VP16, where the line turns west and leaves the field of view from the C13 road. Note that the new transmission line route is directly adjacent to the existing 66 kV transmission line route. This means that the value of the visual landscape post-intervention is similar to the pre-intervention state.

The result was that the focused of the individual viewpoint assessments were on the following elements (*Table 10*):

- Transmission line servitude (33 kV structure) *Viewpoints 10, 11, 12, 13, 15, 16.*
- Wind turbines, solar PV plant and infrastructure *Viewpoints 08, 09, 10, 14.*

Table 10 Viewpoint assessment score summary

Resource	*Transmission lines servitude (33kV) (Partial Retention Class)*	*NP Wind and Solar PV Park (Retention Class)*	*(Total / No view)*
Water Resources	0	0	0
Land Form	0	-2	-1
Vegetation	0	0	0
Land Use	0	-1	-0.5
User Activity	0	0	0
Special Considerations	-1	-1	-1
Rating score per project element	-1	-4	-

The score for the transmission line indicates that the line will not change the current status of the visual landscape significantly, whereas the score for the NWP site indicates a significant change to the visual landscape.

The implications of the scores are discussed below:

The new 66 kV transmission line route runs in an existing 66 kV transmission line servitude route from the planned wind and solar PV park up to the existing Obib NamPower substation. The C13 road maintains a relative parallel route to this transmission line servitude, up to VP 16, which contains an existing 66kV transmission line.

The rating of -1 falls within Partial Retention Class standard. The existing transmission line element strengthens this rating and therefore will have a medium to low visual impact change.

The NWP Wind and Solar PV Park lies immediately to the west of the potential tourist route (C13) and will have a significant visibility for a distance of at least 11km along the route. The depth of view affected will be up to 8km.

The rating of -4 falls outside Retention Class standard. This means that the wind and solar PV park will contrast the form, line, colour, texture, scale and composition characteristics of the visual landscape resource. The visual impact for the 11 km section of the C13 tourist route will therefore be high on the western side.

This will be discussed further in the Impact Assessment, under Section 7.

It should be emphasised that:

- The wind and solar PV park only affect the road section for about 11km. The effect is therefore only for a minor section of the route.

Much of the tourism attraction focusses on the exceptional visual setting. The C13 route consists of up to six (6) identifiable isolated visual landscapes of similar nature, of which only one (1) will be affected significantly by the NWP.

Table 11: Sensitivities related to visual resources

SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
Retention class viewshed in the form of mountains and long valley views.	High – the wind turbines will interfere with the immediate line of sight of the viewpoints.	Reduction of the viewshed management class.
Partial retention class viewshed in the form of mountains along the transmission line	Low – The transmission line runs along an existing transmission line route.	The line will add to the existing visual effect of the existing transmission lines (2).

5.3.2 TOPOGRAPHY

The topography of the landscape where the wind turbines and solar sites are proposed, is mostly flat, sloping gently westwards, towards the Orange River. Run-off is therefore also generally towards the west. As may be seen in Figure 15, drainage lines are shallow and wide, due to the flat gradient and slow water flow. The larger drainage lines have been marked in the figure and it is recommended that wind turbines not be placed within these zones. The terrain is, however, characterised by a braid of washes covering the area.

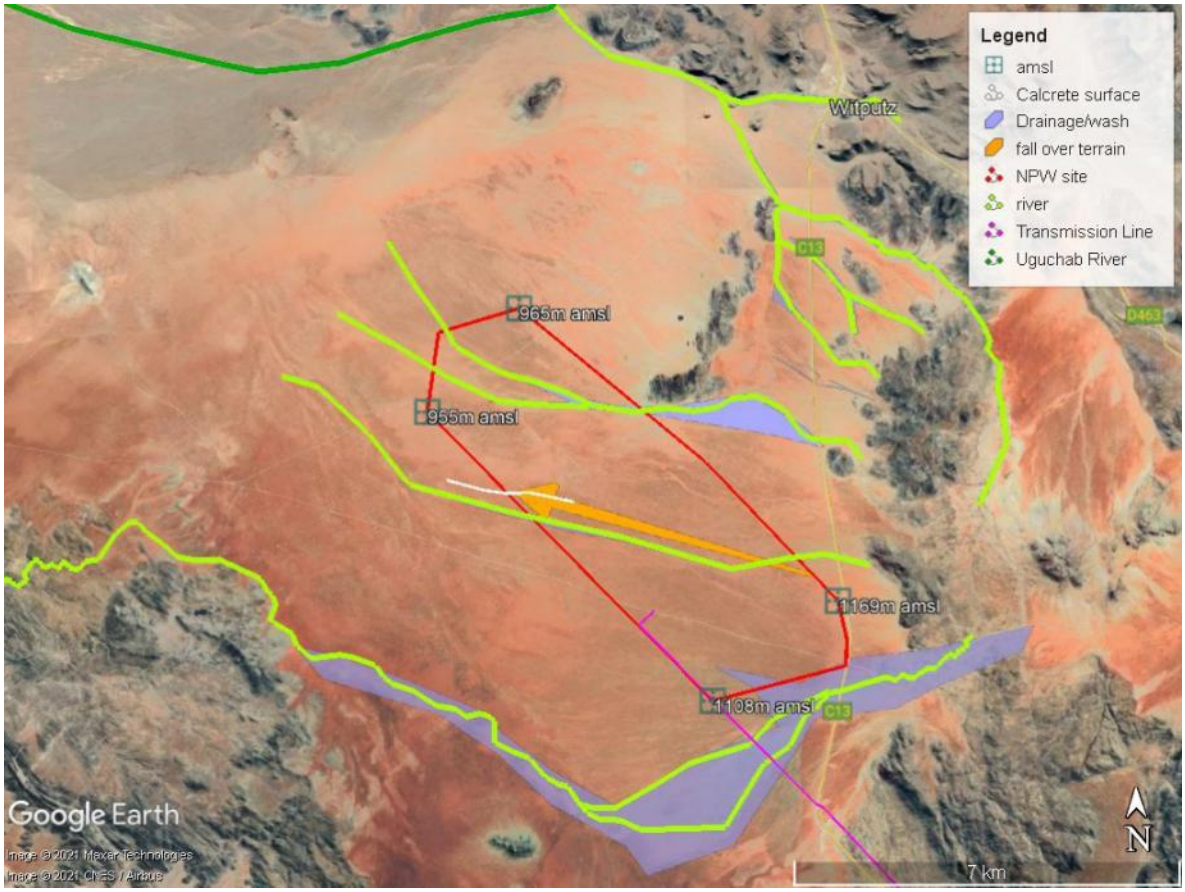


Figure 15: Terrain features of the project area.

The outcrops in the area take the form of relatively steep inselbergs and are not suitable for construction. Most of them have been excluded so far from the development. Final placement of sites should exclude any further outcrops. With the avoidance of these features in the site layout, no further specialist work was required. Nevertheless, the requirement is included in the ESMP to ensure the long-term protection of these features.

Table 12: Sensitivities related to topography and drainage

SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
Flat and wide drainage lines flowing toward the Orange River.	High – important for drainage, potential unstable founding conditions.	Blockage of water flow affecting the ecology, risk of unstable founding conditions.
Steep slopes with rocky substrates on outcrops.	High – steep slopes and rocky areas easily damaged or destroyed during construction.	Destruction or damage to steep slopes and rocky substrates on outcrops.

5.4 HYDROLOGY

The drainage channel/basin dominating the study area drains southwards to the Orange River. Figure 15, which is a Google Earth aerial photograph, shows these numerous braided drainage lines across the site. The tributaries of the Uguchab River and other unnamed rivers form the larger drainage lines. Surface run-off speed and volume is often greatly enhanced during the sparse rainfall events.

Groundwater potential in the area is generally low, but locally there are aquifers which provide livestock and domestic water to farms. On the study site, the aquifer is classified in the Hydrogeological Map of Namibia (Christellis & Struckmeier, 2001), as unconsolidated to semi-consoidated sand and gravel, with local calcrete.

Due to the sandy nature of the area, local contaminants have the potential to easily reach surface water channels and eventually groundwater sources utilised by farm owners.

It is important to locate existing boreholes and delineate important water drainage lines on the site. These will determine buffers where boreholes are situated.

Table 13 provides a summary of hydrological sensitivities:

Sensitivities related to groundwater and surface water

Table 13: Sensitivities related to hydrology

SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
Local aquifers providing livestock and domestic water.	High - aquifers have limited potential but are an important source of water to local farmers.	Increased users of local aquifers potentially causing unsustainable yields. Pollution of existing aquifers due to normal construction activities.
Drainage lines and run-off on site.	Moderate – water flow feeds the water sparse ecology and is important for the well-being of fauna and flora.	Blockage or pollution of drainage lines causes reduced or adapted water flow and resulting deteriorating ecology.

5.5 VEGETATION (FLORA)

The vegetation specialist study was conducted by Coleen Mannheimer. A screening desk top study was conducted as a start to evaluate alternative sites. This was augmented by fieldwork of a narrowed down study site on which sensitivity zones were mapped. This was used with other criteria to identify a preferred site (see Section 3). The selected site was finally assessed in terms of impact on vegetation. The study also included a critical habitat assessment to satisfy the World Bank ESF, ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. The full Vegetation Impact Assessment Report is attached as Appendix E.

Initial desk study conclusions

The greater area concerned falls into the northern section of the Succulent Karoo Biome, which is regarded as a global biodiversity hotspot (Myers et al 2000). It is thus important in global, regional and national terms, making only absolutely unavoidable damage acceptable and careful screening of sites and potential alternatives essential. It is extremely sensitive in terms of near-endemic, endemic and protected plant and animal species, and widely recognised as an important area of both diversity and endemism (e.g., Van Wyk & Smith 2001, Barnard 1998, Hilliard 1994). Approximately 16% of the Namibian flora as a whole is thought to consist of endemic species (Craven & Vorster 2006), and over 30% of plants that occur in the Namibian section of the Desert Biome are believed to be endemic to that area. This is a remarkably high figure, with the areas of highest plant endemicity in the Namib being the Kaokoveld and the southern Namib, both regarded as major

centres of endemicity in Namibia (Maggs et al. 1998). Many of the endemics in the southern Namib have a highly restricted distribution. Elevated and rocky areas, such as mountains and koppies, are known to harbour many plant species of conservation concern, making them sensitive to environmental disturbance, some more than others. Many of the species have very small known ranges and/or are niche-specific, tending to congregate in small patches of suitable habitat, such as on moisture-gathering south-west-facing slopes that are in shade for part of the day, or on quartz or marble outcrops.

The Witputz/Spitskop farms fall into an area that is renowned for their high floral diversity and high levels of plant endemicity. It is also known to harbour many protected species. Many of these occur on rocky outcrops, koppies or mountains and their foot slopes, with sandstone and compacted substrates also being favoured.

Recent work by Burke (2020) found that the areas in the Tsau-//Khaeb-Sperrgebiet National Park directly to the west of the study site are of high to very high biodiversity special value. The sensitivities of various habitats found in a previous study nearby at Gergarub, approximately 20 km to the south of this study site (Mannheimer 2014), were used to inform the current study.

At the time of the screening process, it was anticipated that *the southern wind park site would be less sensitive than the northern site.*

During screening, another site was suggested located to the north of the preferred study area (Section 3.3) for consideration, which is far less diverse, carries a lower number of endemic and protected species and is also far less scenic.

Conclusions following fieldwork

Post-fieldwork the sensitivity zones delineated were as shown in Figure 16 below. The map shows the original alternative site boundaries proposed by NamPower:

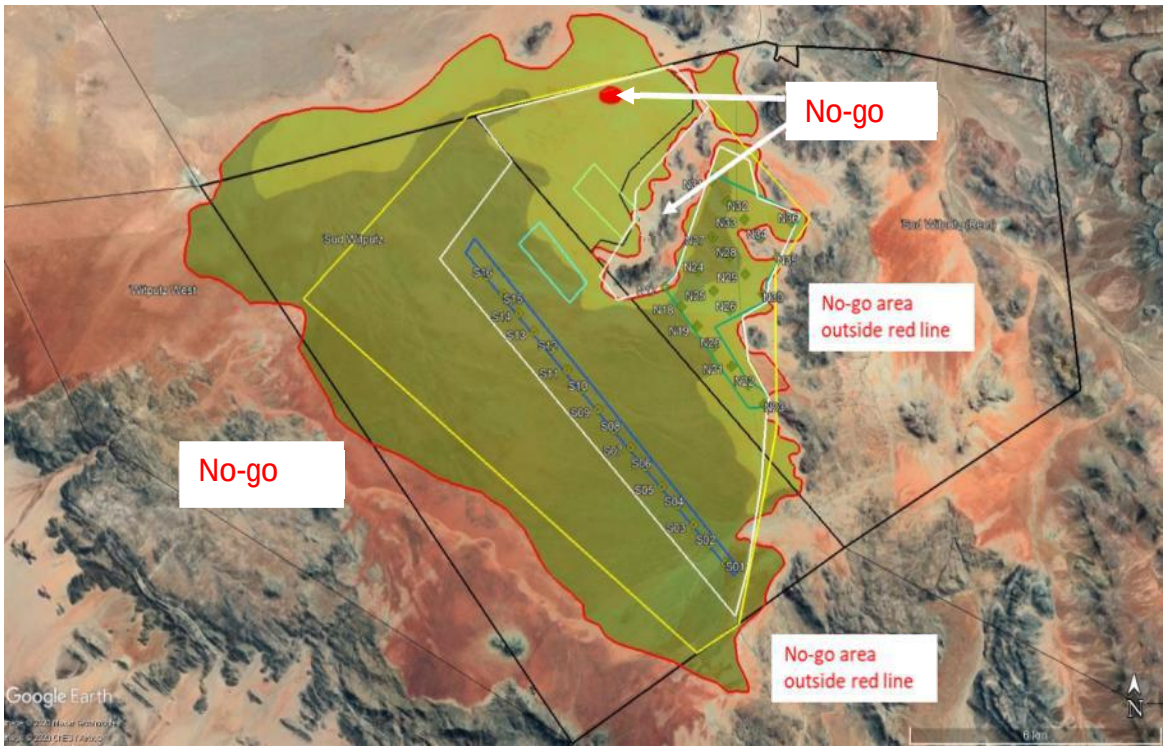


Figure 16: Sensitivity zoning post-fieldwork. Everything outside the red line is no-go area (Very High sensitivity); Dark olive green = High sensitivity; Light olive green = Medium sensitivity. Note red no-go rocky area within WP Site North (Source: Mannheimer, 2021).

These three (3) zones are described as follows:

- Very High Sensitivity (Figure 16 and Figure 17), comprising all mountains, koppies, rocky/quartz outcrops, calcrete areas and parts of major drainage lines (all areas outside of no-go area – indicated in red line in Figure 16, as well as a quartz outcrop and calcrete area (red dot in Figure 16. Outside of the outer red line and the quartz koppies and surrounds is all no-go area.

Figure 17: Rocky outcrops, koppies and mountains carry a very high floral diversity, including most of the species of concern. Turbine sites N34 and N35 affect the areas depicted above.

- High sensitivity (Figure 16, dark olive-green zone, photo in Figure 18), comprising succulent plains. In these plains, diversity of succulent perennials (Figure 19), including several protected species in the Family *Aizoaceae*, as well as a number of endemics and near-endemics in other groups is higher than in the sandy plains, the vegetation is more structured, and the sand more compact. It is not a no-go area, but the impact on flora will be higher here than in the sandy plains, where annuals, which recover quicker and easier than perennials, are far more prevalent.

Figure 18: WP Site South occupies an area of succulent plain of high sensitivity.

Figure 19: Succulent, perennial subshrubs, such as *Ruschia muelleri*, are far more prevalent on the succulent plains, and take far longer to recover than annual and geophytic species.

- Medium sensitivity (Figure 16 and Figure 20), comprising sandy plains. (Light olive green, Figure 16). In these plains, diversity is still high, with a prevalence of annuals and geophytes that are only seen in the rainy season. These species recover more easily than perennial species, which are more prevalent in the succulent plains. Nevertheless, several species of high concern (e.g., *Euphorbia melanohydrata, Dracophilus delaetianus*) occur as scattered individuals in the sandy plains, and the quartz koppies and calcrete areas also carry species of concern, such as *Larryleachia picta* and *Psammophora longifolia*. These areas should be avoided as far as practically possible.

Figure 20: View from the no-go quartz koppie and calcrete area surrounded by the sandy plains, showing the scattered areas of calcrete throughout these plains.

The baseline assessment concluded that a rescue/relocate exercise will be needed for any of the sites chosen regardless of whether they lie in the Medium or High

sensitivity zones, as in both there are scattered individuals of a number of species of concern, including *Euphorbia melanohydrata, Dracophilus deleatianus, Larryleachia picta, Psammophora longifolia* and others.

During the demarcation of these zones, there were four proposed turbine sites in the no-go zone. In addition, the southern site is located in a high sensitivity zone. Therefore, from a vegetation aspect, the northern alternative site was favoured, since it falls within a mixture of medium and high sensitivity vegetation.

Assessment of selected site

The selected southern site falls completely within the high sensitivity zone.

Figure 21 shows the final site location and layout proposed by the Proponent. This re-design, subsequent to scoping, screening and fieldwork, has reduced the potential site footprint considerably by moving the Photovoltaic (PV) installations closer to the Wind Turbine Array as well as carefully positioning access roads to minimise their impact and to use existing farm roads as far as possible. The final Vegetation Impact Assessment is based on this proposed layout and site locality.

This location and layout results in no impact on the vegetation 'no-go' zone and maximises use of space for the proposed facilities. Its impact on the high sensitivity area has been minimised by the use of existing tracks and careful planning of internal access roads. Mannheim as confirmed that the no-go area is classified as critical habitat in terms of the IUCN classification, but the project avoids this zone.

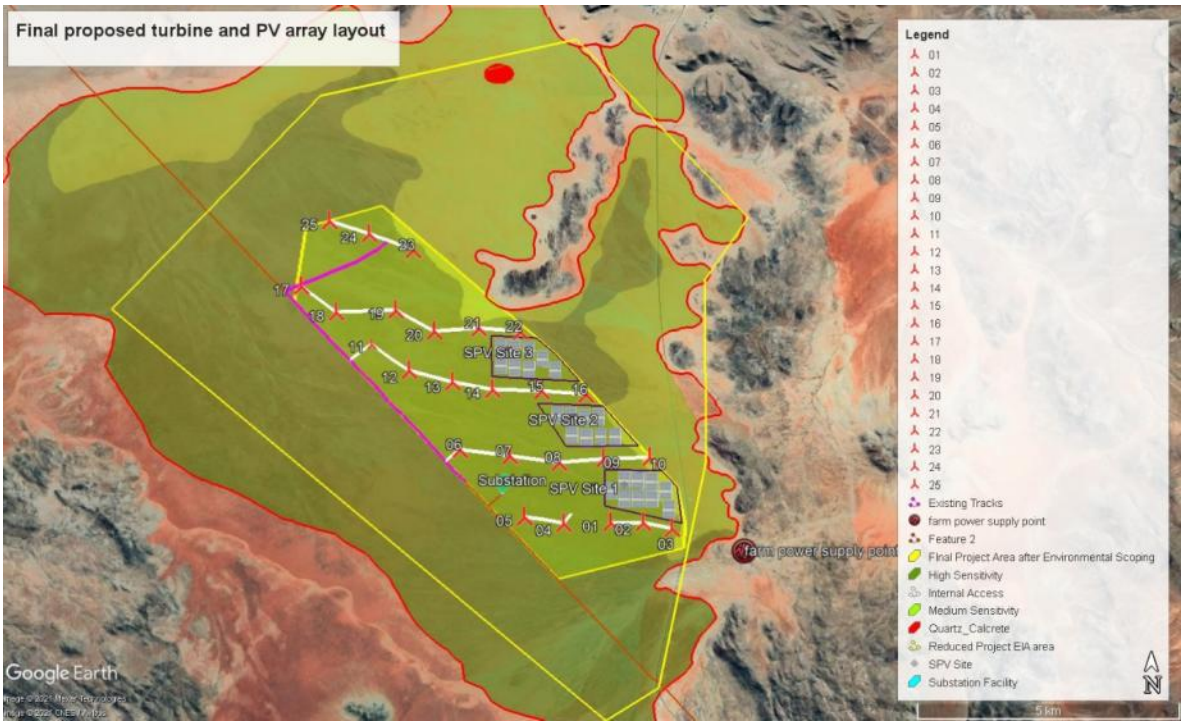


Figure 21: Final (revised) proposed site location and layout after scoping, screening and fieldwork in relation to the vegetation sensitivity.

Table 14: Sensitivities related to vegetation

SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
Area falls within the Succulent Karoo Biome.	Distributed range species, high biodiversity and endemism. High vulnerability to disturbance.	Loss of plant biodiversity.
Plains, mountains, hills and outcrops - no go areas.	Varying degrees of vulnerability Highly vulnerable with high biodiversity, protected species and low restoration potential.	Loss of species in this zone, although the project has avoided the area. Potential impacts remaining include secondary impacts such as illegal plant collection and off-site leisure driving.
High biodiversity sensitivity n the selected site area	Relatively large populations of protected, endemic and restricted range species.	Loss of biodiversity on the succulent plains through vegetation clearance to accommodate footprints, and through movement during activities.

5.6 FAUNA (BIODIVERSITY)

The Succulent Karoo Biome is the smallest of Namibia's four biomes. It is recognised as a global biodiversity hotspot (CEPF 2013). While there is also Succulent Karoo in South Africa, the Namibian portion is bio climatically unique with environmental conditions that do not occur in South Africa (Irish 1994). This underlying bioclimatic uniqueness, combined with the ecotonal effect of proximate other biomes like the Nama-Karoo and Namib Desert and its location at the interface between summer and winter rainfall zones, overlaid on topographical, geological and geomorphologically complex landscapes, gives the Succulent Karoo high niche diversity at a compact scale. This in turn translates to high biodiversity, high endemism rates, relict species, and range-restricted distributions.

The biological uniqueness of the Succulent Karoo is demonstrated in its flora. For every endemic plant species there is an equally range-restricted and endemic pollinators, as well as species-specific invertebrate herbivores, including ones that specialise on flowers, on seeds, on fruits, on wood, on leaves or on roots. In addition, each of these invertebrates has its own specialised predators, and the predators have their own super-predators. And every pollinator, herbivore and predator has its own parasites, and the parasites have hyperparasites. This interconnected web of life forms occurs everywhere, but in the Succulent Karoo the foundational plant forms are particularly range-restricted, rendering the entire food web vulnerable to even small-scale disruption. Thus, the Succulent Karoo is a very sensitive habitat.

Habitat disruptive infrastructure development in the Succulent Karoo, however small the footprint, has a high potential to have a significant impact on the environment and reduce biodiversity.

The desk study was conducted on a quarter degree square (QDS) level, as well as studies mentioning placenames withing the specific 2716Da.

In total, a minimum of 309 taxa are expected to occur in the study area. The majority (74%) of expected taxa in the study area are invertebrates, of which at least 34 (11%) are endemic or near-endemic to Namibia. As quoted from the Biodata report (Irish, 2021):

> "The herbivorous tenuipalpid mite *Coleacarus lithops* has only ever been found at Witputz, adjacent to the study area (Meyer 1979). Its host plant is *Lithops karasmontana* subsp. *eberlanzii* (Dinter & Schwantes) D.T. Cole, which is itself a Namibian endemic and a legally protected plant with a relatively small distribution range centred on the Sperrgebiet and immediate surroundings. It is possible that *Coleacarus lithops* occurs wherever *Lithops karasmontana* subsp. *eberlanzii* occurs, but there is no physical data to confirm that and until proven otherwise have to assume that it is restricted to Witputs and surroundings only. The best way to ensure that the current development does not impact *Coleacarus lithops* would be to ensure that no development happens on potential *Lithops* habitat, which is any non-sandy substrate.
>
> All other endemic and near-endemic taxa in the study area have more extensive distribution ranges in the Karas region or wider Namibia to the extent that the proposed development represents an insignificant proportion of their range and poses no credible threat to their survival."

Only four (4) of the identified taxa occurring in the study area belong to Threatened IUCN categories. There are likely more Threatened taxa in the area, but they have not been assessed yet.

A total of 16 species that occur in the study area have some form of legal status under Namibian law or international laws to which Namibia is a signatory.

Ten (10) mammal species have legal status, mostly under Nature Conservation Ordinance 4 of 1975 (NCO), but also the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), as implemented in Namibia under the Controlled Wildlife Products and Trade Act 9 of 2008. These mammals have very large range requirements and the plain in which the NWP site is located forms part of an east-west migration corridor of mostly individual animals or small herds between the two adjacent national conservation areas.

These taxa may be impacted mainly during the Construction phase, through habitat disruption, traffic, noise and human presence. Larger fauna residing on the project site will likely leave the area during Construction, and those with overlapping home ranges will avoid the area, but if habitat destruction is contained, they should all return after Construction. Six (6) legally protected reptile species occur in the study area.

The sensitivity zoning of fauna follows the same patterns of that of flora. For brevity's sake the zones are not being repeated here but may be consulted in Figure 16.

On resilience, Irish (2021) writes as follows:

> "A pertinent factor to consider in any infrastructure development that includes ground clearing and resultant habitat destruction, is the resilience of the habitat to recover from such habitat disruption. Rocky terrain has zero resilience. The physical habitat developed over geological time and once bulldozed it cannot repair itself on human time lines. When it is gone it is gone. Shrubland has very low resilience; vegetation that has been cleared eventually regrows, but on a very long time-scale. The habitat is essentially lost for decades or more. By contrast, calcrete is very resilient; even aggressive ground clearing, as long as it does not breach the subsurface hardpan, results in a broadly similar habitat that can recover relatively soon."

Two (2) types of habitat occur on the NWP site namely the succulent shrubland (Figure 18) and calcrete plains (Figure 20), whereas the transmission line also in small sections may cover rocky terrain (Figure 17) immediately east of the NWP site.

Habitat diversity is high in the succulent shrubland as well as the rocky terrain but significantly reduced on the calcrete plain. Niche diversity also results species diversity which is seasonally high for succulent shrubland end decreasing through rocky terrain to low in the calcrete plain. This leads to very high endemism rates for rocky terrain, relatively high endemism for shrubland and moderate to above average endemism on calcrete.

Habitat resilience follows the reverse with calcrete at high, through succulent shrubland at fairly low to rocky terrain with no resilience. This makes rocky outcrop habitat very vulnerable for habitat destruction.

Overall habitat sensitivity is high for all three (3) types of terrain, but rocky outcrops rate the highest, followed by succulent shrubland.

Table 15 summarises the sensitivity of the Project site on fauna:

Table 15: Sensitivities related to fauna

SENSITIVITY	vulnerability	POTENTIAL IMPACT
Area falls within the Succulent Karoo Biome.	Distributed range species, high biodiversity and endemism. High vulnerability to disturbance.	Loss of faunal diversity.
Rocky terrain and shrubland are specifically sensitive to disturbance.	Very high and high sensitivity respectively. Calcrete has medium sensitivity because it is resilient, yet with relatively high biodiversity.	Habitat destruction with low recovery potential depending on the habitat selected.

5.7 AVIFAUNA

5.7.1 METHODOLOGY

The avifauna specialist study (Appendix F) included an avifauna screening and scoping study, including an initial site visit, followed by a pre-construction avifauna monitoring programme, comprising four (4) quarterly sessions, covering one full year before construction commences. This monitoring programme has been completed and the baseline results are backed up by that monitoring. The monitoring programme follows and complies with standard best practice guidelines for wind energy development (Jenkins et al. 2015) and for solar energy development (Jenkins et al. 2017) for southern Africa, supported by a more recent update of international guidelines for solar and wind energy development (Bennun et al. 2021). The study also complies with the World Bank Environmental and Social Framework (World Bank 2018.

The above protocols (Jenkins et al. 2015, 2017) include a tiered assessment process consisting of screening/scoping and pre-construction monitoring (already completed); followed by the present impact assessment; construction-phase monitoring (if required); post-construction monitoring (still to be completed); and, if warranted, more detailed research.

5.7.2 BIRD CHECKLIST AND PRIORITY SPECIES

A comprehensive bird checklist was compiled and the diversity for the site represents 17% of the total number of 676 bird species currently recorded in Namibia and is classed as relatively low. During the pre-construction monitoring surveys, a total of 34 bird species was recorded. Although only about 30% of the species on the initial overall checklist were confirmed during the monitoring, it should be noted that species diversity can vary from year to year, depending on environmental conditions.

The confirmed priority species are discussed in Section 5.7.6 below.

5.7.3 CONSERVATION STATUS

On the overall bird checklist, the following indicators of conservation status were noted:

- Red Data status: nine (9) of the 113 species (8%) are classed as Namibian Red Data species;
- Endemism: two (2) of the species (2%) are near-endemic to Namibia, i.e. having ≥90% of the global population in the country; and
- Migrant/partial migrant status (mainly for Red Data species) and nomadism: 11 species (10%) have some form of migrant status; nomadism is fairly common in this arid environment.

During the pre-construction monitoring, one Red Data species (Ludwig's Bustard), one Namibian near-endemic species (Barlow's Lark) and four (4) species endemic/ near-endemic to southern Africa were confirmed. Confirmed partial migrant species included Namaqua Sandgrouse.

5.7.4 RECORDED OR SUSPECTED BREEDING ACTIVITY

Signs of breeding activity or suspected breeding activity (present or past) in the study site and greater study area were noted during the pre-construction monitoring for eight (8) priority species, and seven (7) non-priority species.

Of note was the observation of a suspected old breeding site for Barlow's Lark in June 2021, currently used as a roosting site, near the weather resource monitoring station (nest coordinates 27.677762S 16.681922). Juveniles of the same species were observed in the large wash in the south-east of the study site, which is considered to be a regular breeding/nursery area for the species.

5.7.5 BIRD MOVEMENTS AND FLIGHT PATHS

Some potential flight paths in the study area were identified during screening. These were identified based on suspected movements including local movements, e.g., along drainage lines/water courses, and between inselbergs/mountains and the surrounding plains (orange arrows); and longer movements within the greater study area and further (white arrows), e.g., over the study site and between Lüderitz, the Orange River Mouth and the Neckartal, Naute or Hardap dams.

During pre-construction monitoring, this information was refined and considered the heights of flights, i.e. underneath, within or above the rotor swept area (the height within which the rotor blades would move and potentially strike a bird in-flight).

Of the recorded flying times (total 4,444 seconds), flights below the rotor-swept height (<50 m) were recorded for (56% of the flying time); flights within the rotor-swept height (50 – 140 m) were recorded for (37%); while only one flight above rotor-swept height (>140 m) was recorded (7%). As some overlap is possible, the latter two categories are combined in Table 3 (total 1971 seconds [44%]).

Of the species groups recorded flying within or above rotor-swept height, Cape Crow and Pied Crow were pre-dominant (28%), followed by Namaqua Sandgrouse (25%) and eagles/large raptors (including Black-chested Snake Eagle; 23%).

It is recognised that some of the vantage points used were outside the study site, however, this data provides an indication of bird movement within motor swept height at the site.

The information fed into the site selection and layout for which it was endeavoured to avoid areas of more intense bird activity such as in riverbeds and between outcrops.

5.7.6 BIRD SPECIES AT RISK (PRIORITY SPECIES)

5.7.6.1 List of priority bird species

The Birds and Renewable Energy Specialist Group (Jenkins at. Al. 2015) has identified a suite of ‘‘priority species’’, based on methods outlined in Retief et al. (2011) and according to known risk factors (Ralston-Paton et al. 2017). Priority species are defined as: Threatened or rare birds (in particular those unique to the region and especially those which are possibly susceptible to wind-energy impacts), which occur in the given development area at relatively high densities or have high levels of activity in the area. These species should be the primary (but not the sole) focus of all subsequent monitoring and assessment (Ralston-Paton et al. 2017).

Priority bird species potentially at risk in the Rosh Pinah Wind Park study area have been ranked according to the above scoring system; the Threatened status has been adjusted according to status in Namibia.

The list of 26 priority bird species include nine (9) species actually recorded during monitoring and 17 species expected to occur at the site.

The nine confirmed priority species are as follows (ranked according to priority, and also indicating recorded local abundance:

- *Priority 1*:
  - Ludwig's Bustard; fairly common but seasonal (Figure 22)
- *Priority 2*:
  - Black-chested Snake Eagle; fairly common
  - Jackal Buzzard; fairly common
  - Southern Pale Chanting Goshawk; common
- *Priority 3*:
  - Karoo Korhaan ; fairly common but localised (Figure 22)
  - Namaqua Sandgrouse ; very common but seasonal (Figure 22)
  - Barlow's Lark; fairly common but very localised
  - Greater Kestrel; very common
  - Rock Kestrel; uncommon

The above priority species also fall into three (3) main ecological groups with the following conservation status:

- *Larger terrestrial species* (Figure 22):
  - Ludwig's Bustard (Endangered in Namibia and Globally Endangered)
  - Karoo Korhaan (endemic to southern Africa)
  - Namaqua Sandgrouse (near endemic to s Africa and a partial migrant)
- *Raptors* (Figure 23*):*
  - Black-chested Snake Eagle
  - Jackal Buzzard (endemic to s Africa)
  - Southern Pale Chanting Goshawk (endemic to s Africa)
  - Greater Kestrel

- Rock Kestrel

- *Smaller terrestrial species* (Figure 24*):*
  - Barlow's Lark (near-endemic to Namibia)

Of the 25 non-priority species recorded, Cape Crow and Pied Crow were very common. The latter two (2) species have the potential to be involved in impacts.

The recorded local distribution of priority species was combined in one cumulative map, which was used to identify potentially sensitive habitats/areas (integrated in Figure 11).

The present report confirms the main findings of the three (3) groups of potentially sensitive priority species, as listed above.

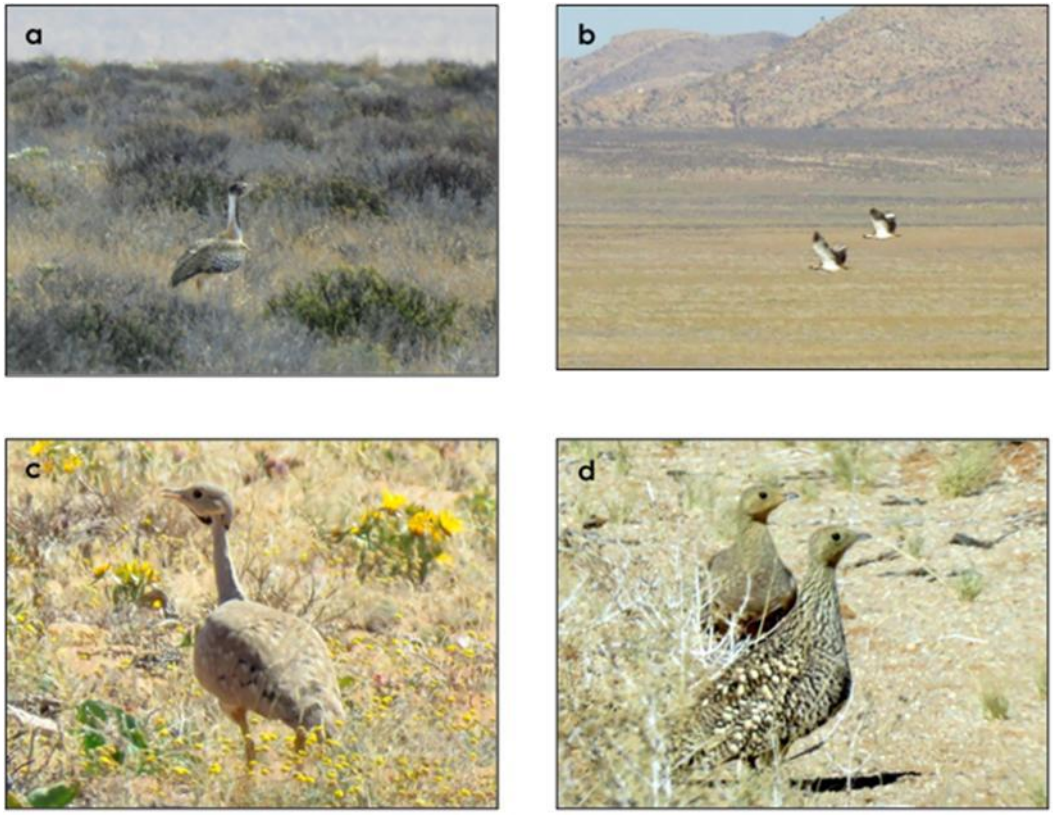


Figure 22: Priority bird species recorded on the study site: Ludwig's Bustard (a and b); Karoo Korhaan (c); and Namaqua Sandgrouse (d). (Photo's: ACS, 2021)

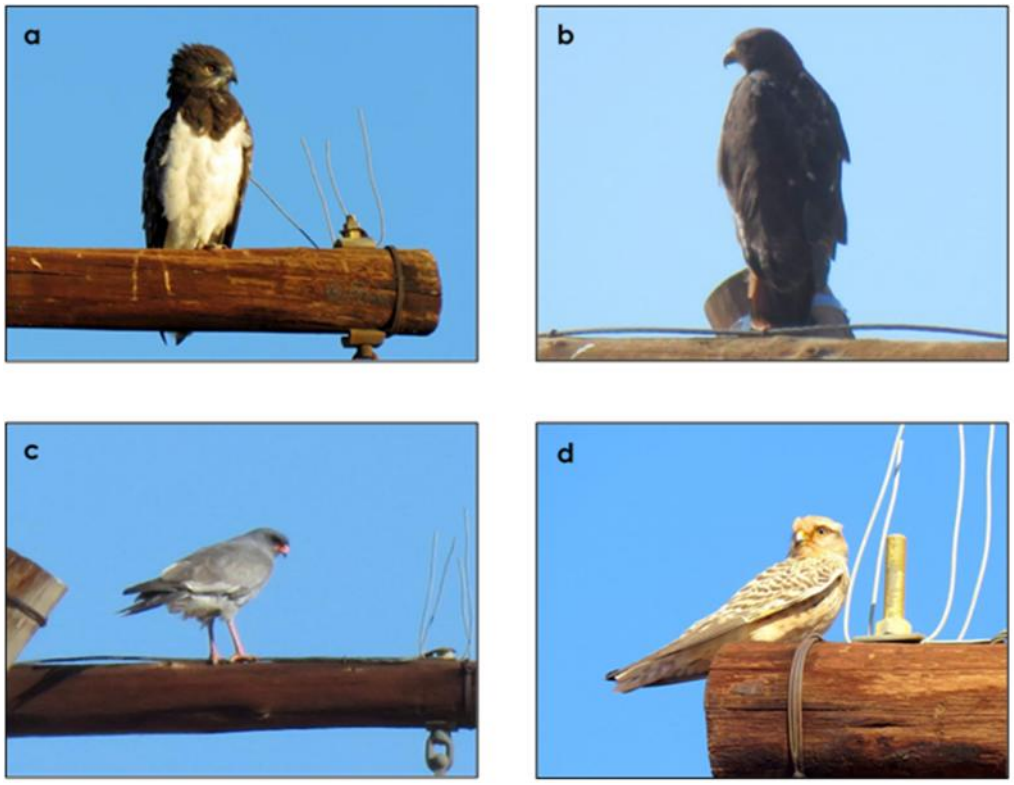


Figure 23: Priority bird species recorded on the study site: raptors. Black-chested Snake Eagle (a); Jackal Buzzard (b); Southern pale Chanting Goshawk (c); and Greater Kestrel (d).(Photo's: ACS, 2021)

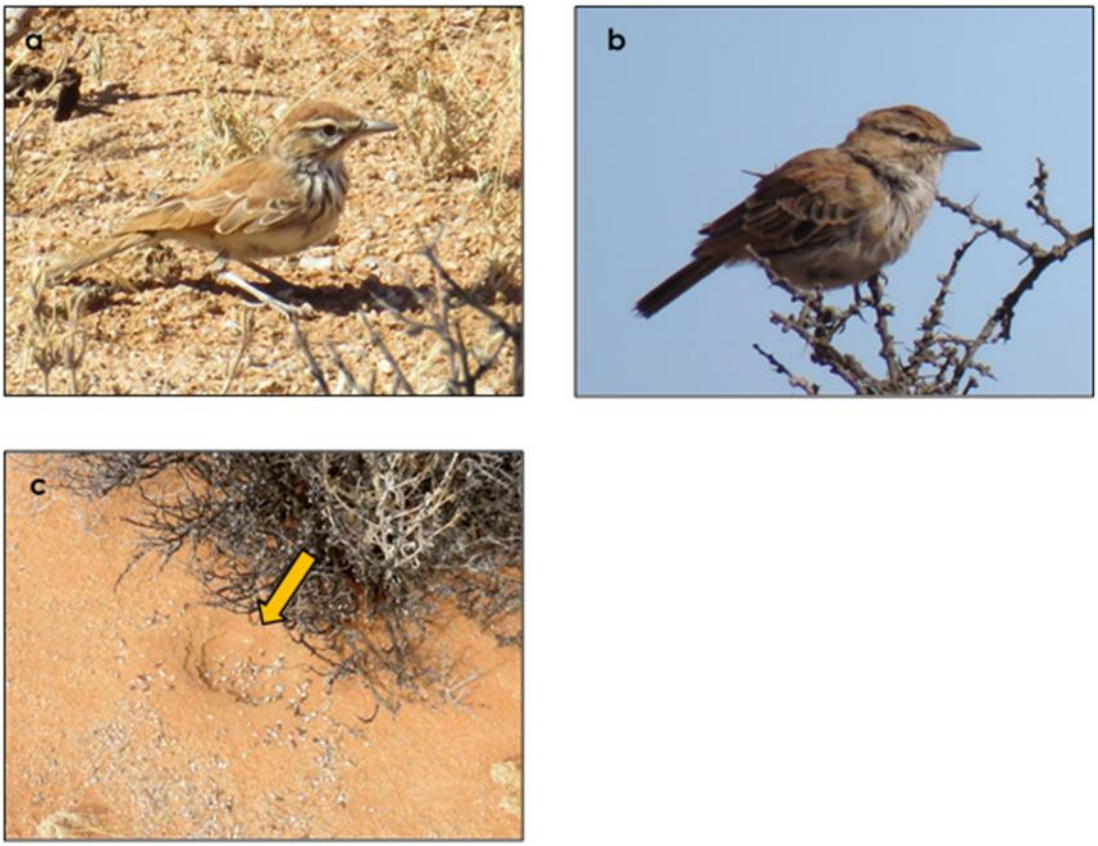


Figure 24: Priority bird species recorded on the study site: Barlow's Lark – adult (a) and juvenile (b); and suspected old nest/roosting site (c). (Photo's: ACS, 2021)

5.7.6.2 Recorded sensitivity of priority bird species to project impacts

The observed habitat modification along the vehicle track beneath the existing 66 kV power line in the large wash in the south-eastern part of the site (Figure 13) is a concern, given that this area is believed to be a breeding/nursery habitat for the near-endemic Barlow's Lark. This species has a very restricted distribution overall (Ryan et al. 1998) and within the study site and is also very territorial and therefore site-faithful (likely to use the same breeding areas and sites from year to year). Barlow's Lark is therefore potentially very sensitive to disturbance and/or habitat modification/destruction.

On the confirmed checklist, at least five (5) threatened/near endemic species are regarded as sensitive to collisions and other power line interactions, as well as crows (least concern).

Recorded bird movements and flight paths are mentioned in Section 5.2.5 above.

During the monitoring survey a collision index of 1 bird/0.07 km of power line over the year was observed. This estimate (uncorrected for bias) is relatively lower than comparable figures of 0.48 birds/km (Shaw 2013) and 0.63 birds/km (Jenkins et al. 2010) for the species, but still of concern given its threatened status. Ludwig's Bustard falls into a category of birds that have restricted vision when flying forward (Martin & Shaw 2010; Martin 2011) which, together with its large size and low manoeuvrability, renders it especially vulnerable to collisions on overhead structures.

No signs of bird collisions were found during three (3) searches at the wind resource measurement station and associated structures each in March 2021 and June 2021. However, a nest (presumed to be of Cape Crow) was found to be in the process of construction on the anti-climb structure near the base of the mast in June 2021. It is likely that the same nest could be used by Greater Kestrel, also seen in the area.

5.8 HABITATS/AREAS THAT ARE POTENTIALLY SENSITIVE FOR BIRD SPECIES/GROUPS, SITE SELECTION AND SITE LAYOUT

Based on the pre-construction monitoring, the relative sensitivity of the above priority bird species groups for each site alternative for the NWP was used during the site selection process.

Also based on the above monitoring, potentially sensitive areas in the selected project site in terms of the local distribution and flight paths of priority bird species have been (provisionally) mapped. These areas include:

- Wash habitats, in particular, the extensive wash in the south-east of the study area;
- Plains habitats with open washes (which include much of the study area);
- The existing 66 kV power line, and telephone line on the C13 road: used as a perch/roost for several raptor species in a largely treeless habitat; the power

line also has the potential for collisions of bustards, as well as raptors and other species; and

- The inselbergs and foothills of the mountains, especially to the north-east of the study area (where thermals may attract large raptors, and crows).

As an initial mitigation, the provisional sensitivity analysis explained above has already been taken into account with the final site layout, including with:

- the avoidance of the large wash area to the south-east of the study site;
- the alignment of the wind turbine generators (WTGs) with that of the wash areas and (east – west) flight paths; and
- the clustering of WTGs to promote visibility and allow for flight paths between such groups of infrastructure.

For the final assessment, the above sensitivity analysis has been fine-tuned by overlaying the maps of the proposed (conceptual) project site layout with the maps of the local distribution and fight paths of priority bird species recorded during pre-construction monitoring. The following sensitivities for the species/groups in terms of site layout pertain:

- Ludwig's Bustard: the sites of WTG05 and WTG12 overlap to a certain degree with recorded power line collision sites for this species.
  - In order to minimise a cumulative impact of collisions of Ludwig's Bustard on the 66 kV power line where it runs adjacent to the six (6) WTGs (both existing and replacement structures), those WTGs sited directly adjacent to the power line route (i.e. WTGs 05, 06, 11, 12, 17, 18) should preferably be avoided.

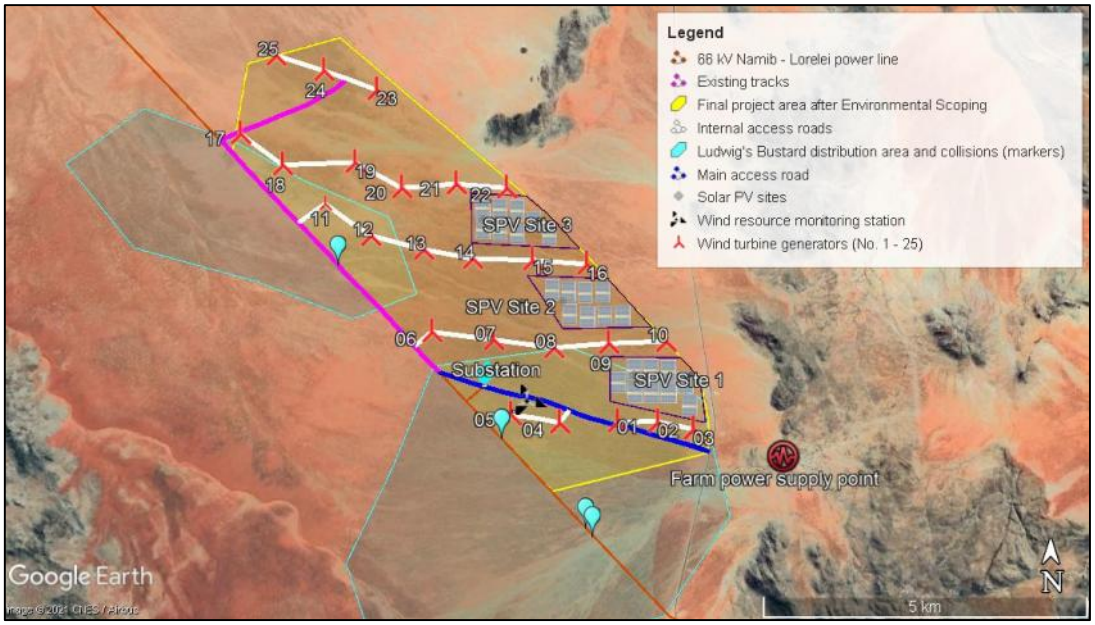


Figure 25: Recorded local distribution and fight paths of priority bird species in relation to proposed project layout: Ludwig's Bustard, also indicating sites of four recorded power line collisions

- Karoo Korhaan: this species may take up roosting in the shade beneath the solar panels, especially at SPV Site 3.
  - No negative impact of note is envisaged, provided that staff are made aware of the need to avoid unnecessary disturbance if the birds are present.
- Namaqua Sandgrouse: the recorded flightpaths of this species have already been taken into consideration with the site layout, as mentioned above.
- Raptors (Black-chested Snake Eagle, Jackal Buzzard, Southern Pale Chanting Goshawk, Greater Kestrel and Rock Kestrel): raptors have been recorded as making extensive use of the existing power line as a perch, often flying around in the adjacent areas. Kestrels are also being attracted to the weather resource monitoring mast, possibly as a breeding site.
  - In order to minimise any cumulative impacts, the WTGs sited directly adjacent to the power line route should therefore be avoided where possible (as for Ludwig's Bustard, above).
- Barlow's Lark: The siting of WTG 04 shows an overlap with the confirmed distribution of this species (including a suspected breeding site near WTG 04
  - The recorded distribution of this species (and suspected breeding/ nursery areas in the large wash) have already been taken into consideration with the site layout, as mentioned above.
  - The siting of WTG 04 and WTG 05 (and possibly of WTG 01) should be avoided if possible, to leave a larger buffer area around an additional Barlow's Lark breeding area to the north.
- Cape Crow and Pied Crow: both crow species also make use of the existing power line and telephone poles as perches and nesting sites and may be involved in electrocutions on power line structures (and cause short circuits), as well as collide with WTG structures. The above mitigation measures would apply to this group as well.

Table 16: Sensitivities related to avifauna

SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
Sensitive habits include inselbergs, drainage lines, the road, and potential flights paths.	Relatively high at the inselbergs, and lower towards the plains (site No.1 and No.3).	Habitat modification, increased movement of the at-risk species along these habitats, increasing potential collision risk.
Birds identified as potentially at risk including twenty-six (26) species.	Six (6) raptor species, the Ludwig's Bustard and the Black Stork are especially at risk.	Potential Collision with the wind turbine blades during operation. Potential electrocution and collision with powerlines.

5.9 BATS

Monitoring is required prior to construction to gain more information on the species occurring in the study area. This is currently undertaken by Inkululeko Wildlife Services with a yearlong acoustic monitoring study until September 2022.

Monitoring is also required once the wind turbines are operational, in order to better understand bat activity vs seasonal insect population activity, as well as actual collisions.

Therefore, an intermediate site visit and desk study is used for the ESIA, as fully reported in Appendix G. This is based on aerial imagery, previous IWS bat monitoring studies from the region (i.e. from Lüderitz and the Richtersveld), and peer-reviewed scientific publications.

Six (6) bat species are likely to occur in the project vicinity with the possibility of two (2) additional species. The most likely species are Egyptian Free-tailed Bat (*Tadarida aegyptiaca*), Flat-headed Free-tail Bat (*Sauromys petrophilus*), and Damara Horseshoe Bat (*Rhinolophus damarensis.* The Cape Serotine Bat (*Laephotis capensis* – previously *Neoromicia capensis*), Namibian Long-eared Bat (*L. namibensis*) may occur. Finally the Mauritian Tomb Bat (*Taphozous mauritianus*), the migratory Natal Long-fingered Bat (*Miniopterus natalensis*), African Straw-coloured Fruit Bat (*Eidolon helvum*), Geoffroy's Horseshoe Bat (*R. clivosus*), Cape Horseshoe Bat (*R. capensis*), and Dent's Horseshoe Bat (*R. denti*) have a low likelihood of occurring.

Bats that have a high likelihood of collision with wind turbines and likely on site are the Egyptian Free-tailed Bat (*T. aegyptiaca*), Roberts's Flat-headed Bat (*S. petrophilus*) and Cape Serotine Bat (*L. capensis*).

There are no known significant roosts withing 80km of the site.

The immediate project vicinity may be able to periodically support bats in the ephemeral (possibly seasonal) drainage. But water is an essential requirement for significant bat populations to occur.

Rocky ridges, steep slopes, and outcrops, as well as farm buildings near the NPW site could be used as bat roosts, though few are within the proposed 500m buffer from wind turbine positions.

Bat sensitivity and resulting buffer zones are shown in Figure 26:

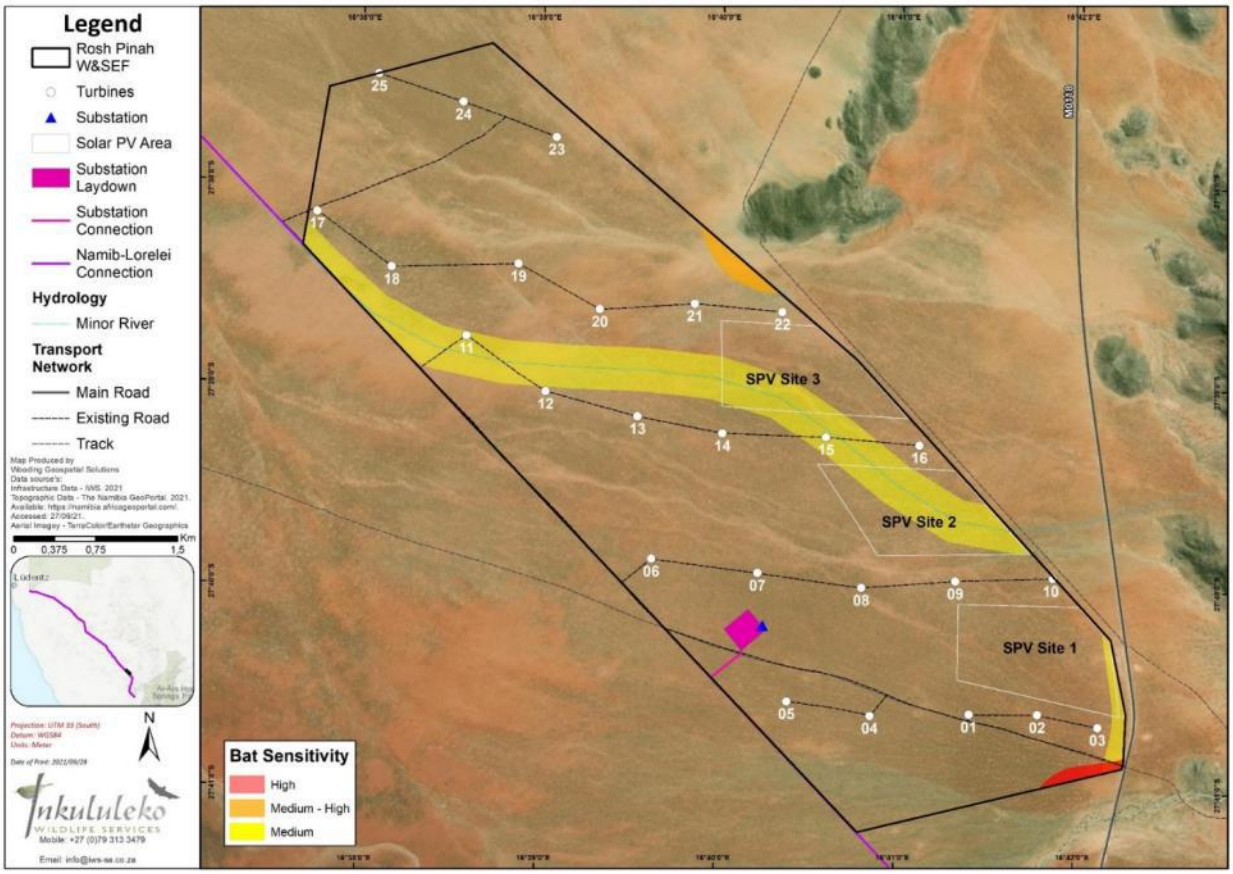


Figure 26 Relative bat sensitivity and buffer zones

Sensitivities related to bats

Table 17 summarises the issues related to bats to be considered during the ESIA:

Table 17: Sensitivities related to bats

SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
Sensitive habitats follow the same patterns as the fauna and flora.	Inselbergs, drainage lines, areas with higher general biodiversity.	Habitat destruction and alternation leading to a reduced bat population, affecting the food chain.
Potentially conservation worthy bat species not identified yet.	There may be species of conservation concern in the study area not identified yet.	Extinction of or reduced numbers of bat species of conservation concern due to habitat alteration and collisions with wind turbines.
Bats are prone to collide with wind turbines especially at night.	Bats play an important role in the ecosystem.	Reduction of bat populations and reduced ecosystem functioning due to collisions with wind turbines.

5.10 ARCHAEOLOGY

Dr John Kinahan, the archaeological specialist on the team (see report in Appendix H) discusses the availability of archaeological information for the project site. It is inferred that archaeological survey of southwestern Namibia is relatively patchy.

Earlier archaeological work has however yielded a well dated human occupation sequence covering the last 65 000 years.

Previous research has concentrated on rock shelter sites with well-preserved stratified occupation sequences, but these do not reflect the full landscape context of archaeological settlement.

Intensive field survey in the area further south (approximately 10+ km) of the Rosh Pinah Wind Project site, indicates a relatively high density of archaeological sites. These data show that the desert fringes to the west of the escarpment were heavily used, particularly following local rainfall events.

The general pattern of archaeological occupation in the southern Namib is now fairly well known from a number of landscape scale investigations. These show that hunter-gatherer communities in this region moved far to the west in response to rainfall but did not remain for long periods in the desert. During the dry months, or during extended dry periods, the desert was abandoned in favor of particular sites on the escarpment where relatively reliable water sources existed.

Human occupation of this region mirrors the climatic record with many sites showing evidence of extended desert hunting expeditions under moist conditions and a general retreat from the desert during the last 4 500 years.

While the area further south of the NamPower Wind Project indicated higher archaeological density, the Project site itself had not yet been surveyed. For this reason, a field investigation was carried out to find potentially significant archaeological sites within the project area.

The project covers two(2) separate areas when it comes to archaeology namely; (1) the NWP site, and (2) the transmission line corridor to the existing Obib substation.

5.10.1 THE NWP SITE AND SURROUNDS

The field survey was conducted on the initial ESIA study area during early April 2021 and the area surveyed covers approximately 9000ha. This area covered a much larger area surrounding the NWP site, in order to evaluate other potential project sites. Figure 27 shows the archaeological sites identified on the project area during the investigation in relation to the final NWP site selected.

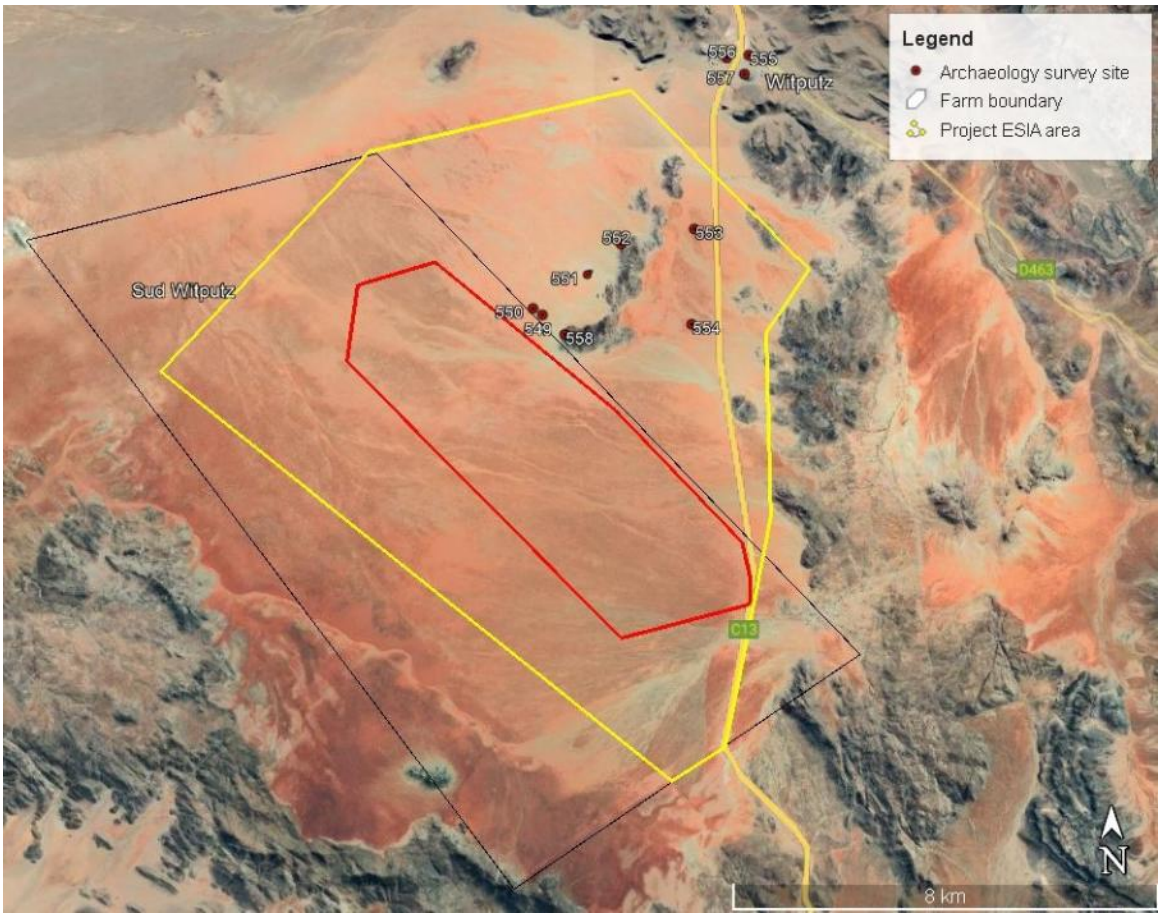


Figure 27: Archaeological sites found, in relation to the final project area.

The sites found during the fieldwork are as follows (Table 18), with their significance ratings provided (ratings are: no significance 0; disturbed or secondary context 1; no threat posed 2; archaeological site 3; multi-component site 4 and 5 major archaeological site):

Table 18 Archaeological finds identified during the field survey.

Site	Attitude	Longitude	Find significance rating
QRS 288/549	-27.6311500	16.6658140	2
QRS 288/550	-27.6300130	16.6640130	3
QRS 288/551	-27.6243860	16.6745270	3
QRS 288/552	-27.6192320	16.6811090	2
QRS 288/553	-27.6168370	16.6790730	3
QRS 288/554	-27.6331550	16.6703080	3
QRS 288/555	-27.5871260	16.7064010	4
QRS 288/556	-27.5875350	16.7021690	4
QRS 288/557	-27.5903790	16.7055160	4
QRS 288/558	-27.6345670	16.6700240	3

Kinahan (2021) reported that the sites QRS 549 to 554 and 558 are all open-air sites, mostly small groups of crude stone structures such as windbreaks and possible storage cairns. The largest site 551 appeared to represent a seasonal grazing camp dating to the 1940s or 50s.

It is likely, but not confirmed, that other sites represent occupation by late pre-colonial hunter-gatherers, allied to those living a little further south on sites located during previous surveys.

Further north of the project footprint area are three (3) early colonial sites including the remains of the Witputz police camp with defensive positions that may relate to the Morenga insurrection of 1907, although this has not been confirmed and it is also possible that the defensive works formed part of the German colonial response to the threat of British and South African invasion in 1915.

In the near vicinity of the police post and fortifications is the Witputz farm cemetery, containing approximately twenty (20) graves. The Witputz sites are listed as 555 to 557 in Table 18.

All the survey finds are located outside and to the north of the final selected NWP site. The farm boundary forms a natural border to keep personnel out of the finds. Conditions need to be included in the ESMP that no movement or activity on these outcrops should be allowed.

A chance find procedure for any potential archaeological finds on the construction sites will accompany the ESMP.

5.10.2 THE EXISTING TRANSMISSION LINE SERVITUTE

The proposed new transmission line (66 kV) is a monopole structure with a small footprint. The route follows the exact servitude of the existing 66kV transmission line up to the existing Obib substation.

Since the new transmission line runs on an existing servitude, where human activity likely already disturbed archaeological sites, existing data was used to assess the level of risk on the line, instead of additional field survey work.

Figure 28 indicates a potentially higher-density area of archaeological sites in the vicinity of the most southern section of the transmission line route (see red oval). This area has been surveyed before, hence the detailed information is available.

Since the line is in the existing corridor the chance of undisturbed archaeological sites occurring is low, but extra care should be taken to identify potential sites once the detailed design of pylon positions is finalised.

A chance find procedure for any potential archaeological finds on the construction sites will accompany the ESMP.

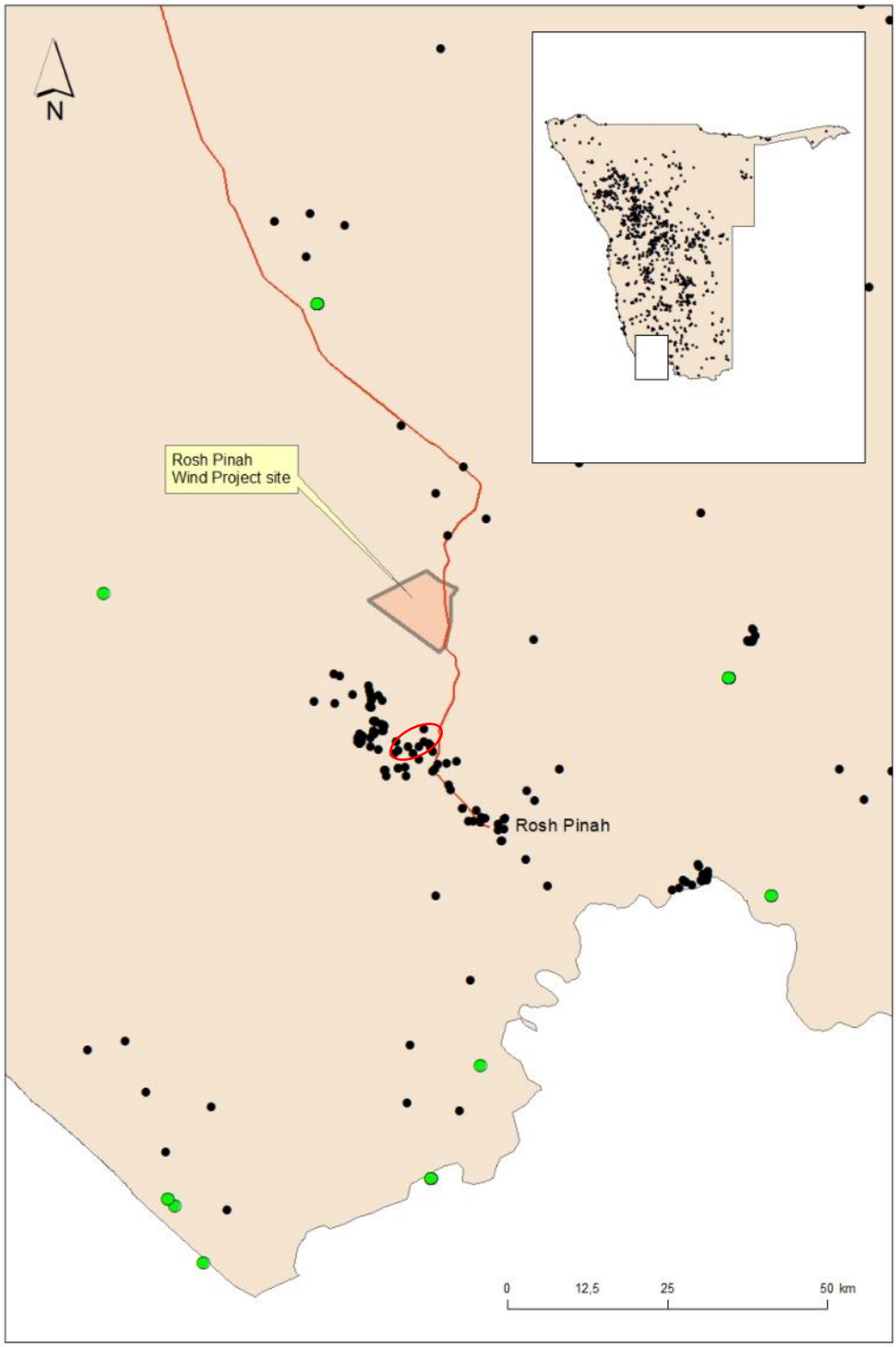


Figure 28 The ESIA study area for the proposed NamPower Wind and Solar Power Plant near Rosh Pinah in the //Kharas Region, Namibia, shown in relation to the known distribution of archaeological sites (black dots) and radiocarbon dated sites (green dots). The red oval indicates potential higher incidence of sites near the transmission line.

The section of the transmission line that crosses the higher-density archaeological area is seen in Figure 29:

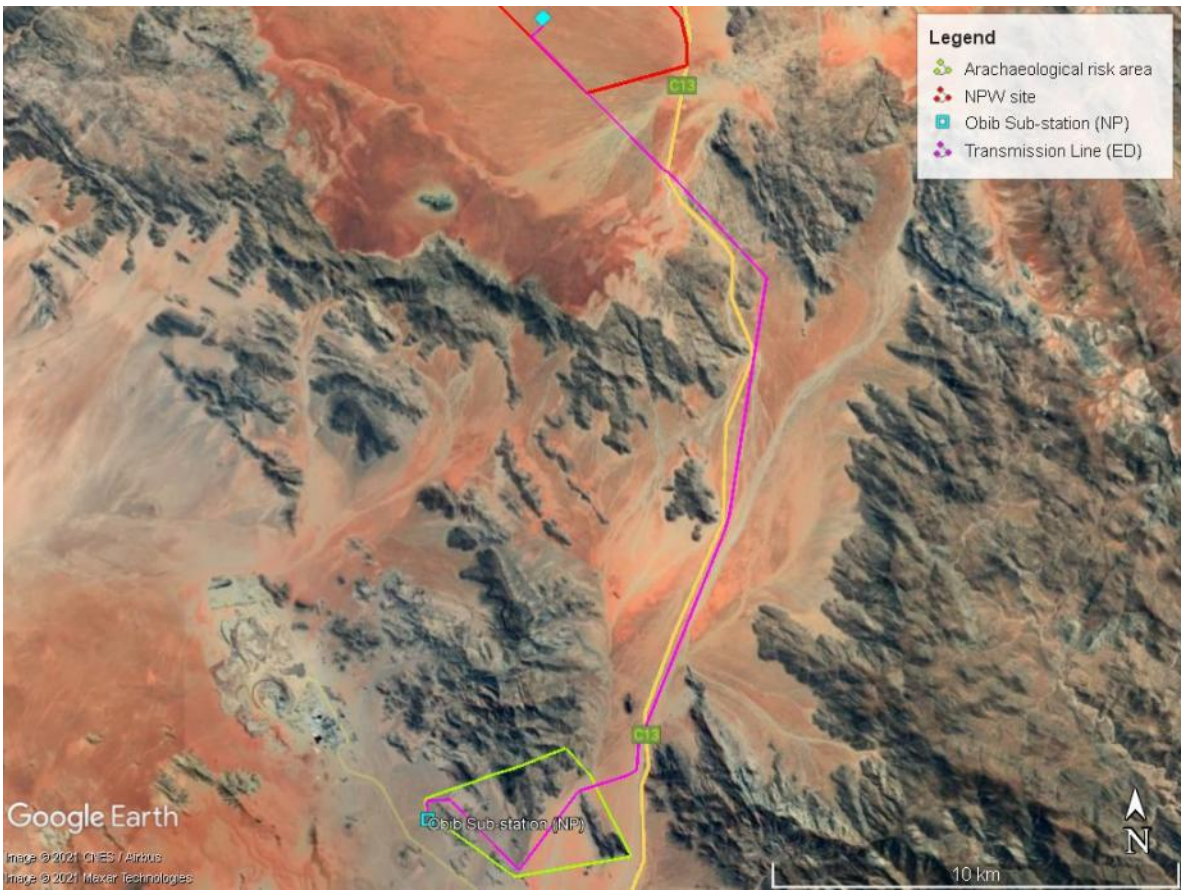


Figure 29 Transmission Line in relation to the higher density archaeological area.

Table 19 is an overview of the archaeological sensitivities identified on the project site:

Table 19: Sensitivities related to archaeology

SENSITIVITY	vulnerability	POTENTIAL IMPACT
Archaeological and historical sites existing on the outcrops close to the project area.	Vulnerable only to movement outside of the project area by construction workers.	Destruction of or damage to heritage sites due to construction activity or movement of construction workers on the outcrops close to the project sites.
Sites found on the project area.	Low sensitivity.	Potential destruction or damage to of low sensitivity archaeological sites during construction.

5.11 SOCIO-ECONOMIC BASELINE

The areas where the socio-economic profile may be affected by this project will be addressed under this section, including key indicators such as income, jobs, poverty indicators, as well as land use activities in the area and noise levels, which is a key issue generally on wind parks.

5.11.1 SALIENT REGIONAL SOCIO-ECONOMIC INDICATORS

Table 20 below indicates the key demographic and socio-economic indicators of the //Kharas Region in which the project is located. The population is relatively small, and the density is very low at below 1 person per km. The population is highly literate and there is limited migration to other regions, Most of the employed people have jobs at the mines, the fishing industry, local and regional Government, and the tourism industry. Most employed people earn their income through salaries, but there is currently a high unemployment rate (Figure 30), which is expected to have risen due to the current effect of the COVID-19 regulations and the general economic slump. Poverty is noticeable in the population living in makeshift housing (25.2%). Yet, a relatively large percentage of the population have access to basic services including safe drinking water and sanitation, and most have good access to medical facilities. The health of the people in the region is also fairly good, as a large proportion have no chronic illnesses.

Table 20: Key socio-economic indicators (sources: National Statistics Agency, 2015/2016; Namibia Statistics Agency , 2016) [9]

Socio-economic indicator	Value
//Kharas Population size	85 759 (Male: 50.5%; Female: 49.5%)
Literacy rate[10]	96.1%
Usual residence in //Kharas Region	89.2%
Source of income	Salaries: 74.4% Old age pension: 11%
Housing type	Detached and semi-detached: 47.1% Schacks: 25.2% Other: 27.7%
Sources of energy used for cooking	48.2% Electricity 26.2 % gas 25.2% wood

[9] All statistics are given as estimated for 2016

[10] Defined as the ability to read and write with an understanding in any language for the population 15 and above

Socio-economic indicator	Value
//Kharas Population size	85 759 (Male: 50.5%; Female: 49.5%)
Population with access to safe water	79.4%
Population with no toilet	25%
Distance to health facilities	80% within a distance of 5km
Population with no chronic illnesses	86.5%
Population with high blood pressure	7.9%

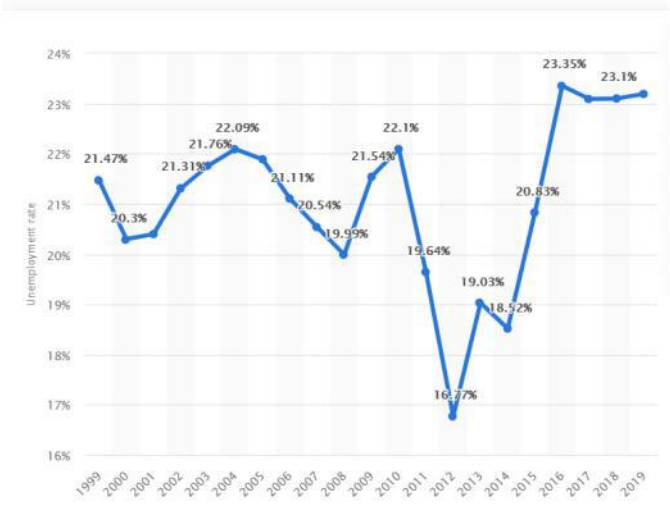


Figure 30: Unemployment rate in Namibia from 1999-2019 (Plecher, 2020)

5.11.2 ROSH PINAH

Rosh Pinah is the nearest town, which will be the centre where the project staff will be accommodated. It is therefore important to understand the socio-economic profile of this town in preparation of the project. The information presented has been obtained from an interview held with the Roshskor staff in October 2021 (pers. Comm. Shilongo, 7/10/2021).

Rosh Pinah's economy is sustained by two (2) zinc mines, namely Rosh Pinah Mine, situated in the town, and Skorpion Mine, some, situated approximately 25km to the north. The staff of both mines are accommodated in Rosh Pinah. Rosh Pinah Mines employs an estimated 1200 people. Its Life of Mines is currently another 10 years but an extension is likely. Skorpion Mine only employs 100 people since it is currently on care and maintenance. This mine plans to expand its capacity of processing during 2022 and it is also investigating potential new deposits for mining. The processing capacity will focus more on processing of ore from other South African mines.

The total population of the town was approximately 7500 people, but since Skorpion Mine is on care and maintenance, the population has shrunk to some 5200

inhabitants. The population therefore fluctuates due to mine activity, but the low-income group remains even when unemployed. The gender profile is quite skew, at 70% male to 30% female.

The specific unemployment rate is unknown but recognized as high for the low-income group. Main sources of income revolve around the two (2) mines and the contractors to the mines. Other income sources are very limited.

The medical facilities are well developed in the town, but these are focused on the needs of the mines.

Accommodation in the town currently exceeds demand, but only because Skorpion is under care and maintenance. Should the mine open up again, there will be no accommodation available. However, the town will be able to accommodate temporary housing development, and space has already been earmarked for this purpose, towards the north-west of the town. The Skorpion management also confirmed that the town services will be able to accommodate the temporary increase in service requirements. The contractor should approach Roshskor in order to discuss accommodation and associated infrastructure needs.

On local labor availability, Roshskor staff advised that the town would likely have unskilled and semi-skilled labor. Roshskor encouraged the project during the focal meeting to consider Rosh Pinah as the host of the project, therefore the current residents of the town should receive first priority, above the region, in the recruitment process. This only makes sense, since such a strategy will also assist in curbing the influx of additional population and "followers", who enter the town with family and friends in search of opportunities. It will assist the town in stabilizing its current economic predicament. An influx of people would increase the demand for services and infrastructure, but without the ability to pay for such services. Rosh Pinah has an arid environment and unlike elsewhere in Namibia where the unemployed and poor can rely on readily available natural resources, Rosh Pinah is extremely sparse in such resources, including vegetation for firewood, cooking and medicinal purposes, irrigation and grazing potential in the surrounds.

Experience in the town has shown that semi-skilled and unskilled people migrate to Rosh PInah in search for jobs, but do generally not leave when their contracts conclude or when they are retrenched. Some may not be able to afford travelling back, have hope for another opportunity and find it the least risky to survive there where they have settled. For these reasons, the project would curb further influx by making recruitment in Rosh Pinah a priority. Otherwise, job creation attracting outsiders will only worsen the current economic situation in Rosh Pinah. It is advisable to use Roshskor and the Government: Local Labour Office to assist in the recruitment process and to communicate clearly to the local community, that informal invitations and inaccurate rumors about the project to the outside world will not benefit their community situation.

Key issues for Rosh Pinah are the following:

- Employment deficit and survival needs are at a peak. The community is currently desperate for job opportunities.

- The water source from the Orange River is becoming more unreliable due to changing water levels and drought periods.
- Roshskor is trying to diversify employment opportunities and draw investors to pursue potential developments in agriculture (irrigation) and tourism and landscape use e.g., cycling tours.
- Roshskor is currently conducting a post-mining sustainability study for the town.

Figure 32 provides an impression of the town centre its facilities and the Tutungeni Informal settlement during a clean-up campaign is shown in in Figure 32:

Figure 31: Business centre in Rosh Pinah (Photo's: Roshskor website http://roshskor.com.na/gallery)

Figure 32: The information settlement Tutungeni, photo taken during a clean-up campaign (Source: Roshskor Websit
http://roshskor.com.na/gallery

In impact assessment related to labour influx is included in the impact assessment section (Section 7) and the ESMP. This has been informed by local experience,

legislation, and World Bank (2016) guidance document: "Managing the Risks of Adverse Impacts on Communities from Temporary Project-Induced Labor Influx.[11]

Figure 33 below shows key landmarks, bulk infrastructure locations and amenities in Rosh Pinah:

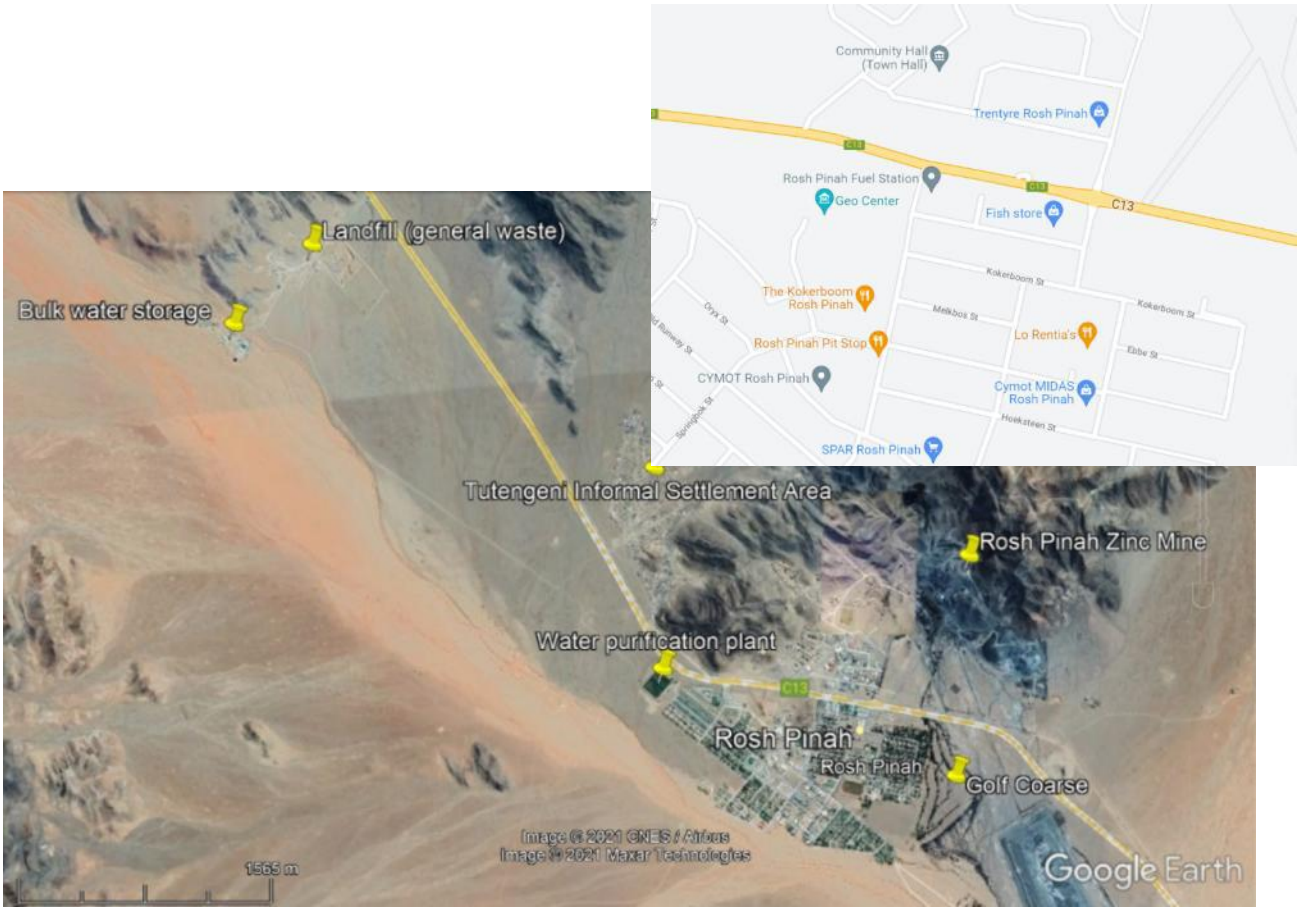


Figure 33: Google image and map of Rosh Pinah showing bulk services and key businesses.

[11] 2016. "Managing the Risks of Adverse Impacts on Communities from Temporary Project-Induced Labor Influx." World Bank, Washington, DC. "http://pubdocs.worldbank.org/en/497851495202591233/Managing-Risk-of-Adverseimpact-from-project-labor-influx.pdf

5.11.3 LAND USE

A number of different land uses surrounds the proposed project area. This includes the following:

Farming: Activities include farming with small livestock as well as game. Limited tourism, mainly hunting is also accommodated. The farms in the vicinity are all commercial farms. The carrying capacity of the farms is very low, the lowest in Namibia in the study area, at 0-10 kg per hectare and the risk of farming is also the highest in the study area, of the entire Namibia (Mendelsohn et. Al, 2002). This is due to the short growing season, low rainfall and high rainfall variability, coupled with the lack of suitable grazing (poor quality grasses) for animals. With climate change, this risk is expected to increase even further. For these reasons, livestock farming may provide a source of income for the farm owners, but is generally not adequate to sustain their livelihoods and farm owners therefore diversify their incomes with an additional venture which does not depend on the land. The directly affected farm does not have any active land use currently and the buildings on it are not occupied. The area is not known for any nomadic movements, which is a feature of livestock farmers in the northern regions of Namibia and the San community in the north-eastern regions of Namibia, on communal land. Conflict of land use is therefore of limited concern on this project.

Generally in social impact assessment, land use *potential*, as described above, is considered of greater importance than *current* land use, in order to understand potential future impact. Nevertheless, the current land use/occupancy on the farms in the vicinity of the project is as follows (Figure 34):

- Directly affected farm, Witputz Sud, currently owned by Mr. Sybie Kotze, no land use or occupancy.
- Farm Witputz West, owned by Mr. Sybie Kotze, no land use or occupancy.
- Farm Witputz North, owned by Mr. Hennie Joubert, leased for small livestock grazing.
- Farm Remainder of Witputz, owned by Mr. Kobus Smit, occupied, used for small livestock grazing.
- Farm Zebrafontein, owned by Mr. Sarel Engelbrecht, occupied, used for small livestock grazing.

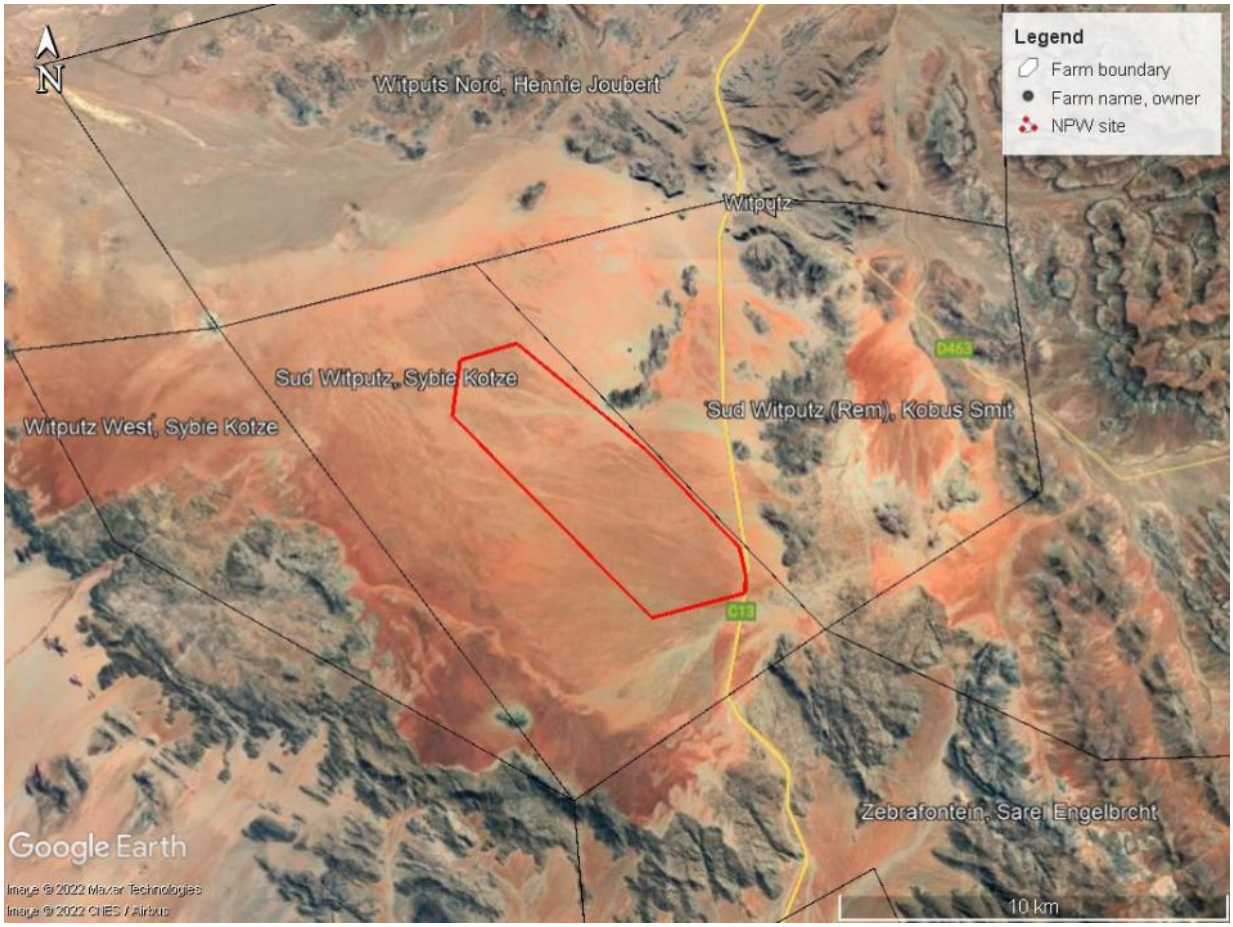


Figure 34: Farm names and owners in the project area

- *Conservation and Tourism:* Rosh Pinah is situated between two (2) conservation areas namely the Sperrgebiet National Park and the Ai-Ais/Richtersveld Transfrontier Park. Even though Rosh Pinah is not a tourist destination itself, it is frequented by tourists passing through en-route to other destinations such as the Fish River Canyon. The contrasting geological features of the area provide visually stimulating scenes to passing tourists (Fish Eagle Productions, 2012). The MEFT has plans to develop the Tsau Khaeb National Park with concessions, which also include the section along the Orange River and Oranjemund.
- *Mining:* The Skorpion Zinc mine and its associated infrastructure is located south-east of the proposed project area. Drilling and exploration are also ongoing in the area. The Rosh Pinah Zinc Mine is situated in the town of Rosh Pinah, established to serve the mine, which is now a service centre for the area.
- *Road users:* The C13 National Road traverses the proposed site. This road is used by visitors, tourists and Rosh Pinah residents. The employees and service providers of Skorpion Zinc and Rosh Pinah Zinc mines make use of this road daily.

5.11.4 INFRASTRUCTURE

Limited volumes of water will be required during construction and during operation, for solar PV panel cleaning, and for domestic use. The provision of water will be negotiated with the applicable farm owner.

Sewerage facilities will be provided on site to the satisfaction of NamPower and to acceptable environmental standards.

There is a waste disposal site in Rosh Pinah managed by Roshskor. It receives general waste from domestic sources. According to Roshskor, the site has the capacity to receive the general waste of the project. Hazardous waste and specific waste such as the turbine blades to be disposed can currently not be accommodated at this site. A hazardous waste disposal facility at the site will have to be developed at the cost of the Proponent, should it be required. Rosh Pinah Zinc, Skorpion and the Orange River Mines (Namdeb), have temporary disposal facilities for hazardous waste, scrap, hydrocarbons, and medical waste. Salvage companies periodically collect these wastes from the various locations. The Proponent needs to develop a waste management strategy for treatment and disposal of the various forms of waste in line with best practice and national and applicable international requirements.

5.11.5 TRAFFIC

A traffic impact assessment has been prepared for this ESIA (Appendix I), for which the baseline road, traffic and access conditions have been studied. Based on the abnormal load requirements, a preliminary route as outlined in Figure 35 and Figure 36 below is proposed for transporting the large equipment from the Lüderitz harbour to the site. The route follows Bismarck Street from the Harbour up to Bay Road and then leaving Lüderitz along the B4 eastbound. The route continues along the B4 roadway towards the B4 / C13 intersection and then finally traveling along the C13 roadway towards the site.

The final route will have to be checked for compliance during the final design stages of the project. Permits will need to be obtained from the Roads Authority for all abnormal loads and the specific route will be specified based on the characteristics of each load type.

The Lüderitz harbour has previously been used to import wind turbine equipment and based on the preliminary route evaluation the route is acceptable from a transport impact perspective. Possible constraints at intersections and power line/cable crossings will also be confirmed during the permit application process based on the characteristics of each load. Based on the information currently available no issues are expected along the route and the wind turbine components can be imported via the Lüderitz harbour.

There is an existing gravel road off C13 Road which will be used as an access road for the development. This access road is approximately10km to the south of the Witputz intersection.

The access road should be at last 5m wide to accommodate the abnormal load vehicles. The public road network in the site vicinity should be maintained during the construction period and once the construction phase is completed any damage to the surrounding Road Network should be repaired to an acceptable standard.

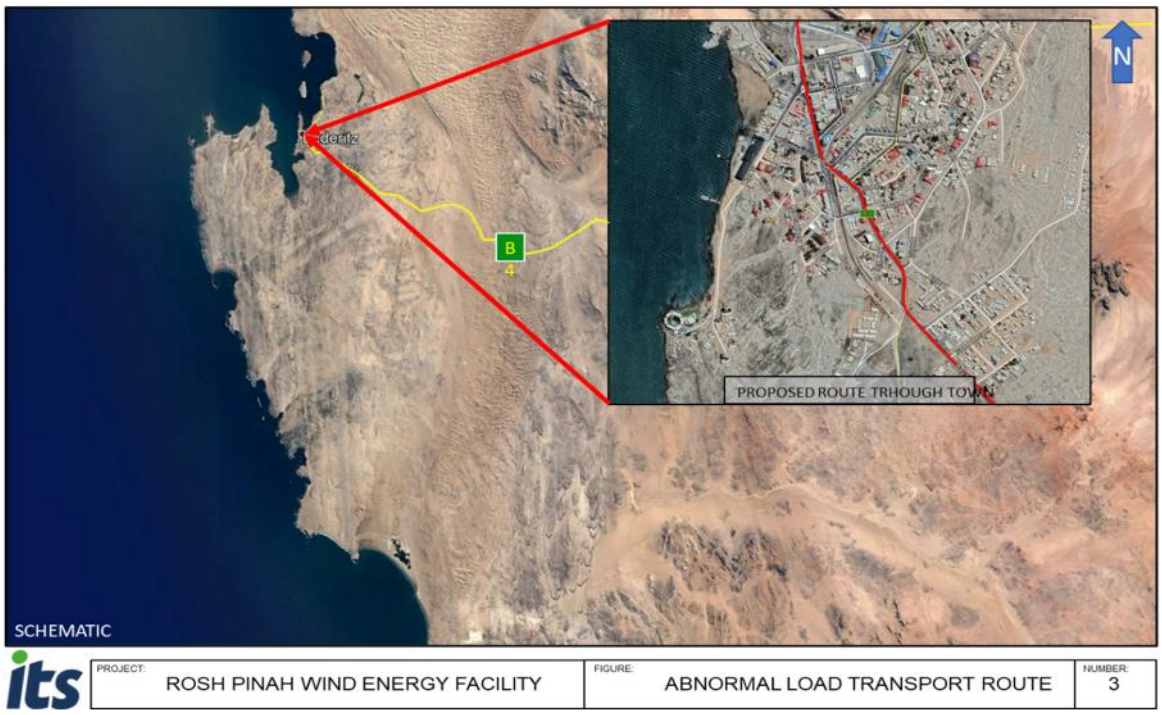


Figure 35: Abnormal transport route proposed through Lüderitz (ITS, 2021)

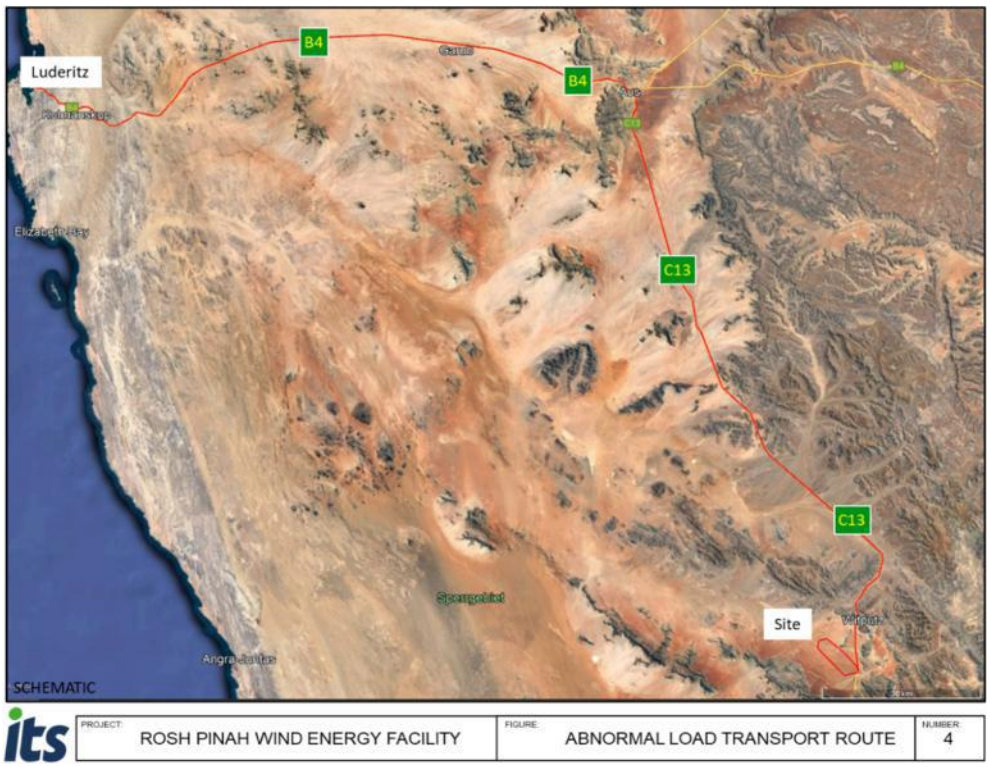


Figure 36: Abnormal load transport route proposed along the B4 and C13 national roads to the site (ITS, 2021)

Based on the most likely transport route to be used, the major roads included in this study are the National Road (B4) and the C13 Road. The existing roadway characteristics are summarised in Table 21:

Table 21: Existing Roadway Facilities

Roadway	Type of Road	Posted Speed (km/h)	Road Surface
B4(T0402)	National Road (Class 2 major arterial)	120	Asphalt
C13(M0118)	Regional Road (Class 3 rural minor arterial)	120	Asphalt
Bismarck Street	Local Street (Lüderitz)	60	Asphalt

5.11.5.1 Existing Cross Sections and Surface Conditions

The B4 Road is paved with one lane per direction of travel with gravel shoulders along both sides of the road. The lanes are 3.4m wide with about 2m wide shoulders. The B4 surface condition ranges from fair to good surface conditions in the site vicinity. A section of the B4 close to Lüderitz is often partially covered by moving sand dunes and have to be cleared in the mornings.

The C13 Road is also that of a typical rural setting of a provincial Road, with a single lane per direction with gravel shoulders. The roadway lanes are approximately 3m wide with the shoulders approximately 1.8m wide. The surface conditions of C13 ranges from fair to good surface conditions in the site vicinity.

The Site Access Road is a gravel road, single lane that is approximately 3.5m wide, currently with no posted speed limit.

5.11.5.2 Existing Traffic Volumes

The Average Daily Traffic (ADT) volumes along the B4 (T0402) and C13 (M0118) were obtained from the Traffic Surveillance and Pavement Management System of the Namibian Roads Authority. The 2018 traffic volumes were escalated with a 4.5% growth rate which was used to determine a calculated 2021 traffic volume. Table 22 below shows the current ADT volumes, the Average Daily Truck Traffic (ADTT) volumes and the peak hour volumes on the road network in the NWP site vicinity. Based on the traffic count data the peak hour for the B4 and C13 is around midday between 12:00 and 13:00. The peak hour in the town of Lüderitz will be more defined during the a.m. and p.m. peak hours with people commuting to/from work.

Table 22: Existing Traffic Volumes

Roadway	ADT	ADTT	Peak Hour Volume	% Heavy Vehicles >8000kg
B4	254	68	55	27%
C13	236	91	51	39%

5.11.6 NOISE

The need for modelling the noise was considered during scoping. Advice in this regard was gained from what is learnt on other projects:

"The noise is a combination of two factors, mechanical noise and blade noise. The mechanical noise is created by the gearing and generator and is audible from 100 m. The primary noise comes from the blade, created by the compression of air and the impact of the compressed air against the wind turbine. The combined noise for a single wind turbine (typical) has been measured at 99.8 dB and is audible under still (low wind) conditions at 1 km, though distances of 1.5 km have been reported." (Interconsult, Update 2018).

World Bank Environmental, Health, and Safety Guidelines: Wind Energy, updated 2021). [12], provide guidelines to suggest when noise may require further modelling. Sensitive receptors are to be identified within a 2km radius. This threshold is considered to be conservative, with other guidelines given at 1.5 km and as close as 500 m. However, the ambient noise of the study area is expected to be low, therefore the conservative distance of 2km would be more appropriate.

The boundaries of the originally proposed sites considered were all beyond the 2km threshold distance, therefore noise modelling was not required. However, as seen in Figure 37 the final selected site has two (2) homesteads within 2km from the site boundary. Therefore the wind turbine generator falling within this rage, namely WTG03, should be either moved, or noise modelling conducted to determine the impact on the receptors to the south-east. It is suggested, therefore that this particular turbine position be kept in abeyance until the exact noise impact in the area has been established. Noise modelling can be arranged with the nearby occupent by

[12] https://www.ifc.org/wps/wcm/connect/b82d0563-b39a-42a7-b94e-0b926b4a82f9/FINAL_Aug%2B2015_Wind%2BEnergy_EHS%2BGuideline.pdf?MOD=AJPERES&CVID=mpusVXy

Construction noise at the solar PV site and the wind park site should be considered in the ESMP, of which blasting activities are expected to be the most significant, if required. For blasting a permit is required from the Ministry of Mines and Energy (MME). This requirement has been included in the ESMP.

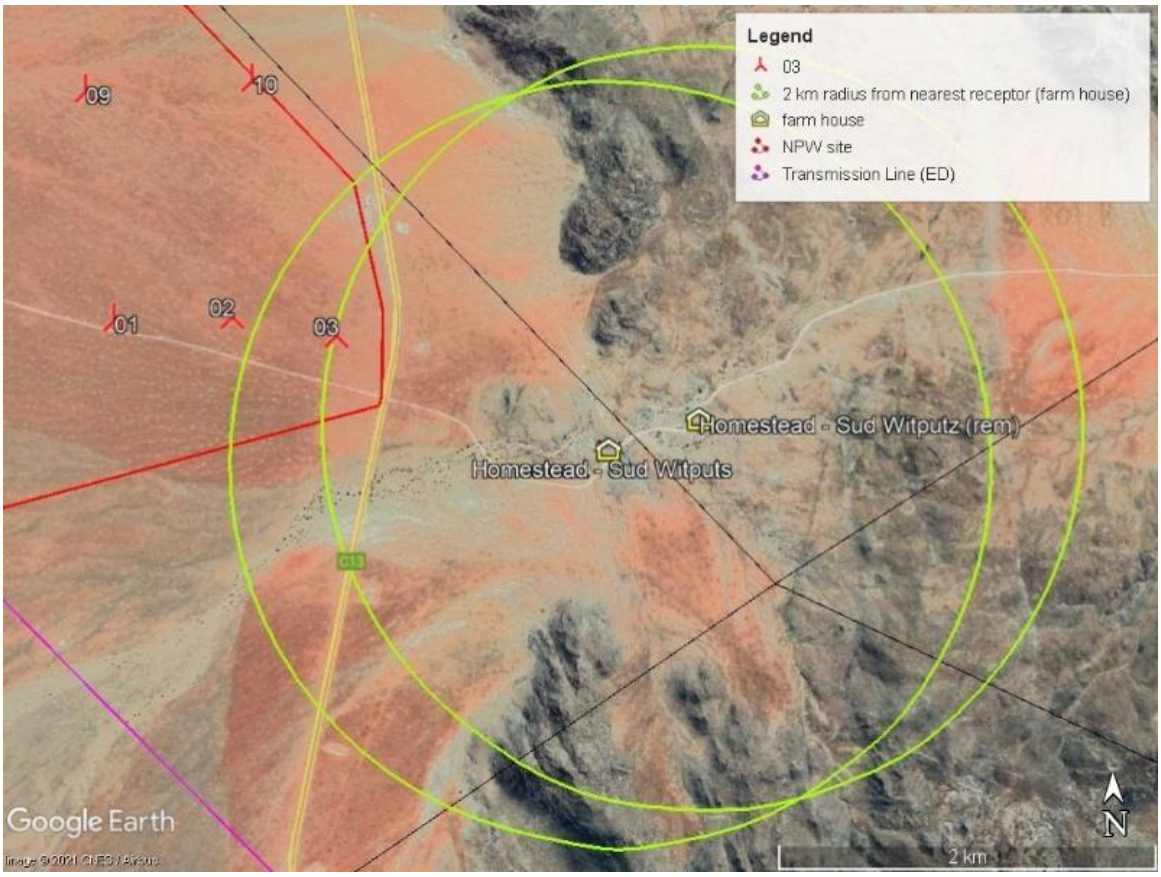


Figure 37: 2km Threshold radius to the nearest two sensitive receptors.

The zones sensitive from a land use point of view are incorporated in the visual assessment, Section 5.3).

Table 23 summarises the sensitivity of the Project site in terms of the other Socio-economic characteristics of the area:

Table 23: Socio-economic and infrastructure sensitivities

SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
Energy provision of Namibia – historic dependency on South Africa importing non-renewable energy.	High – Increased costs of electricity imports, resources becoming increasingly scarce in the region, environmental impact of non-renewable resources.	Nation-wide benefit as the country's energy source is strengthened whilst curbing the future increases in average cost of electricity.

SENSITIVITY	VULNERABILITY	POTENTIAL IMPACT
The workforce accommodation site, and laydown area with associated need for infrastructure and services.	High due to sensitivity of plant species, archaeological sites, visual impact, commercial land ownership.	Reduced land availability for the farm owner, and land use conflict during construction. Impact on vegetation, archaeology and biodiversity when placed in an undisturbed area near Rosh Pinah.
Noise levels – current ambient noise levels vs potential raised levels.	Low to medium – for the one sensitive receptor at the Farm Witputz.	Noise impact at homestead on Farm Witputz.
Livelihood strategies.	Currently high vulnerability of people in the region and in Rosh Pinah area, as the mines have scaled down in recent years and the regional and national economy is under pressure. The unemployment in Rosh Pinah is high.	Positive contribution to livelihood strategies in Rosh Pinah area and the region. Potential labour influx and additional burden on services and infrastructure and associated social ills.
Road infrastructure – existing road infrastructure, their surface condition, accesses, heavy load routes to the harbour.	Low vulnerability. Roads are in an acceptable condition and traffic volumes are low.	Impact of additional loads on existing road network. Impact of abnormal traffic on Lüderitz and harbour traffic.

6 STAKEHOLDER ENGAGEMENT

The stakeholder engagement process for this ESIA has included consultation with likely affected people and with those who have registered as Interested and Affected Parties (I&APs) following public invitations to participate. This draft report was also circulated to the same group for their review and comment. The Stakeholder Engagement Report, with the outcome of these engagements, is attached to this document as Appendix J.

The issues identified during the engagement is summarised in Table 24.

The community of Rosh Pinah are generally in favour of the proposed development. Socio-economically, the town of Rosh Pinah experiences an economic slump and the community is hopeful for potential employment opportunities. The potential issues of concern have been incorporated into the assessment and the references to the information is provided in the table below (Table 24).

The comments resulting from the review of this draft report were 1) technical questions and 2) questions and comments about the impact on avifauna, the details of which have been included in Appendix J. The comments and questions were responded to, and resulting in minor changes to the Afivauna Impact Assessment.

Table 24: Issues identified so far during the public engagement process

COMMENT	REFERENCES WHERE ADDRESSED IN THE ESIA AND ESMP
The motivation for wind power deployment in Rosh Pinah area	An answer was briefly given at the meeting. There is a section in the ESIA report explaining NamPower's motivation for the project (Section 2.1).
Movement of wildlife: 1) how may the site restrict movement of wildlife between the two nearby national parks (the farm and surrounds is considered by MEFT as a natural corridor for wildlife movement between the two national parks, and this feature should be preserved, and 2) to what extent will wildlife move away as a result of the project.	These questions are answered in the Biodiversity Impact Assessment for the study (Appendix K, Section 5.6, Section 7) and appropriate conditions included in the ESMP.
Current desperate socio-economic situation of the Town.	Corporate responsibility and job opportunities, including recruitment procedures, to Rosh Pinah to be maximised. Considered during the socio-economic investigation for the ESIA (Section 5.11 and 7) and conditions to be included in the ESMP.
Waste disposal – where will waste be disposed of – consider the capacity of the waste disposal site of Rosh Pinah to effectively receive and accommodate the waste. Consider the disposal of the wind turbine blades, when they reach the end of their life span.	Considered in the waste management section of the ESIA (Section 5.11.4) and ESMP, operational and decommissioning phases.
Water consumption – the planned water source.	To be considered in the infrastructure, hydrology, sections of the ESIA report, and the ESIA (Sections 2.3 and 5.4.) and the ESMP.
Impact on vegetation, including the impact of the solar park on vegetation and the shadow effect.	Considered in the Vegetation Impact Assessment (Appendix E).

7 IMPACT ASSESSMENT

Since the identification of sensitivities and potential impacts during the screening and the scoping phases, the project site layout has been adjusted as explained in Section 3. The assessment provided hereafter is based on the assumption that the no-go zones have been excluded. It is also based on an improved understanding of the sites following ground-truthing.

This section focusses on significant impacts which require particular mitigation over and above the normal management actions contained in the ESMP that are relevant to all construction projects (Appendix L). The specialist reports also contain further detail of impacts that are relevant to each expert. The aim of this assessment is to elaborate on matters of central importance.

The impact assessment is combined herein for the Wind Park Sites, the solar PV site and its components, and the power line. The impact assessment is generally similar for the project components, but where there are differences, these are provided.

Table 25 below provides the criteria used for the significance assigned to each potential impact:

Table 25: Impact assessment criteria used

DESCRIPTION	
Nature	Reviews the type of effect that the proposed activity will have on the relevant component of the environment and includes ''what will be affected and how''.
Extent	Geographic area. Indicates whether the impact will be within a limited area (on site where construction is to take place); local (limited to within 15 km of the area); regional (limited to ~100 km radius); national (limited to the coastline of Namibia); or international (extending beyond Namibia's boarders).
Duration	Whether the impact will be temporary (during construction only), short term (1-5 years), medium term (5-10 years), long term (longer than 10 years, but will cease after operation) or permanent.
Intensity	Establishes whether the magnitude of the impact is destructive or innocuous and whether or not it exceeds set standards, and is described as none (no impact); low (where natural/ social environmental functions and processes are negligibly affected); medium (where the environment continues to function but in a noticeably modified manner); or high (where environmental functions and processes are altered such that they temporarily or permanently cease and/or exceed legal standards/requirements).
Probability	Considers the likelihood of the impact occurring and is described as uncertain, improbable (low likelihood), probable (distinct possibility), highly probable (most likely) or definite (impact will occur regardless of prevention measures).
Significance	Significance is given before and after mitigation. Low if the impact will not have an influence on the decision or require to be significantly accommodated in the project design, Medium if the impact could have an influence on the environment which will require modification of the project design or alternative mitigation (the route can be used, but with deviations or mitigation) High where it could have a ''no-go'' implication regardless of any possible mitigation (an alternative route should be used).
Status of the impact	A statement of whether the impact is positive (a benefit), negative (a cost), or neutral. Indicate in each case who is likely to benefit and who is likely to bear the costs of each impact.
Degree of Confidence	Is based on the availability of specialist knowledge and other information.

Table 26 below presents an evaluation matrix adopted for the impact assessment, including the key impacts identified and their final assessment, based on the criteria provided above:

Table 26: Impact assessment table

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
CONSTRUCTION PHASE[13]									
Overall implementation of the project	Positive Increased power security for the country and curb increase in future cost of energy.	National	Long term	High	Definite	High	High	N/A	. N/A
	Positive Reduced need to import ESKOM coal generated electricity followed by reduced overall carbon footprint.	International	Long term	High	Definite	High	High	Continue replacing greener energy with energy generated from non-renewables where feasible.	High
	Positive Contribution to job security, livelihoods and	Regional	Short term	Medium	Definite	High	Low	Locals first policy	Low to medium

[13] The activities of the construction phase are similar to the decommissioning phase. Therefore, the impact assessment for the former also applies to the latter phase.

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
	economic spinoffs in the region and Rosh Pinah								
	Negative Increased pressure on housing and infrastructure in Rosh Pinah caused by additional labour demand and labour influx.	Local	Medium term	High	Highly probable	High	Medium	Locals first policy – local residents continue living in existing housing with minimum additional housing required. Identify with Roshskor a temporary site for housing in case the mining industry recruits again. Negotiate all infrastructure provision with Roshskor.	Low
Excavation, blasting, vegetation clearance, transport, construction of concrete foundations for turbines, crane	Negative Decline in populations of endemic plant and animal species and others of high concern and loss of important fauna and flora habitats, including displacement of associated biota, such as birds and their food sources. (vegetation	International	Permanent	High	Definitive	High	High	Avoid the no-go zones, keep collateral damage to a minimum. Implement and monitor the Vegetation Management Plan, which includes a restoration programme. DO NOT remove the vegetation underneath the solar panels.	Medium

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
pads, crane assembly areas, access roads, transmission line poles, PV panels and associated support structures, office buildings etc.	listed in red in Table 1, Appendix E).							Use existing roads / tracks as far as possible. Stick to designated tracks. Avoid WTG04, WTG05; and possibly WTG01 which are potential Barlow's lark breeding/distribution areas.	
	Negative Traffic congestion in Lüderitz from the harbour due to abnormal loads, inability of existing roadway capacity to accommodate heavy vehicles.	Local	Short term	High	Definite	High	Medium	Traffic Management Plan during construction Designs of internal roads to Roads Authority standards.	Low
	Negative Roost disturbance	Local	Permanent	Medium	Uncertain	Low	Low	Blasting should be avoided, and any bat roosts in buildings should be left undisturbed.	Insignificant

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
	Negative Loss and degradation of bat foraging habitat	Onsite	Permanent	High	Definite	High	Medium	Project infrastructure and disturbance footprints should be minimized as far as possible. Off-road vehicle activity must be strictly prohibited, and human trampling of native vegetation should be tightly controlled. Local drainage lines must remain strictly undisturbed. Flora should be effectively rescued and relocated.	Low
	Negative Displacement of bats from remaining habitat	Onsite	Long term	Medium	Probable	Low	Medium	Built infrastructure and disturbances including noise and light should be minimized onsite.	Low
	Negative Physical disturbance of the NWP project site terrain	On site	Permanent	high	Improbable	High	Low	Apply chance find procedure	Low
	Negative	Local (only around turbine	Long term	High	Definitive	High	High	Implement recommendations provided in the screening	Medium

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
	Physical destruction of vegetation, including species of conservation concern	footprint locations, internal access roads, laydown areas etc.)						and scoping reports, i.e. avoid the no-go zones. Limit activity footprint and limit movement to designated areas only. Implement and monitor the Vegetation Management Plan.	
	Negative Habitat loss involving Namibian legally Protected and / or Threatened species.	National	Permanent	Medium	Definite	High	High	Minimise the footprint of habitat destruction as per recommendations in scoping report: locate lay-down areas, site offices and personnel housing elsewhere; minimise, demarcate and enforce the smallest possible construction footprint and do not clear any additional vegetation; make	

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
								access routes single-lane.	
	Negative Deaths of individual animals belonging to slow-moving species prone to road kills.	On site	Temporary	Medium	High	High	Medium	Introduce and enforce speed limits on all vehicles; educate and sensitise construction workers to avoid running over live animals, particularly tortoises and chameleons.	Low
Illegal human activity (trespassing on private land) on rocky hillside and mountain habitats	Negative Habitat loss with the potential for species extinction in the case of habitat-specific range-restricted endemic species.	International	Permanent	High	Definite	High	High	Completely ban access to highly sensitive rocky hillside and mountain habitats	Low
Construction of the transmission line.	Negative: Visually significant impact of construction activities on a section	Local	Temporary	Low	High	High	Low to Medium	Keep construction activities geographically focused, not along the entire route section affected.	Low

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
	of the C13 main road tourism route.								
Construction of wind turbines, solar PV fields and associated infrastructure.	Negative: Visually significant impact of construction activities on a section of the C13 main road tourism route.	Local	Temporary	Medium	High	High	High	Keep construction activities geographically focused.	Medium
Movement of the workforce and easier access by the public in the project area.	Negative Illegal harvesting of plants for ornamental purposes or fuelwood (including species of conservation concern).	Local	Long term	High	High	Medium	Medium	The workforce will not be permitted to live on site or move away from the designated construction site. Strict measures in the ESMP, e.g. training, workforce management, penalties, the public not to have uncontrolled access without guides.	Low
Environmental conditions including existing and predicted increasing high	Negative Heatstroke and dehydration followed by potential community dissatisfaction and	Local	Long term	High	Possible	High	Medium	Prevent working under hot temperatures, Provide cool water for all on-site staff,	Low

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
temperatures and extreme weather events (causing risks to the project)	reduced productivity during summer months.							Change working hours to avoid hottest part of the day, Provide PPE and sun protection.	
OPERATIONAL PHASE									
Existence of transmission line pylons and turbines	Negative Collision with wind turbines (rotor blades, nacelles and towers), including during periods of poor visibility (fog, or at night) result in injuries and mortalities of birds. This includes direct collision events and mortalities from injuries sustained when caught in the suction draft of moving rotor blades.	Local	Long term	Medium	Probable	High	Medium	Avoid sensitive sites and flight paths, and maintain buffer zones. Avoid power line servitude area for wind turbine generators, used by Ludwig's Bustard and raptors. Avoid alignment of wind turbine perpendicular to main flight paths; align the direction of rows of turbines with that of the wash areas and (east – west) flight paths (for Namaqua Sandgrouse).	Medium-low

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
								Site the turbines close together, in clusters, to increase visibility; allow for corridors/flight paths between clusters, aligned with main flight trajectories. Incorporate selective turbine removals (or relocation) at the design stage. Mark the turbine blades to increase visibility. Down-shield all lighting on infrastructure. Preferably use red, intermittent lighting on wind turbine generators. Consider further mitigation by means of the temporary halting of the turbines during periods of high risk. Monitor all structures for any impacts, and apply retro-mitigation as appropriate.	

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
	Negative Collisions with transmission lines or wire stays, and / or electrocution by transmission lines cause injuries and mortalities; particularly priority species as defined in the Avifauna Impact Assessment (Appendix F).	Local[2]	Long-term	Low to Medium	Uncertain	Low to Medium	Medium	Where possible, install transmission and other power cables underground along access tracks. Mark identified sensitive overhead sections of power line (and guy wires if necessary) using bird flight diverters/ deflectors (see ESMP). Monitor all structures for any impacts, and apply retro-mitigation as appropriate.	Low
	Negative Bat fatalities	Regional	Long term	Medium	Definite	High	Medium	During the first two (2) operational years of the wind farm diligent bat fatality monitoring. Diligent bat fatality monitoring and data analysis accompanied by adaptive management and mitigation of bat fatalities. If bat fatalities are unacceptably high, wind turbine curtailment,	Low

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
								bat deterrents, and/or other measures must be implemented.	
	Negative Deaths of insects due to collision with moving turbine blades. Reduced turbine efficiency and hence generating capacity due to accumulation of insect remains on blades.	Local	Long term	Medium	Definite	High	Medium	Measure climate (wind speed, rainfall, temperature) on site and simultaneously gather data on insect flight patterns and collision intensity. Determine the climatic factors that correlate with periods of high collision risk. Use this information to develop turbine management practices that balance efficient generation with lower collision risk.	Potentially low, depending on study results.
Eviction of bats from buildings.	Negative Roost disturbance	Local	Permanent	Medium	Uncertain	Low	Low	Any bat roosts in buildings should be left undisturbed.	Insignificant
Continued vehicle and human traffic, and introduction and uncontrolled	Negative Loss and degradation of bat foraging habitat	Onsite	Permanent	Medium	Definite	High	Medium	Project infrastructure and disturbance footprints should be minimized as far as possible. Off-road vehicle activity must be strictly prohibited, and	Low

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
proliferation of invasive alien flora.								human trampling of native vegetation should be tightly controlled. Local drainage lines must remain strictly undisturbed. Disturbed areas should be effectively rehabilitated post-construction.	
	Negative Deaths of individual animals belonging to slow-moving species prone to road kills.	On site	Long term	Medium	High	High	Medium	Maintain speed limits on site; educate and sensitise personnel to avoid running over live animals, particularly tortoises and chameleons.	Low
Operation of the wind farm and solar PV sites.	Negative Displacement of bats from remaining habitat	Onsite	Long term	Medium	Probable	Low	Medium	Built infrastructure and disturbances including noise and light should be minimized onsite.	Low
Fencing off of the NWP site	Negative The migration range of some of the antelope and predator species are very high and fences act as	Regional	Long Term	Low	Improbable	High	Medium/ Low	DO NOT fence off the entire site, only critical safety components.	Low

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
	obstructions that may be detrimental to individual animals surviving								
Indirect impact from construction and operation.	Negative Decline or loss of common and conservation priority bat species populations.	Regional	Long term	Medium	Probable	Medium	Medium	Ensure effective mitigation of direct impacts.	Low
Indirect impact from construction and operation.	Negative Decline or loss of bat ecosystem services.	Regional	Long term	Low	Uncertain	Medium	Medium	Ensure effective mitigation of direct impacts.	Low
Cumulative impact of multiple wind farms in the region.	Negative Cumulative impact on bats, bat habitats, and ecosystem services.	Regional	Long term	Low	Uncertain	Medium	Medium	Ensure effective mitigation of direct impacts.	Low
The transmission line.	Negative: Visually significant impact of construction activities on a section	Local	Long term	Low	High	High	Medium	Use neutral colours on the structures with a blue basis (e.g. grey).	Low

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
	of the C13 main road tourism route								
The wind turbines, solar PV fields and associated infrastructure	Negative Visually significant impact of construction activities on a section of the C13 main road tourism route	Local	Long Term	Medium	High	High	High	Use neutral colours on the structures with a blue basis (e.g. grey) if possible from an aviation safety perspective. Alternatively investigate new patterns to make wind turbine visible from flight path positions, while having broken patterns to reduce visibility from the viewpoints affected. Develop the site in phases from the northwest to reduce initial visibility.	High to Medium
Environmental conditions including existing and predicted increasing high temperatures,	Negative Reduction of the efficiency of certain types of equipment and wind turbines.	On - site	Temporary	High	Possible	High	Medium	Review and adjust if possible, the operational temperatures of equipment.	Low

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
extreme weather events and changes in wind regimes (causing risks to the project)								Increase maintenance schedule and prevent slow/shut downs. Investigate the suitability of selected turbines in hot temperatures and consider turbine types designed for hotter climates. Modern-day turbines are altered to deal with changing wind regimes (e.g. feathering, blocking out, etc.)	
DECOMMISSIONING PHASE[14]									
Waste disposal	Negative Increased waste in the area and region, particularly caused by the need to discard the end-of-life large-sized	Regional	Permanent	High	Definite	High	High	Commission a study during operation prior to decommissioning to determine the best practical environmental solutions for the disposal	Medium-low

[14] General impact management of this phase, including the need for rehabilitation, is contained in the ESMP, and the construction impacts will generally also be applicable to this phase.

PROJECT ASPECT	IMPACT STATUS/ NATURE	EXTENT	DURATION	INTENSITY	PROBABILITY	DEGREE OF CONFIDENCE	SIGNIFICANCE		
							PRE-MITIGATION	MITIGATION/ ENHANCEMENT (ELABORATED ON IN THE ESMP)	POST-MITIGATION
	turbine blades and other parts of the turbines.							(which should following waste avoidance-minimisation-recycling hierarchy principles) of the turbine blades and other components of the project in need of removal from the site.	
Decommission of the transmission line.	Negative Visually significant impact of construction activities on a section of the C13 main road tourism route.	Local	Temporary	Low	High	High	Low to Medium	Keep decommission activities geographically focussed, not along the entire route section affected. Remove all structures during de-commissioning.	Low
Decommission of wind turbines, solar PV fields and associated infrastructure.	Negative Visually significant impact of construction activities on a section of the C13 main road tourism route.	Local	Temporary	Medium	High	High	High	Keep decommission activities geographically focussed.	Medium

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 SCREENING AND SCOPING

The timing of this ESIA process determined that the fieldwork for critical studies could be finalised during the screening and scoping phases. This provided a thorough understanding of the project area and could be used to clarify no-go and high sensitivity zones, as well as preferred site locations and configurations for the wind and solar arrays.

8.2 SITE SELECTION

This information fed into the selection of the final project site, together with technical and business case information. The no-go zones could be completely avoided, while infrastructure was condensed to minimise damage in the other sensitive zones. The design of the wind turbine and solar array layout was significantly influenced by the vegetation and avi-fauna information presented.

8.3 IMPACT ASSESSMENT BASED ON SELECTED SITE

The final impact assessment reported on in this document was based on this previous work, i.e. assuming that sensitive areas will be avoided. The significant impacts in need of careful avoidance and management are as follows:

- *Socio-economic impacts* are positive for Namibia as the project will move the country toward a more sustainable energy mix, free from reliance on South Africa for its power. There will be some, yet limited contribution towards Rosh Pinah and the region's economy. Negative socio-economic impacts, including potential labour influx and increased pressure on Rosh Pinah's infrastructure can be addressed by communication and management through the relevant stakeholders. There should be ongoing stakeholder engagement and a grievance mechanism allowed for during construction and operation.
- *Habitat modification and destruction to make way for the project footprint.* This impact is often much larger than needed due to unplanned and unsupervised activities. This is particularly relevant in Namibia where construction and associated activities are generally characterised by excessive destruction caused by negligence. The fact that the study area is particularly sensitive to disturbance due to its locality in the Succulent Karoo Biome, harbouring many endemic and restricted range plant species, and some 26 priority bird species sensitive to the project, makes the avoidance of collateral damage to the habitat of crucial importance. The footprints of the wind turbines are relatively small, but destruction can be significant if clearing is done indiscriminately, particularly if vehicle movement between the turbine footprints is not carefully planned. With the additional significant footprint of the roads, the solar PV

footprint and other infrastructure corridors, destruction is easy and can happen quickly, and will practically be irreversible as rehabilitation efforts can never fully replace what has been lost. Notably, the vegetation under the solar panels should not be removed. This should be clearly spelt out to the contractor and to all involved and repeated to ensure it is understood. In Namibia it is normal practice to remove all vegetation in the way of a development. NamPower will have to make every effort to avoid collateral damage by ensuring supervision at the crucial periods of construction, notably when vegetation clearance is being contemplated. The Environmental Control Officer has to be present for this activity. Areas to be cleared need to be defined and only this vegetation should be removed, on the basis of the recommendations from the vegetation specialist in the ESMP.

- *Faunal diversity* (Biodiversity) is closely associated with the vegetation zones. It is especially rocky outcrops that are vulnerable to change (avoided by the site), but all three (3) the biodiversity zones are of high significance and range restricted resulting in vulnerability to indiscriminate habitat destruction. Vulnerable species are Namaqua Chameleon, various range restricted tortoises and vegetation-dependent insects. Prohibiting habitat destruction by reducing project footprint is the most effective mitigation measure.
- *Loss of protected and endemic, range restricted plant species, habitat loss and modification and loss of archaeological sites* due to movement outside the designated site. The contractor should strictly prohibit movement outside of the project site and continually enforce this.
- *Traffic disruption during construction in Lüderitz as abnormal loads move from the harbour towards the site.* A route has been recommended to be followed by the abnormal load vehicles, which should be approved by the Roads Authority and the traffic police should direct traffic whilst moving through the town.
- *Bird collisions with project infrastructure, especially wind turbines and power line conductors*. Expected bird flight paths have been indicated and should be avoided where possible. Bird markers, arrangement of solar PV arrays and WTGs, as well as all other recommendations by the bird specialists should be implemented. Monitoring during and after construction is important to increase Namibia's understanding of bird-infrastructure collisions and to more specially tailor mitigation measures.
- *Escalation of waste during decommissioning*. The specific challenge in this regard is the sheer size of the rotor blades and other components, which makes it challenging to find a suitable waste disposal solution for them. It is recommended that the matter be further investigated as the time for disposal draws near, when the globe has hopefully advanced in dealing creatively with this challenge.
- Though *bat occurrence* is expected to be low, caution should be taken not to reduce or add to supporting habitat. Neither should artificial food and water

sources be created of attracted to the wind turbines leading to excessive collisions.

- Visual impact of the NWP, especially the wind turbines, is significant and markedly alters the visual landscape for it's visual class. The transmission line is visible for at least two thirds (>66%) of the route, however it is in the same corridor as an existing major transmission line and will not alter the visual landscape beyond what is allowed in its landscape class. Using colour schemes that blend with the environment (with a blue tone) will assist in reducing the visual impact of the NWP elements.

Other more general construction impacts are addressed in the ESMP.

8.4 CUMULATIVE IMPACT

Even though the project is located in a relatively sensitive area, the expected impacts of the project can remain within limits of acceptable change given its relatively small scale within the Succulent Karroo Biome and sensitivity zones in which it is located. The workforce is also relatively small. Management strategies would have to be targeted and committed to limit this change, particularly those related to limiting footprint and avoiding collateral damage.

Of some concern is the cumulative effect of this project combined with other wind developments in the next-door; //Tsau Khaeb National Park, as well as the wind resource that will probably be further developed in the vicinity of this project to capitalise on the local wind resource. While the wind resource is limited in the local area (see Figure 38), it is extended in the //Tsau Khaeb National Park, but covers the same biome. It is therefore recommended that a Strategic Environmental Assessment (SEA) be conducted for wind development in Namibia to address matters of strategic concern, including impact on habitat, vegetation, tourism, archaeology and socio-economic impact.

While these issues may be manageable on an individual project basis and are being assessed for each project independently, resulting in relatively acceptable change expected for each, this may well not be the case if projects are considered jointly. The individual Project Developer, such as NamPower, could contribute toward such a study, commensurate with their contribution to the cumulative footprint. Each individual developer can however not be held responsible for assessing these cumulative impacts and the initiation and funding of such a study should therefore be driven by the regulator.

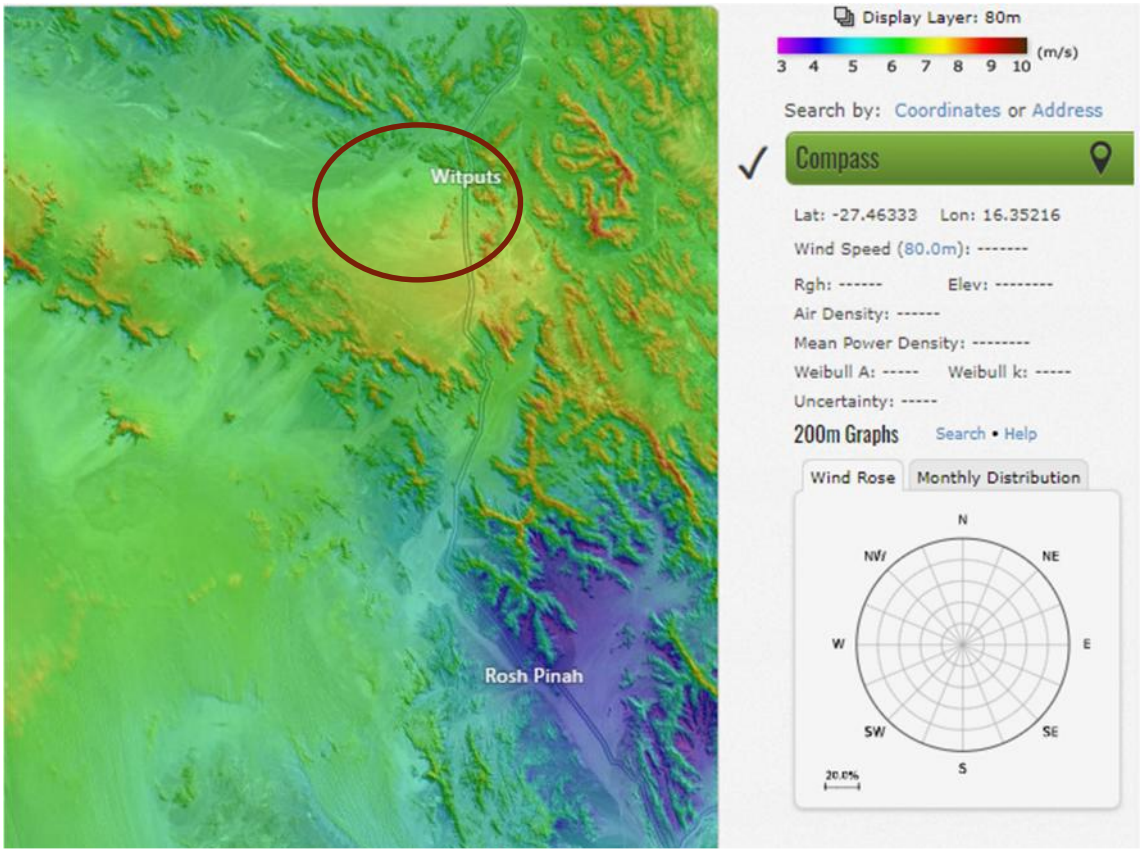


Figure 38: Wind Power density map showing highest densities within the red circle at the project site in the Witputs valley (Source: NamPower).

8.5 CONCLUSION

The proposed 100MW NamPower Wind Project, including a potential additional future 100MW Solar Park and associated transmission lines and other infrastructure will offer increased power security and curb increases in future costs of energy for the country. It will also reduce the need to import ESKOM coal generated electricity followed by a reduced overall carbon footprint. It will also provide a welcome injection into the local and regional economy, in an otherwise strained economic climate.

Notwithstanding this, the project will be developed in a sensitive and unique biophysical setting. With the avoidance of sensitive ecological, technical and physical zones, the impacts expected from the project have been significantly reduced. Key impacts, including those expected on vegetation and birds are still expected to be significant. Above average commitment is required to manage these impacts and to avoid them from becoming unacceptable. Monitoring should continue to inform the management of impacts and to adapt strategies where necessary. The design measures, management regimes and monitoring requirements given in the ESMP are of utmost importance and should be structured into all communications and management platforms related to the project. With

this condition in place, it is recommended that Environmental Clearance be granted for the project.

It is further recommended that an SEA be initiated for the development of wind power in the TKNP, including these adjacent wind projects in the same biome, with contributions made by all the prospective wind power developers.

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