ENVIRONMENTAL IMPACT ASSESSMENT: THE DEVELOPMENT OF A 20MW SOLAR PHOTOVOLTAIC (PV) POWER PLANT AT KHAN SUBSTATION IN USAKOS, ERONGO REGION-NAMIBIA.

ENVIRONMENTAL SCOPING REPORT (ESR)

DATE: JULY 2021

D&P ENGINEERS
AND ENVIRONMENTAL CONSULTANTS
"Purpose with Passion"

AUSSENKJER ENERGY INVESTMENT (PTY) LTD

ACCESS

The Development of a 20mw Solar Photovoltaic (PV) Power Plant at Khan Substation in Usakos, Erongo Region-Namibia

Environmental Scoping Report (ESR)

Environmental Scoping Report Prepared for
Access Aussenkjer Namibia IPP Consortium

P.O. Box 73766
Dubai
UAE

D&P Engineers and Environmental Consultants (Pty) Ltd.

20 Joseph Ithana Mukwayu street
Ludwigsdorf
Windhoek-Namibia
PO Box 8401, Bachbrecht,
Telephone: +264 (61) 302 672/ 081299 8444
Facsimile: +264 (61) 255 207
tdavid@dpe.com.na
https://www.facebook.com/DP-Engineers-and-Environmental-Consultants-193970370936785/

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Compiled by:

D&P Engineers and Environmental
Consultants (Pty) Ltd
Email: info@dpe.com.na
Authors:
Tendai E. Kasinganeti

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Definitions

TERMS	DEFINITION
BID	Background Information Document
EAP	Environmental Assessment Practitioners
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA (R)	Environmental Impact Assessment (Report)
ESIA	Environmental and Social Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Plan Report
GHG	Greenhouse Gasses
ISO	International Organization for Standardization
I&Aps	Interested and Affected Parties
MEFT: DEA	Ministry of Environment, Forestry and Tourism's Directorate of Environmental Affairs
NHC	National Heritage Council
NEMA	Namibia Environmental Management Act
ToR	Terms of Reference
UNFCCC	United Nations Framework Convention on Climate Change

i. Purpose of This Environmental Impact Assessment Report

This Environmental Scoping Report (ESR) follows on the Scope of Work delineated by Access Aussenkjer Namibia IPP Consortium in collaboration with Nampower for the proposed solar PV plant proposed at Khan Sub-Station in Usakos, Namibia. Existing information and input from commenting authorities, Interested and Affected Parties (I&APs) was used to identify and evaluate potential environmental impacts (both social and biophysical) associated with the proposed project.

Environmental flaws associated with the proposed project were identified through this ESR. A conscious decision was made based on the recommendations and guidelines by the Directorate of Environmental Affairs EIA guidelines in order to assess both significant and less significant environmental impacts proposed by the development. The developed Environmental Management Plan (EMP) for this proposed activity will have to be effectively implemented by the client, to ensure that adverse environmental impacts are not considered.

The detailed assessment of the anticipated impacts was undertaken with the purpose of highlighting any areas of concern regarding to the proposed project during its construction, and operation. In addition, an independent sensitivity mapping analysis was undertaken. This analysis characterised the development site on the significant environmental aspects in order to reflect the sites suitable and unsuitable (no-go) development footprint areas. This action guided the final footprint of the PV Plant and the transmission line.

This report will also be used to motivate and define the previously identified, project alternatives (i.e. site, technology and layout) based on the findings of the environmental baseline study and the suitability of the site to the type of development. This EIAR has been compiled in accordance with the regulatory requirements stipulated in the EIA Regulations (2012), promulgated in terms of the Namibian environmental legislation (Environmental Management Act (No. 7 of 2007))

The ESR was commissioned because the proposed establishment triggered the application for an environmental clearance certificate as the following listed activity will be triggered by the proposed energy generation activities.

ENERGY GENERATION, TRANSMISSION AND STORAGE ACTIVITIES

1. The construction of facilities for -

(a) The generation of electricity;

(b) The transmission and supply of electricity;

Anticipated Environmental Impacts

- Low potential environmental impacts because the proposed site is already disturbed from human encroachment.
- Adding on a management plan has been developed to mitigate any anticipated possible impacts of the project to the environment.
- Relative or moderate social impact (positive)

Social Impact

The project is generally expected to improve the socio-economic environment of Usakos through a major boost in business through integrations, employment and improved transport system on the long term. Interested and Affected Parties were notified of the project through Site notices and newspaper adverts and all relevant information on consultation is covered in this document and Appendix A of the document.

Recommendation

It is concluded that most of the impacts identified during this Environmental Assessment can be addressed through the recommended mitigation and management actions for both the construction and operation phases of the PV Plant. Should the recommendations included in this report and the EMP be implemented the significance of the impacts can be reduced to reasonably acceptable standards and durations. All developments could proceed provided that general mitigation measures as set out are implemented as a minimum.

It is therefore recommended that the proposed solar farm get an approval receive Environmental Clearance, provided that the recommendations described above and the EMP are implemented.

NB: The EAP does not accept any responsibility in the event that additional information comes to light at a later stage of the process. All data from unpublished research utilised for the purposed of this project is valid and accurate. The scope of this investigation is limited to assessing the potential biophysical, social and cultural impacts associated with the proposed project.

1. CHAPTER ONE: BACKGROUND

1.1. Introduction

Access Aussenkjer Namibia (AAN) herein referred to as the proponent has been awarded an Independent Power Producer (IPP) for the development of a 20 MW Solar Photovoltaic (PV) Power Plant at Khan Sub Station at Usakos on a Build-Own Operate (BOO) basis by NAMPOWER. In this respect, the proponent intends to establish the 20MW solar power (PV) plant and associated structures at Khan Sub Station in Usakos, Erongo Region-Namibia.

In terms of the Namibian environmental legislation (Environmental Management Act (No. 7 of 2007)) and the Environmental Assessment Regulations of 2012; an EIA is required to obtain an Environmental Clearance Certificate from the Ministry of Environment and Tourism (MET) before the proposed project can proceed.

Furthermore, as per the requirements of the Environmental Management Act No. 7 of 2007, Access Aussenkjer Namibia has appointed D&P Engineers and Environmental Consultants (DPEE) to conduct an Environmental Assessment (EA) and develop an Environmental Management Plan (EMP) for the development. This has been followed by an application for Environmental Clearance Certificate (ECC) to the Ministry of Environment and Tourism (MET): Directorate of Environmental Affairs (DEA).

In this respect, this document forms part of the application to be made to the DEA's office for an Environmental Clearance certificate for the proposed 20 MW PV plant, in accordance with the guidelines and statutes of the Environmental Management Act No.7 of 2007 and the environmental impacts regulations (GN 30 in GG 4878 of 6 February 2012)

1.2. Project Location

The proposed solar PV plant is to be conducted on a 100 hectare land portion in Usakos ,Erongo Region-Namibia. The exact project area coordinates are as follows:

A) 22°05'58.1"S / 15°15'05.4"E. b) 22°08'17.5"S / 15°17'14.7"E
c). 22°07'43.8"S/ 15°18'30.3"E. d) 22°05'31.6"S / 15°18'11.5"E

Additionally, a project Locality map is on Figure 1.

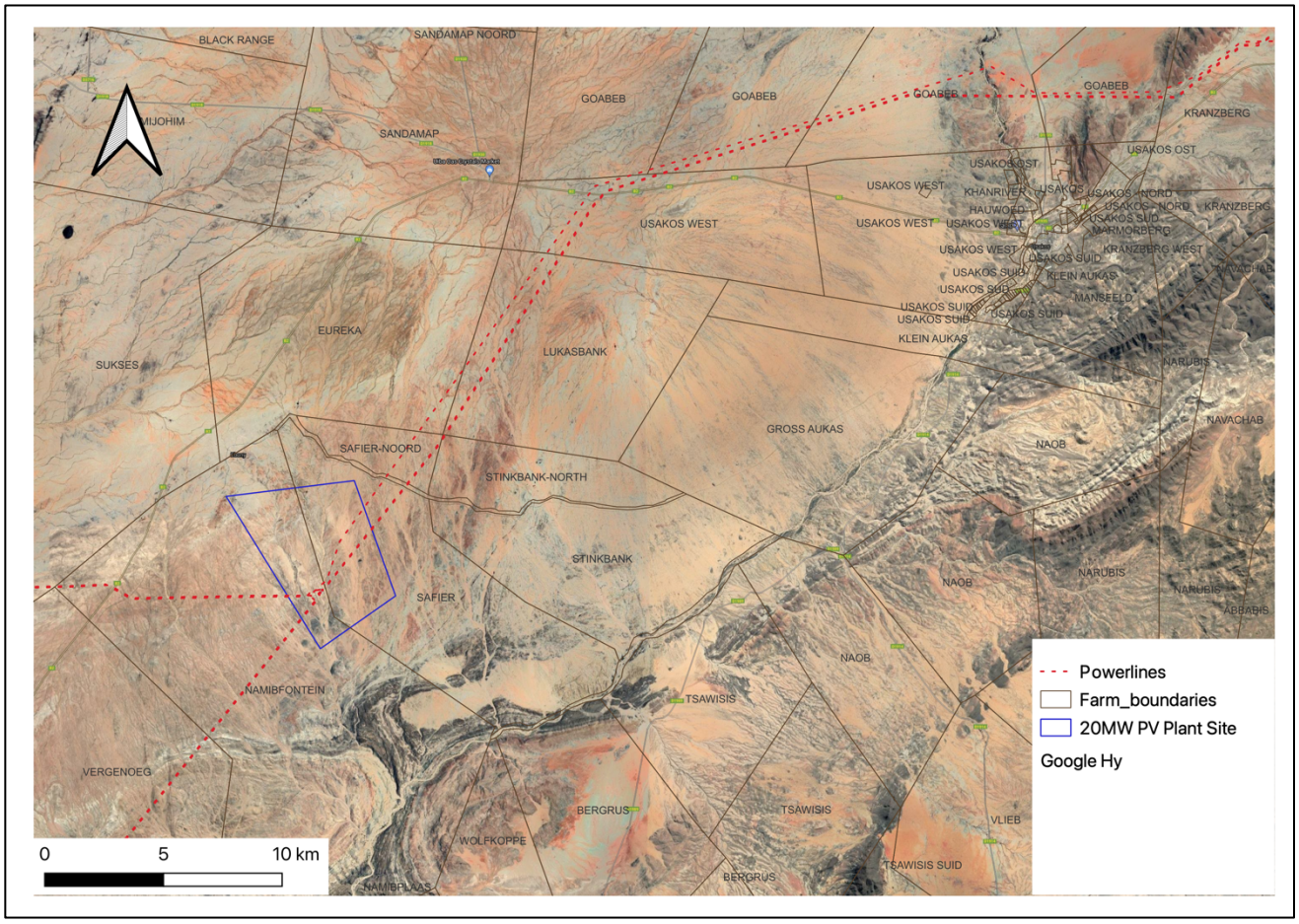


Figure 1: Project Locality

1.3. Project Overview

Access Aussenkjer Namibia intends to construct and operate a 20MW (PV) plant in Usakos. The proposed solar farm entails the construction and operation of a 20 MW PV development, associated infrastructure and services for the provision of renewable electricity to the national power grid.

This project entails the transformation of farm land to accommodate the proposed Solar Power plant, associated infrastructure and services. The infrastructure proposed for the entire Solar Power Plant (project) includes but is not limited to inter alia:

1.4. PV Technology Specific Infrastructure

PV systems produce energy by converting solar irradiation into electricity. A PV system consists of PV panels that encase the solar cells. Solar cells are solid-state semiconductor devices that convert light into direct-current electricity. The top layer of the silicon portion of a solar panel is made from a mixture of this silicon and a small amount of phosphorous, which gives it a negative charge. The inner layer, which constitutes the majority of the panel, is a mix of silicon and a little bit of boron, giving it a positive charge.

The place where these two layers meet creates an electric field called a junction. When light (or photons) hits the solar cell, before it gets to the silicon crystal to make electricity it passes through a glass cover on the panel and an anti-reflective coating, which stops photons from reflecting off of the panel and being lost. The photons are absorbed into the junction, which pushes electrons in the silicon out of the way (See Figure 3). If enough photons are absorbed, the electrons are pushed past the junction and flow freely to an external circuit.

To convert the Direct Currant (DC) to Alternating Current (AC) an inverter will be used. The AC energy can then be used to power anything that uses electricity. In fact, they are just larger versions of the cells used in solar calculators. The front surface of the solar panel is toughened glass with an anti-reflective coating to maximise the light captured by the solar cells and reduce glare back towards the atmosphere. The PV panels are predominantly black in appearance – when viewed directly from the front; however, from close-up, a grid of silver contacts is clearly visible.
The proposed PV developments will entail the following infrastructure –

-The DC current is converted to AC current by inverters, the Voltage is stepped up by Transformer and transmitted over transmission network.

The proposed solar farm will consist of the following:

- Photovoltaic component: numerous rows of PV panels and associated support infrastructure to generate electricity, one (1) 20 MW PV Development;
- DC-AC current inverters and transformers.
- PV module generate DC current (12V, 24V, 48V)
- Transmission corridor: one overhead transmission line (150m) located within the transmission corridor to connect the proposed onsite substation to the existing main substation, this will follow an existing powerline servitude in the area, to minimise impacts.
- On-site substation: the on-site substation to collect the electricity produced on site and step it up to the correct voltage to transfer via the transmission line to the existing main central substation.
- Buildings: operation and maintenance buildings to house equipment and a guard cabin for security.
- Additional infrastructure: includes a boundary fence for health, safety and security reasons; water supply infrastructure for groundwater abstraction and storm water infrastructure, if required.

1.5. Accessibility

There is an existing access road to Khan Sub-station and connects to the project site.

1.6. Infrastructure and Services

Water: A borehole will be drilled on site.

Ablution: A sewer ablution system will be established on site to cater for construction and operation phases.
Communication: The site is connected with MTC, TN Mobile and satellite phones.

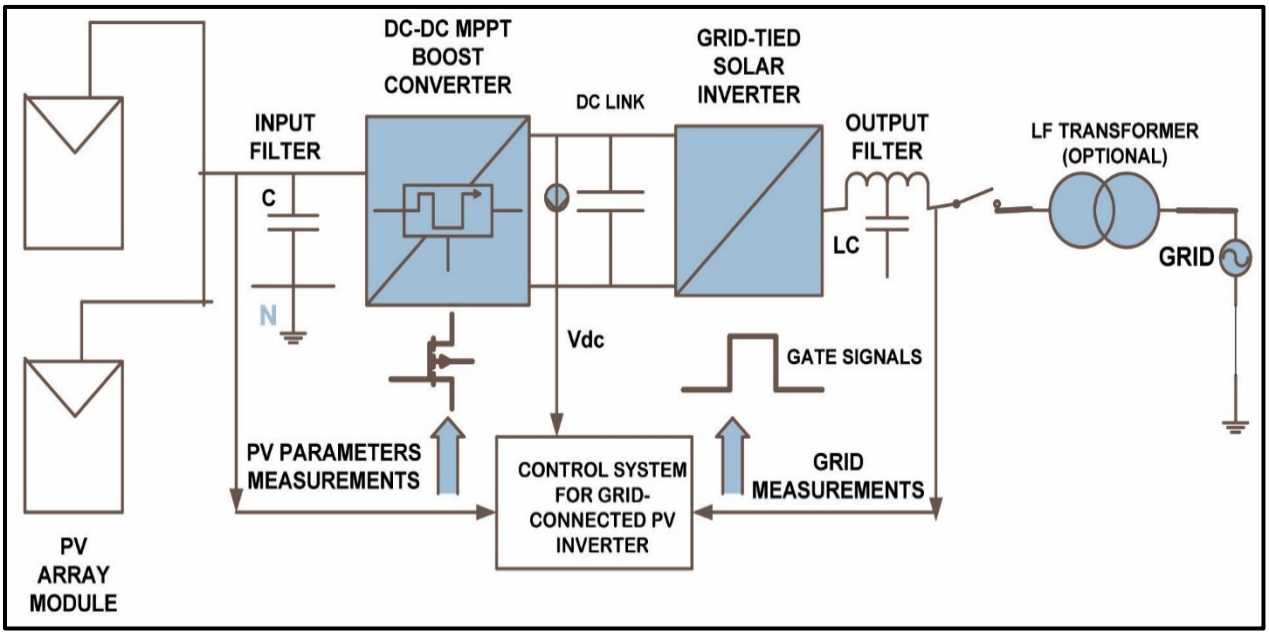


Figure 2: Circuit Layout

Figure 3: Completed PV Panel Mounting
Figure 4: Completed PV Panel Structures
Figure 5: PV Panel Inverters

1.7. Need and Desirability

The economic and social development goals of Namibia are embodied in (i) Vision 2030 and (ii) the National Development Plan 5 (NDP 5) 2017/2018 – 2021/2022 as well as NDPs 1, 2, 3, and 4. In

addition, the Government has developed the Harambee Prosperity Plan (HPP) 2016/2017 – 2019/2020, which complements the Vision 2030 and NDP 5. All of the three plans set the goals, targets, and strategy for Namibia to move on a path to economic prosperity through a concerted strategy for the development of Namibia's economic growth. These Plans also include specific growth targets milestones and strategies for the sustainable deployment of Namibia's resources to achieve the stated economic and social development goals.

The Government recognizes the importance of developing the country's energy sector in order to fuel the targeted economic growth and the transformation of Namibia to an industrialized nation. Availability of reliable electricity service is central to the development of all sectors of the economy, as well as to achieve the country's economic and social development goals. Namibia continues to face electricity shortages. The shortfall between peak demand and peak supply in Namibia continues to be supplemented by imports from the neighbouring countries in the Southern Africa Power Pool (SAPP) system. This represents an untenable dependence on imports that must be addressed in the near term in order to ensure Namibia's energy supply security.

1.8. Project Alternatives

1.8.1. Site Location Alternatives

An integrated site selection study was done in order to identify a suitable site for the proposed solar power plant. The proposed solar plant site is considered highly desirable due to the following considerations:

- Solar resource: Analysis of available data from existing weather stations suggests that the site has sufficient solar resource for a viable solar power plant
- Site extent: Sufficient land was secured from the town council to enable sufficient power supply and to allow for a number of heliostats to make the project feasible.
- Land suitability:

-Sites that facilitate easy construction conditions (relatively flat land with few rock outcrops or water-bodies) were favoured during site selection.
-The site is located in proximity to a sub-station.
-Avoidance of environmentally sensitive areas and fatal flaws.
Consideration of the above criteria resulted in the selection of the preferred site. No further site location alternatives are considered in the EIA process.

1.8.2. Site Layout Alternatives

The PV layout and project component design underwent a number of iterations based on technical aspects and the environmental and social considerations assessed during the EIA process. From a site location perspective, the position of the proposed site infrastructure was determined by the consideration of the following aspects:
-Local topographical conditions.

-Accessibility
-Pre-existing supporting infrastructure

1.8.3. NO-GO Alternative

The current low environmental impact associated with current land use will be maintained and no change in land use or zoning would be required. The status quo needs to be measured against the proposed facility to determine whether the environmental and socio-economic benefits warrant the approval thereof or whether the status quo should be maintained.

This development alternative entails that the proposed PV developments not be constructed on the project site, thus result in the site being left as is. With Namibia's new focus on renewable energy and the targets set the NO-GO option will result in a zero contribution to these targets and no alleviation with regards to the current demand pressures on electricity. The non-development of the proposed PV plant will furthermore impede economic development and socio-economic progress.

Due to the numerous socio-economic benefits of the proposed project and the fact that the identified environmental impacts can be suitably mitigated it has been determined that the No Go option can be eliminated. Should the Competent Authorities (CA) refuse the authorisation of the proposed Solar Farm, the 'No Go' option will be "implemented" and the status quo of the site will remain intact - leaving the site in its present state.

1.8.4. Conclusion

The project will go ahead and will consider sustainable technologies and reduce materials required when establishing the PV plant. A non-intrusive site has also been identified, to ensure minimal environmental impacts as a result of the project development.

2. CHAPTER TWO: POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1. Introduction

An important part of the EIA is identifying and reviewing the administrative, policy and legislative frameworks concerning the proposed activity, to inform the proponent about the requirements to be fulfilled in undertaking the proposed project. This section looks at the legislative framework within which the proposed development will conform to; the focus is on the compliance with the legislation during the planning, construction and operational phases. All relevant legislations, policies and international statutes applying to the project are highlighted in the table below as specified in the Environmental Management Act, 2007 (Act No.7 of 2007) and the regulations for Environmental Impact Assessment as set out in the Schedule of Government Notice No. 30 (2012).

Table 1:Policies, legal and administrative regulations

LEGISLATION/POLICY/GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
The Constitution of the Republic of Namibia (1990)	The articles 91(c) and 95(i) commits the state to actively promote and sustain environmental welfare of the nation by formulating and institutionalizing policies to accomplish the sustainable objectives which include: - Guarding against overutilization of biological natural resources, - Limiting over-exploitation of non-renewable resources, - Ensuring ecosystem functionality, - Maintain biological diversity.	-Through implementation of the environmental management plan the proposed development will be in conformant to the constitution in terms of environmental management and sustainability, through bringing development in an environmentally sensitive way.
Vision 2030 and National Development Plans	Namibia's overall Development ambitions are articulated in the Nations Vision 2030. At the operational level, five-yearly national development plans (NDP's) are prepared in extensive consultations led by the National Planning Commission in the Office of the President. Currently the Government has so far launched a 4th NDP which pursues three overarching goals for the Namibian nation: high and sustained economic growth; increased income equality; and employment creation.	-The proposed project, is an important element in the industrialisation of the country as well as FDIs in Namibia.
Environmental Assessment Policy of Namibia 1994	The Environmental Assessment Policy of Namibia requires that all projects, policies, Programmes, and plans that have detrimental effect on the environment must be accompanied by an EIA. The policy provides a definition to the term "Environment" broadly interpreted to include biophysical, social, economic, cultural, historical and political components and provides reference to the inclusion of alternatives in all projects, policies, programmes and plans.	-The construction and operation of the solar farm and transmission line will only commence after being awarded an environmental clearance certificate, thus by abiding to the requirements of the Environmental Assessment Policy of Namibia. The EIA and EMP will cater for the sustainable management of biophysical environment.

LEGISLATION/POLICY/GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
Environmental Management Act No. 07 of 2007	The Act aims at ▪ Promoting the sustainable management of the environment and the use of natural resources by establishing principles for decision-making on matters affecting the environment; ▪ To provide for a process of assessment and control of projects which may have significant effects on the environment; The Act gives legislative effect to the Environmental Impact Assessment Policy. Moreover, the act also provides procedure for adequate public participation during the environmental assessment process.	-This document is compiled in a nature that project implementation is in line with the objectives of the EMA. EIA guiding procedures developed by MET were also used in the course of this project.
Electricity Act 4 of 2007	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 license is granted, the Minister may impose conditions relating to public health safety or the protection of the environment.	-Obliges AAN to comply with all relevant provisions of the EMA and its regulations.
The Atomic Energy and Radiation Protection Act, Act 5 of 2005:	Provides for the adequate protection of the environment and of people against the harmful effects of radiation by controlling and regulating the production, processing, handling, use, holding, storage, transport and disposal of radiation sources and radioactive materials, and controlling and regulating prescribed non-ionising radiation sources according to the standards set out by the ICNIRP.	-Justifies the need for assessing the impact of electromagnetic radiation from the power line, on the nearby residents.

LEGISLATION/POLICY/GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
"Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300GHz)" (April 1998 developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP))	Provides international standards and guidelines for limiting the adverse effects of non-ionising radiation on human health and well-being, and, where appropriate, provides scientifically based advice on non-ionising radiation protection including the provision of guidelines on limiting exposure.	-Justifies the need for assessing the impact of electromagnetic radiation from the power line, on the nearby residents.
Public Health Act (No. 36 of 1919)	Under this act, in section 119: "No person shall cause a nuisance or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge any nuisance or other condition liable to be injurious or dangerous to health."	-The project proponent will ensure that all legal requirements of the project in relation to protection of the health of their employees and surrounding residents is protected. -Personal protective equipment shall be provided for employees in construction. -The development shall follow requirements and specification in relation to water supply and sewerage handling so as not to threaten public health of future residents on this piece of land.
Soil Conservation Act 76 of 1969	The objectives of this Act are to: ▪ Make provisions for the combating and prevention of soil erosion, ▪ Promote the conservation, protection and improvement of the soil, vegetation, sources and resources of the Republic.	-The project will have a rather localized impact on soils and on the soil through clearance for PV panel stands and powerline poles. Soil protection measures will be employed and preservation of trees as much as possible.
Nature Conservation Ordinance 1996	To consolidate and amend the laws relating to the conservation of nature; the establishment of game parks and nature reserves; the control of problem animals; and to provide for matters incidental thereto.	The proposed project implementation is not located in any known or demarcated conservation area, national park or unique environments. The project site was selected with this ordinance in mind to ensure that Namibian nature is conserved.

LEGISLATION/POLICY/GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
Protected Areas and Wildlife Management Bill	This bill, when it comes into force, will replace the Nature Conservation Ordinance 4 of 1975. The bill recognizes that biological diversity must be maintained, and where necessary, rehabilitated and that essential ecological processes and life support systems be maintained. It protects all indigenous species and control the exploitation of all plants and wildlife.	Environmental recommendations and considerations on this project has ensured that the proposed activities will not fall within the boundaries of any protected area and that the project will not affect heavily endangered vegetation and animals on its site.
Forest Act, 2001 (Act No. 12 of 2001)	The Act gives provision for the protection of various plant species through the Ministry of Agriculture, Water and Forestry (MAWF), Directorate of Forestry).	-Land clearing of an extensive piece of land will be done upon approval from the Directorate of Forestry. -The proponent will also have to ensure that there is no indiscriminate cutting down of trees during construction and operation -A site vegetation assessment was commissioned for this area.
National Rangeland Policy and Strategy, 2012	The policy aims at enabling resource users (farmers and managers) to manage their rangeland resources in a sustainable manner and sustainable in that they are economically viable, socially acceptable, environmentally friendly and politically conducive.	-This proposed project will ensure that the local community benefits both economically and socially from the project, this in line with the recently declared Harambee Prosperity Plan and NDP 4&5.
National Biodiversity Strategy and Action Plan (NBSAP2)	The action plan was operationalised in a bid to make aware the critical importance of biodiversity conservation in Namibia putting together management of matters to do with ecosystems protection, biosafety, biosystematics protection on both terrestrial and aquatic systems.	-The project proponent has been advised by DPE and recognises the need for ecosystems protection to manage the changing climatic environment. -This project is one of the drivers to reduce the rate of global environmental change given its contribution, to decreased use of burning fossil fuels for energy generation.

LEGISLATION/POLICY/GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
National Policy on Climate Change for Namibia, 2010	In harmony with the findings of the IPCC over time and the Earth Summits held annually, the policy seeks to outline a coherent, transparent and inclusive framework on climate risk management in accordance with Namibia's national development agenda, legal framework, and in recognition of environmental constraints and vulnerability. Furthermore, the policy pursues the strengthening of national capacities to reduce climate change risk and build resilience for any climate change shocks.	-Solar energy harnessing technologies are a positive impact to fighting climate change, thus this development is a positive step towards climate smart energy generation and environmental sustainability.
Wetland Policy, 2004	The policy provides a platform for the conservation and wise use of wetlands, thus promoting inter-generational equity regarding wetland resource utilization. Furthermore, it facilitates the Nation's efforts to meet its commitments as a signatory to the International Convention on Wetlands (Ramsar) and other Multinational Environmental Agreements (MEA's).	-In compliance to this Policy, the development will ensure a standard environmental planning such that it does not affect any wetlands within its locale through recognition of wetlands to promote the conservation and wise utilization of wetlands resources. -There are no existing wetlands/peatlands within 2km radius of the proposed project site.
Water Resources Management Act, 2013 (Act No. 11 of 2013)	This Act provides for the management, protection, development, use and conservation of water resources. This also forms the regulation and monitoring of water resources.	-Borehole water supply will be used and a water abstraction license will be applied for.
National Heritage Act 27 of 2004	Heritage resources to be conserved in development.	-During the project implementation as soon as objects of cultural and heritage interests are observed such as graves, artefacts and any other object believed to be order than 50 years, all measures will be taken protect these objects until the National Heritage Council of Namibia have been informed, and approval to proceed with the operations granted accordingly by the Council.

LEGISLATION/POLICY/GUIDING DOCUMENT	PROVISION	PROJECT IMPLICATION
National Monuments Act of Namibia (No. 28 of 1969) as amended until 1979	"No person shall destroy, damage, excavate, alter, remove from its original site or export from Namibia: (a) any meteorite or fossil; or (b) any drawing or painting on stone or a petroglyph known or commonly believed to have been executed by any people who inhabited or visited Namibia before the year 1900 AD; or (c) any implement, ornament or structure known or commonly believed to have been used as a mace, used or erected by people referred to in paragraph (b); or (d) the anthropological or archaeological contents of graves, caves, rock shelters, middens, shell mounds or other sites used by such people; or (e) any other archaeological or palaeontological finds, material or object; except under the authority of and in accordance with a permit issued under this section.	-The proposed site of development is not within any known monument site both movable or immovable as specified in the Act, however in such an instance that any material or sites or archeologic importance are identified, it will be the responsibility of the developer to take the required route and notify the relevant commission.
Pollution Control and Waste Management Bill	-This bill has not come into force. Amongst others, the bill aims to "prevent and regulate the discharge of pollutants to the air, water and land" Of particular reference to the Project is: Section 21 "(1) Subject to sub-section (4) and section 22, no person shall cause or permit the discharge of pollutants or waste into any water or watercourse." Section 55 "(1) No person may produce, collect, transport, sort, recover, treat, store, dispose of or otherwise manage waste in a manner that results in or creates a significant risk of harm to human health or the environment."	-To control air, water and land pollution as agitated by the Act the project proponent will ensure that erven will have approved drainage on site as well as standard conservancy tanks that do not threaten public health, adding on an integrated pollution management strategy following the EMP provided herein.
Convection on Biological Diversity (CBD)	Namibia is a signatory of the Convention on Biological Diversity and thus is obliged to conserve its biodiversity.	The project will preserve tree species on as part of their plans for greed and sustainable development.
United Nations Convection to combat Desertification	Namibia is bound to prevent excessive land degradation that may threaten livelihoods.	It will be the responsibility of the proponent to conserve vegetation on and around the area, to avoid encroachment of the desert environs in the area.

3. CHAPTER THREE: RECEIVING ENVIRONMENT

3.1. Introduction

In this chapter, the findings of the EIA Team on baseline surveys, public consultation and desk reviews undertaken are in respect to the ecology, society, economy and geo-political set up of the proposed project area. The geological make up and meteorology of the project site will also be discussed in this chapter to give an in-depth understanding of the project area in question.

3.2. Socio-Economic status

The Usakos is a town that falls within the Karibib Constituency, about 150 km East of Swakopmund and about 30 km West of Karibib along the B2 in the Erongo Region. Usakos was originally built as railway station between Swakopmund and Windhoek. The total area of Karibib Constituency covers 14 535.8 km² amounting to 22.8 percent of the total area of Erongo Region (Republic of Namibia, 2014b). Karibib Constituency is bordered by the Omaruru Constituency in the North, Daures Constituency in the North-West, Arandis Constituency in the South-West and Otjizondjupa and Khomas Regions to the East.

Usakos is home to 3 600 people (Erongo Regional Council, n.d.). The origin of the town is linked to the narrow guage railway construction in the area in 1900. Until the 1960s Usakos was a center which serviced the steam locomotives. When the steam locomotives were replaced by diesel locomotives, the workshops were moved to Windhoek and the economy of the town started to decline. Nowadays the majority of residents are farmers and dependent on livestock farming as a source of income (UNESCO, n.d). 4.4.2. The majority of these people are dependent on livestock farming as a source of income. Due to the high unemployment rate, the most marginalized group of people, the children, grow up in extreme poverty. This poverty, resulting in high frustration among the community, often expressed through violence and alcoholism. This and the lack of money for nutrition, other basic needs, school fees and school material make it difficult for the youth to complete their schooling – a situation creating a vicious circle (UNESCO, n.d).

In this respect, the proposed development will propel the local economy during construction and operation through employment creation as well as backward and forward economic linkages emanating from the proposed development.

3.3. Climate

3.3.1. Precipitation

Based on the regional data, the average annual rainfall of the area is between 200 – 300 mm. This wide rainfall variability typifies the rainfall patterns in the west central parts of Namibia. Mean annual gross evaporation ranges between 3200 – 3400 mm.

3.3.2. Temperature

The area has a desert climate prevailing. The daytime temperature is warm to hot, while it can also be cold at night. The average annual temperature is 26° degrees. It is dry for 265 days a year with an average humidity of 35% and an UV-index of 5. The general local project area has the following three temperatures related seasons:

- A dry and relatively cool season from April to August with average daytime highs of 23°C and virtually no rainfall during this period;

- A hot and dry season from September to December with minimal and variable rainfall falling (<20mm per month) and average daytime highs of 30°C, which regularly exceed 40°C, and;

- A hot and dry season from September to December with minimal and variable rainfall falling (50mm per month falling during this period (although this is extremely variable) and average high temperatures of 29°C.

3.3.3. Wind Patterns

The prevailing winds in the general area, seems to be dominated by winds from the east, south eastern and southwest quadrants. Locally, the situation may be different dues various influences including topographic surroundings effects and structures. Seasonal variations in the wind fields are presented by the regional average wind data for January, April, July and October. An increase in the north to north-easterly winds during summer (January) and autumn (April) is likely. Winter months may be characterised by the highest frequency of these north-eastern winds.

Generally, the southerly and south-westerly winds that are prevalent in this part of Namibia and may reach a maximum speed of 30.6 m/s particularly during the dry summer periods. During the rainy season, winds are much more variable, typically with low average velocities. Low clouds and dust storms sometimes affect the visibility but the influence is limited to fewer than five hours or even minute.

3.4. Flora

The likely temporal and long-term impacts and influences of the proposed project will largely be localized and will depend on the susceptibility of the local flora and fauna. Such local condition will include the type, density and conservation status of the concerned species with respect to actual project sites likely to be affected. Generally, plant species are sources of food and shelter to a variety of birds and animals. The size of the habitat area that might be impacted and the conservation status of affected species are important in the assessment process. The local area is pristine and it's suited on the outskirts of Usakos.

Soils on the study area are shallow, containing pebbles and depositions. There are deposits in the gorges and in the lee of mountains, while colluvium has been deposited at the base of hills and

mountains. Alluvial, silty sands and gravel are deposited in the drainage lines. The vegetation study area is characterized by sparsely scattered dwarf shrubs and ephemeral grasslands on the plains, undulating hills and mountains and sparse riparian woodland along the river.

In summary, Vachelia reficiens (red umbrella thorn) and *Boscia foetida* are the dominant perennial plant species on the plains. While *Commiphora glaucescens* and *Boscia foetida* are characteristic perennial plants on hillsides. The trees, *Faidherbia albida,* and Acacia reficiens (red umbrella thorn) are common in drainage lines.

3.4.1. Habitat categorization

There solar farm will have direct impacts on two farms (Namibfontein and farm Safier.) From these farms, a total of four plant-based habitats were visited for plant identification. The habitat types in the farm areas were:

1. Rocky hillside with loose surface rocks and no soil or soil that is very shallow

2. Open plains with deeper soil and scattered bushes and shrubs. The plains are interrupted with rocky outcrops of varying sizes. It relatively consists of the least vegetation or least species richness.

3. Watercourses that are normally dry but that carry water for very short periods during the rainy season. The watercourses are marked by having more bushes and scattered trees along their length, and the substrate is usually sandy and un-compacted.

The areas were the solar panel will be build is divided into:

1. Farm Namibfontein
    a) Rockyhill Namibfontein
    b) Plain Namibfontein
2. Farm Saphir

Each of these habitats has its own distinctive food, shelter and refuge characteristics, but each harbor almost the same faunal component. Compared to rocky hillsides and watercourse habitats, open plains are more widespread and more homogeneous. Therefore, avoidable disturbance in any of the area should be minimized, since they all support taxa of high priority especially Rockyhills and Watercourse Namibfontein.

A detailed fauna study is also attached in Appendix 2 of the ESR.

Figure 6: General overview of the vegetation structure around the project area

Figure 7: Low-density vegetation structure on the project area

Figure 8: Existing access roads, water infrastructure and kopje ecosystem

Figure 9: Existing NAMPOWER sub-station within proximity to the PV plant location

3.5. Fauna

Farms Namibfontein and Safier are already affected by khan sub-station operational activities as well as fam activities within the project area. The general area has limited occurrence of wildlife due to the aridity of the project area. Animals said to be occurring predominantly within the project area are springbok, eland, kudu, zebra and small animals such as rabbits and squirrels. No wildlife was observed during the baseline assessment of the project area. Domestic animals such as cattle, sheep and goats are domesticated at Farm Namibfontein for farm subsistence. In general the proposed project will not have any detrimental and irreversible effect on the general fauna carrying capacity of the project area.

3.5.1. Amphibians Diversity

Of the seven species of amphibians that potentially could occur in the general area, 2 species are endemic (Poyntonophrynus hoeschi and Phrynomantis annectens) (Griffin 1998b) and 1 species is classified as “near threatened” (Pyxicephalus adspersus) (Du Preez and Carruthers 2009) – i.e. high level (42.9%) of amphibians of conservation value from the general area. Pyxicephalus adspersus is also more common in northern Namibia where it faces severe anthropomorphic pressure (Griffin pers. com).

With the exception of these important species and due to the fact that there is no open permanent surface water in the general area, amphibians are not viewed as very important in the dry western part of Namibia. The most important amphibian habitat is probably the ephemeral Khan (north of Karibib) and Swakop Rivers (south of Karibib) and associated tributaries; fountains; farm reservoirs; ground dams and sewage works.

3.5.2. Mammals Diversity

Of the at least 88 species of mammals known and/or expected to occur in the general Karibib/Usakos/Omaruru areas, 10 species (11.4%) as endemic while the Namibian legislation further classifies 5 species as vulnerable, 2 species as rare, 3 species as specially protected game, 9 species as protected game and 5 species as insufficiently known.

The most important species from the general area are probably those classified as rare (e.g. Cistugo seabrai & Atelerix frontalis angolae) and vulnerable (e.g. Galago moholi, Proteles cristatus, Hyaena brunnea, Acinonyx jubatus, Felis silvestris, Otocyon megalotis, Vulpes chama & Giraffa camelopardalis) under the Namibian legislation and near threatened (e.g. Eidolon helvum, Hipposideros commersoni, Hipposideros vittatus, Hyaena brunnea & Panthera pardus) and vulnerable (e.g. Acinonyx jubatus, Equus zebra hartmannae) by the IUCN (IUCN 2016).

The most important habitat is the rocky outcrops and Khan River and Swakop Rivers habitat. Smaller rivers such as Namibfontein are in existence to the west of the project area, however the river is not classified as a sensitive habitat area.

3.5.3. Reptile Biogeography

Reptile diversity is high in the Namib Desert and the central Namib in particular has a surprisingly high diversity of lizards, especially geckos. The State Museum work, together with more recent literature (Griffin 2002 and Griffin 2007), lists a total of 33 lizard species recorded or having a high probability of occurrence in the study area.

The high percentage of endemic reptile species (43%) associated with the rocky escarpment region of central western Namibia underscores the importance of this area without formal state protection. The most important species expected to occur in the general area are viewed as the tortoise Stigmochelys pardalis; pythons – P. anchietae and P. natalensis–Varanus albigularis and some of the endemic and little known gecko species – e.g. Pachydactylus species. Tortoises, snakes and monitor lizards are routinely killed for food or as perceived threats. Other important species are those viewed as “rare” – i.e. Rhinotyphlops lalandei, Mehelya vernayi & Afroedura africana – although very little is known about these species. An important, albeit little known and understudied species occurring in the Karibib area, is the Namibian Wolf Snake (Lycophidion namibianum) (Haacke and Branch pers. com.). Indiscriminate killing of snakes is a threat to little known species. The most important habitat is the rocky outcrops and the project area will not affect rocky kopjes.

Figure 10: Earth boring animals such as squirrels occurring around the project area

Figure 11: Wildlife defecation around Farm Safire was observed

3.6. Avifauna

One of the most crucial aspects of this EIAR, is in relation to avifauna in the project environment because of the proposed 1.5km electricity transmission line. Power lines worldwide kill thousands of birds each year (Bevanger 1998, Lehman et al. 2007) either by electrocution or by direct collision. The NamPower/Namibia Nature Foundation Strategic Partnership (http://www.nnf.org.na/project/nampowernnf-partnership/13/5/5.html) has documented wildlife and power line incidents from 2006 to the end of 2016, involving some 630 animals, mostly birds.

Due to the difficulty of obtaining records in bushy areas (especially in the northern and north-eastern parts of the country), low reporting rates and the high scavenging rates in general, it is likely that the incidents observed are an under-estimate.

Examples of power line incidents (mainly collisions, but also electrocutions) recorded in the vicinity of the study area to date are shown in Figure 27 (NamPower/NNF Strategic Partnership database, EIS 2017). Obviously, many more incidents have been recorded throughout the country. Most of the incidents have involved flamingos (39%) and bustards/korhaans (32%; Figure 28). A further 10% have involved raptors, mainly vultures as well as eagles, snake-eagles and owls; and 9% have involved waterbirds.

On the Khan-Lithops-Walmund 220 kV line south of the proposed power line route, collisions of 18 Ludwig's Bustards, four korhaans and one flamingo have been recorded; on the Lithops-Walmund line south of the Swakop River, collisions of six Ludwig's Bustards, 11 flamingos and one White Pelican are on record; on the Trekkopje Bypass north of the study area, collisions of 27 Ludwig's Bustards, 18 flamingos and eight korhaans have been recorded. A group collision of six Greater Flamingos was recorded on a low voltage power line crossing the Swakop River at the River Plots in November 2016. A number of electrocutions have also been recorded at Husab Mine on the low voltage distribution structures, including a Martial Eagle.

Bustards are susceptible to collisions due to their nomadic habits, a large body size with low maneuverability, and a visual "blind spot" when flying forwards (Martin & Shaw 2010). This proneness to collision is believed to be shared by korhaans, and has also been demonstrated in vultures, storks, snake-eagles and other groups. In desert habitats bustards and korhaans are often associated with drainage lines, where they find food (locusts and other insects) and shelter amongst the sparse vegetation.

High mobility of bird species, e.g. among ephemeral food sources, may also render them more prone to power line interactions. Flamingos are particularly prone to collisions due to their habit of flying at night or under conditions of poor light, in groups. Apart from movements up and down the coast, collision records on power lines indicate that flamingos appear to use rivers and drainage lines as flightpaths at times. Dolerite ridges may also be used as flight paths, e.g. during windy conditions.

Usakos-Arandis Avifauna and Transmission Lines Risk:
Baseline data collected from Bird Information Systems layers, generated for Namibia by Environmental Information Systems revealed that the proposed transmission line has a low risk, as about 1.5km is not threatening major bird species, and additionally the project area has pre-existing powerlines connecting to the sub-station;

3.7. Ground components

3.7.1. Local Geology

The local geology is dominated by quartz biotite schist and forms part of the major regional metasedimentary rocks of the Swakop Group (Miller, 2008 and 1992). The schist is often gradational to biotite quartzite / greywacke. In general the schist is fine to medium grained, massive sections do occur throughout the stratigraphic section. The schist is typically moderately to well bedded. Bedding and the primary schistosity are, in general, defined by the alignment of fine to coarse-grained biotite. Bedding is commonly on the scale of 1 to 10 cm. Quartz and biotite are the most common constituents and are typically hosted within a finegrained, biotite, chlorite, and minor sericite matrix. Minor pink garnets are locally developed in some places. Surficial deposits are characterised by the following materials:

(i) Minor boulders with rock fragments from localised loose rock head mainly quartz biotite schist; (ii) Gravels from the ephemeral river channels within the vicinity of the proposed solar park site;

(ii) (iii) Sand and silts.

3.7.2. Water Sources

Water supply to for Farm Namibfontein and Farm Safier is from groundwater resources supplied by a network of boreholes in the area. Groundwater as well as surface water (only during the rainy season) from ephemeral river channels is the sources of water supply in the area as well as much of the Erongo Region. According to the Department of Water Affairs, (2001), the Erongo Region and in particular the Town of Usakos. The area with aquifer potential, more or less reflects the rainfall distribution, decreasing westwards. Knowledge of the aquifers in this area is sparse, due to the low number of boreholes and few on groundwater.

3.7.3. Water Vulnerability

The proposed project is likely to have no major negative impacts on the water resources. The local area does not seem to have economic water resources. Therefore, the development of the proposed project is likely to have no negative impacts on water resources. The combined effects of unsaturated and saturated flow probabilities were used as indicator for groundwater vulnerability. However, groundwater or surface water will only be vulnerable to contamination if the following three (3) component are all present at the same time and at a site-specific area within project area:
(i) Contaminant sources resulting from proposed construction programme;

(iii) Potential pathways for contaminant migration such as major high order discontinuities (ephemeral river channels, valleys and gullies;

(iv) (iii) Targets (economic water resources) present within the project area. Overall, the limited local groundwater resources found in the area form part of the poorly developed metamorphic rocks based confined and unconfined aquifer system that is moderately vulnerable to any sources of pollution

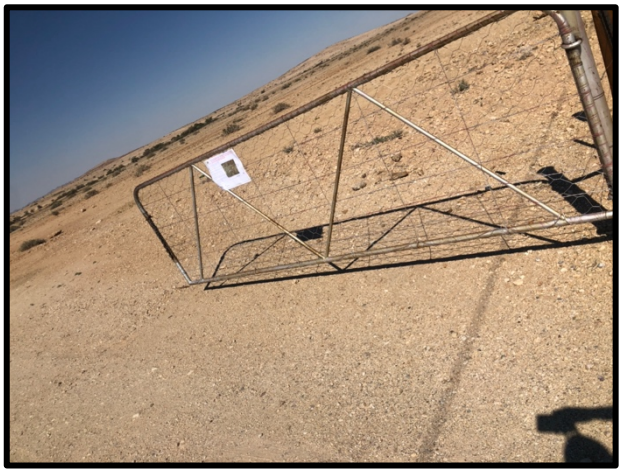
4. CHAPTER FOUR: PUBLIC CONSULTATION

Public and Stakeholder involvement, is a key component of the EA process. The public consultation process, as set out in Section 21 of Regulation No 30 of EMA, has been followed during this assessment and the details thereof documented below.

4.1. Printed Media

4.1.1. Background Information Document

A Background Information Document (BID) was drafted at the onset of the EA process to act as a useful information handout about the proposed project development. In addition, the BID provided details on the public consultation process with contact details for further information. This document was advertised for availability through various means of newspaper articles, public meeting and electronic mail; see Appendix B of this document.



4.1.2. Newspaper Advertisements & Articles

Newspaper notices about the proposed project and related Environmental Assessment processes was circulated in two newspapers for two weeks. These notices appeared in the “Confidante” and “New Era” newspapers, shown in Appendix B.

4.1.3. Site Notices

A site notice was placed at the project site. These provided information about the project and related EA while providing contact details of the project team.

Figure 12(top): Site Notice Farm Namibfontein.

Figure 13(bottom and centre Site notice at Farm Safier)

4.1.4. Building a Stakeholder Database

A stakeholder database for the project collected through a variety of means. During the advertisement of the project (though public notices in local newspapers and site-notices) the list was augmented as Interested & Affected Parties (I&AP) registered and contact information of stakeholders updated, Please refer to Appendix B.

4.1.5. Stakeholder Meetings & Key Conversations

A public meeting was scheduled on Friday 14 May 2021 and only affected farm owners were consulted, due to COVID-19 restrictions. However the consultant ensured that public consultation was adequately conducted through farm to farm consultation and providing for an online platform for commenting. The consultant administered questionnaires through email to all members who attended the meeting as well as other members who were recommended by the public that they should be consulted.

Figure 14: A public meeting was announced and the meeting was attended by surrounding farm owners

COVID 19 Regulations were observed, hence a public meeting did not involve unregulated number of attendees.

4.1.6. Comments and review period

From the onset of the public consultation process and the initial information sharing through the BID, newspaper and site notices, various stakeholders have registered and provided comments. All of the immediate neighbours are not in support of the initiative due to several reasons. The Scoping Report and Environmental Management Plan was made available to the public and stakeholders for comment and review. Questionnaires and proof of stakeholder's engagement are attached in appendix B of this EAR.

5. CHAPTER FIVE: ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

5.1. Overview

Access Aussenkjer Namibia has committed to sustainability and environmental compliance through coming up with a corrective action plan for all anticipated environmental impacts associated with the project. This is also in line with the Namibian Environmental Management legislation and International best practices on telecommunication infrastructure. The proponent will implement an Environmental Management Plan (EMP) in order to prevent, minimise and mitigate negative impacts. The environmental management plan is being developed to address all the identified expected impacts, the plan will be monitored and updated on a continuous basis with aim for continuous improvement to addressing impacts.

5.2. Assessment Of Impacts

This section sets out the overall approach that was adopted to assess the potential environmental and social impacts associated with the project. To fully understand the significance of each of the potential impacts each impact must be evaluated and assessed. The definitions and explanations for each criterion are set out below in Table 2: Assessment Criteria and

Table 2: Assessment Criteria

Duration – What is the length of the negative impact?	
None	No Effect
Short	Less than one year
Moderate	One to ten years
Permanent	Irreversible
Magnitude – What is the effect on the resource within the study area?	
None	No Effect
Small	Affecting less than 1% of the resource
Moderate	Affecting 1-10% of the resource
Great	Affecting greater than 10% of the resource
Spatial Extent – what is the scale of the impact in terms of area, considering cumulative impacts and international importance?	
Local	In the immediate area of the impact
Regional / National	Having large scale impacts
International	Having international importance
Type – What is the impact	
Direct	Caused by the project and occur simultaneously with project activities
Indirect	Associated with the project and may occur at a later time or wider area

Cumulative	Combined effects of the project with other existing / planned activities
Probability	
Low	<25%
Medium	25-75%
High	>75%

(***Adopted from ECC-Namiba, 2017)***

Table 3: Impact Significance

Class	Significance	Descriptions
1	Major Impact	Impacts are expected to be permanent and non- reversible on a national scale and/or have international significance or result in a legislative non- compliance.
2	Moderate Impact	Impacts are long term, but reversible and/or have regional significance.
3	Minor	Impacts are considered short term, reversible and/or localized in extent.
4	Insignificant	No impact is expected.
5	Unknown	There are insufficient data on which to assess significance.
6	Positive	Impacts are beneficial

(Adopted from ECC-Namiba, 2017)

Table 4: Environmental Impacts and Aspects Assessment

Environmental Impact	Valued Ecosystem Component	Impact	Project Phase	Duration	Magnitude	Extent	Type	Probability	Significance	Infrastructure
TOPOGRAPHY	Landscape Scenery	Visual aesthetic impact	Construction and Operation	Moderate	Moderate	Local	Direct	Medium 25 - 75%	Minor	PV Plant & Transmission line
SOIL	Soil	Contamination to soil from waste disposal	Construction and Operations	Moderate	Small	Local	Direct	Low <25%	Minor	PV Plant
	Soil	Spillages of fuel, oil and lubricants.	Construction	Short	Small	Local	Direct	Low <25%	Minor	PV Plant & Transmission line
	Soil	Erosion	Operations	Moderate	Small	Local	Direct	Low <25%	Minor	PV Plant & Transmission line
LAND CAPABILITY	Terrestrial ecology and aquatic ecosystems	Change in land use	Construction and Operations	Permanent	Great	Local	Direct	Low <25%	Moderate	PV Plant
	Carrying capacity	Increase in human activities in the environment	Construction and Operations	Moderate	Moderate	Regional	Direct	Medium 25 - 75%	Moderate	PV Plant & Transmission line
WATER	Surface water quality	Water pollution from oils and lubricants from vehicles and machinery.	Construction and Operations	Moderate	Moderate	Local	Direct	Medium 25 - 75%	Moderate	PV Plant and Transmission line
	Surface water quality	Turbidity and high sediment load	Construction	Moderate	Small	Local	Direct	Low <25%	Moderate	PV Plant
	Soil, Vegetation, Infrastructure	Flooding	Construction& Operation	Permanent	Moderate	Local	Direct	Medium 25 - 75%	Moderate	PV Plant
AIR QUALITY	Air Quality	Construction phase dust	Construction	Short	Small	Local	Direct	Low <25%	Minor	PV Plant
WASTE	Groundwater quality	Hazardous waste such as waste oil and lubricants.	Construction and Operations	Short	Small	Local	Direct	Low <25%	Minor	PV Plant

Environmental Impact	Valued Ecosystem Component	Impact	Project Phase	Duration	Magnitude	Extent	Type	Probability	Significance	Infrastructure
	Surface water quality	Threatened from plant stormwater discharge into the river.	Construction and operations	Moderate	Moderate	Regional	Direct	Medium 25 - 75%	Moderate	PV Plant
	Topography and Landscape	Visual impacts due to use of unsustainable disposal methods	Construction and Operations	Short	Small	Local	Direct	Low <25%	Minor	PV Plant and transmission line
FAUNA	Terrestrial ecology and biodiversity	Loss of habitat and driving away of local animals and aquatic animal species	Construction and Operations	Moderate	Moderate	Local	Direct	High >75%	Minor	PV Plant& Transmission line
	Avifauna	Bird electrocution, and physical crashes	Operations	Moderate	Small	Local	Direct	Low <25%	Minor	Transmission line
	Aquatic life	Antifouling paints	Operations	Moderate	Small	local	Direct	Low <25%	Minor	PV Plant
	Terrestrial ecology and biodiversity	Destruction of vertebrate fauna (e.g. road kills; fence and powerline mortalities)	Construction and Operations	Long	Moderate	Local	Direct	Low <25%	Minor	PV Plant & Transmission line
FLORA	Terrestrial ecology and biodiversity	Proliferation of invasive species inland	Construction and Operations	Long	Moderate	Local	Direct	High >75%	Moderate	PV Plant & Transmission line
	Terrestrial ecology and biodiversity	Illegal collection of firewood	Construction and Operations	Long	Moderate	Local	Direct	Low <25%	Minor	PV Plant & Transmission line
	Terrestrial ecology and biodiversity	Loss of unique flora and special habitats in the local environment because of general	Construction and operations	None	Small	Local	Direct	Low <25%	Moderate	PV Plant & Transmission line

Environmental Impact	Valued Ecosystem Component	Impact	Project Phase	Duration	Magnitude	Extent	Type	Probability	Significance	Infrastructure
		nuisance and animal migrate.								
	Terrestrial ecology and biodiversity	Uncontrolled fires	Construction	Long	Great	Regional / National	Direct	Low <25%	Major	PV Plant & Transmission line
SOCIAL	Noise Pollution	Increased noise levels	Construction and operations	Moderate	Small	Local	Direct	Low <25%	Minor	PV Plant & Transmission line
	Socio Economic Activities	Temporary and permanent employment prospects.	Construction and operations	Long	Moderate	Regional	Direct	Medium 25 – 75%	Positive	PV Plant & Transmission line
	Socio Economic Activities	Climate change impacts	Operations	Long	Moderate	Regional / National	Direct	High >75%	Positive	PV Plant & Transmission line
	Contribution to National Economy	Employment, local procurement, duties and taxes.	Construction and Operations	Short	None	Regional / National	Direct	Low <25%	Positive	PV Plant & Transmission line
Heritage/Archaeology	Artefacts, archaeological high value components	Destruction or affecting paleontological and archaeological artefacts	Construction and Operation	Moderate	Moderate	Local	Direct	Medium 25 – 75%	Moderate	PV Plant & Transmission line
HEALTH AND SAFETY	Health Sanitation	Poor ablution and waste management facilities may be detrimental to human health.	Construction and Operation	Moderate	Moderate	Local	Direct	Medium 25 – 75%	Moderate	PV Plant & Transmission line
	Property and human life	Electrocution, fires resulting in fatalities, damage to properties, veldt	Construction and Operation	Moderate	Great	Local	Direct	Medium 25 – 75%	Major	PV Plant & Transmission line

Environmental Impact	Valued Ecosystem Component	Impact	Project Phase	Duration	Magnitude	Extent	Type	Probability	Significance	Infrastructure
		fires and power surges.								

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