2023

Environmental Impact Assessment for the Construction of the ORE 50MWac Solar PV Power Plant in Katima Mulilo, Zambezi Region

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LIST OF ACRONYMS

AIDS	Acquired immune deficiency syndrome
CRR	Comments and response report
dB	Decibels
DESR	Draft Environmental Scoping Report
EA	Environmental Assessment
EAP	Environmental Assessment Practitioner
EAR	Environmental Assessment Report
ECC	Environmental Clearance Certificate
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan
FESR	Final Environmental Scoping Report
ESR	Environmental Scoping Report
GTZ	Gesellschaft für Technische Zusammenarbeit
HIV	Human immunodeficiency virus
I&AP	Interested and Affected Party

IUCN	International Union for Conservation of Nature
MET	Ministry of Environment and Tourism
MEFT: DEA	Ministry of Environment, Forestry and Tourism: Department of Environmental Affairs
MURD	Ministry of Urban and Rural Development
MWTC	Ministry of Works Transport and Communication
PPP	Public participation process
p/km^2	People per square kilometre
SADC	Southern African Development Community
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

INTRODUCTION

Namibia is regarded as a net exporter of electricity, local electricity generation is derived from hydropower, coal and diesel burning power stations; however, this is not enough to meet local demand (INCUNFCC, 2002) necessitating the country to source the balance, amounting to more than 60%, from other countries within the Southern African region such as Zambia, South Africa, Zimbabwe and Mozambique; of which South Africa's contribution is dominant at 53% (von Oertzen, 2012). Despite the current situation, the energy consumption in Namibia follows an upward trajectory because of the unavoidable dependency of national development on the availability, supply, demand and use of energy (Ajayi & Ajayi, 2013). Namibia will thus have to develop, as a matter of urgency, its own capacity to generate electricity (Kapika & Eberhard, 2010).

It is against this background that Omukwa Renewable Energy (Pty) Ltd has embarked on this opportunity to contribute towards energy self-sufficiency and efficiency by constructing an 50MWac Solar PV Power Plant in the town of Katima Mulilo in the Zambezi Region. The overall solar PV development will be rolled out in two phases. Phase one will be 10MWac PV power plant. Whereas phase two will be a 40MWac PV power plant.

The above activity is discussed in more detail in Chapter 3. The proponent appointed Environam Consultants Trading cc (ECT) to undertake the Environmental Assessment (EA) in order to obtain an Environmental Clearance Certificate (ECC) for the activity from the Office of the Environmental Commissioner in the Ministry of Environment, Forestry and Tourism (MEFT).

The process will be undertaken in terms of the gazetted Namibian Government Notice No. 30 Environmental Impact Assessment Regulations (herein referred to as EIA Regulations) of the Environmental Management Act (No 7 of 2007) (herein referred to as the EMA). The EIA process will investigate if there are any potential significant bio-physical and socio-economic impacts associated with the proposed development and related infrastructure and services.

The EIA process would also provide an opportunity for the public and key stakeholders to provide comments and participate in the process. It will also serve the purpose of informing the proponent's decision-making, and that of MEFT.

PROJECT LOCATION

The proposed sites for both phase one and two are located within the Zambezi Region of Namibia, in the proclaimed town boundaries west of Katima Mulilo town (see **Figure 1** for the locality map of Katima Mulilo town), on Portion 3. **Figure 2** illustrates the ±20Ha area that is available for the Phase 1 development. **Figure 3** illustrates the ±83.9Ha area that is available for the Phase 2 development. See **Figure 4** for the proposed transmission line route. The site for Phase 1 is found at coordinates, Latitude: -17.505500°, Longitude: 24.234286° whereas Phase 2 site is at Latitude: -17.508502°, Longitude: 24.240274°.

Annexure A illustrates the ±20Ha area that is available for the Phase one development. The project site for Phase two is situated approximately 3.8 kilometres from the Katima Mulilo Nored Substation to the East and approximately 1.5km from the NamPower Zambezi Substation to the West. Annexure A illustrates the ±80Ha area that is available for the Phase Two development. Both sites are accessed via the B8 highway which is approximately 3 kilometres from the site.

LEGISLATIVE FRAMEWORK

The principle environmental regulatory agency in Namibia is the Office of the Environmental Commissioner within the Directorate of Environmental Affairs of the Ministry of Environment, Forestry and Tourism. Most of the policies and legislative instruments have their basis in two clauses of the Namibian Constitution, i.e. Article 91 (c) and Article 95 (l); however, good environmental management finds recourse in multiple legal instruments.

ENGINEERING SERVICES

The infrastructure needs of the proposed project can be categorised into two broad classifications namely:

- Basic infrastructure that includes electricity and roads.
- Environmental infrastructure that consists of water supply, sewage and drainage systems, and solid waste management.

There is an existing 11kV overhead line which will connect the solar plant with Nored substation, an existing 66 kV Nampower powerline runs from the Zambezi substation to the Katima Mulilo substation. This powerline has a 25 meters servitude in favour of Nampower on both sides.

The service infrastructure such as water, sewer, drainage, electricity and roads will be designed by registered professional engineers to integrate with the existing infrastructure. These will be carried out in consultation with the Katima Mulilo Town Council and other relevant authorities such as Namwater and Nored.

Both sites are accessed via the B8 highway which is approximately 3 kilometres adjacent to the site. An access road will be constructed giving access to the PV power plant. Internal roads of 4m will be constructed and will connect all three MVS's with the main building and the access gate. The fence will be constructed enclosing the complete plant with an access gate. The internal road network will be designed and the construction thereof supervised by professional engineers as part of the service infrastructure.

PUBLIC PARTICIPATION PROCESS

In terms of Section 21 of the EIA Regulations a call for public consultation with all I&APs during the EIA process is required. This entails consultation with members of the public and providing them an opportunity to comment on the proposed project. The Public Consultation Process does not only incorporate the requirements of Namibia's legislation, but also takes account of national and international best practises.

A public meeting was arranged for 27 January 2023 at the Zambezi Vocational Training Centre in Katima Mulilo. While properly publicised, the attendance was disappointing as I&APs did

not turn up. The comment period of the initial public participation process commenced on **13 January 2023** and ended on **03 February 2023.**

The second phase of the Public Consultation Process involves the lodging of the Draft Environmental Scoping Report (DESR) to all registered I&AP for comment. Registered and potential I&APs are informed of the availability of the DESR for public comment. An Executive Summary of the DESR is included in the communication going out to the registered I&APs. I&APs are given time until **27 April 2023** to submit comments or raise any issues or concerns they may have with regard to the proposed project.

POTENTIAL IMPACTS IDENTIFIED

The following planning and design phase impacts were identified:

- Surface and groundwater;
- Land use;
- Fauna and flora;
- Existing infrastructure;
- Traffic; and
- Visual impact.

The following construction phase impacts were identified:

- Fauna and flora;
- Pressure on the existing infrastructure;
- Surface and groundwater;
- Health, safety and security;
- Air quality,
- Noise,
- Traffic;
- Waste management;
- Hazardous substances;
- and Social.

The following operational phase impacts were identified:

- Environmental monitoring and evaluation;
- Surface and ground water;
- Air quality;
- Noise;
- Impact on human health;
- Waste management; and
- Social.

CONCLUSION

Solar powered electricity generation is experiencing rapid growth. A major motivation for deploying solar power is to reduce emissions of carbon dioxide caused by traditional power generation (Turney & Fthenakis, 2011) for the same quantity of energy produced. The size of land required by the photovoltaic plant is less than what would be required by a fossil fuel

based power plant of the same capacity. Photovoltaic power plant impacts are reversible in the short-term because after decommissioning, the area can be returned to its previous state and become available for other activities. In addition to producing clean energy the power plant can contribute to the promotion of biodiversity, by providing a refuge for plants and animals, in particular smaller animals such as invertebrates.

Another advantage of a photovoltaic power plant over the conventional power plant is that as the lifetime of the solar power plant gets longer, the land transformation per capacity does not change, even when considering the impacts on land use. All high priority impacts are in favour of solar power displacing traditional power generation while all the harmful impacts from solar power are of low priority (Turney & Fthenakis, 2011).

Based on the evidence produced during the assessment process, it is very unlikely that this project will have any significant negative impacts on the environment. It is therefore recommended that a clearance certificate be issued for the project.

1. INTRODUCTION

1.1 Project Background

Namibia is regarded as a net exporter of electricity, local electricity generation is derived from hydropower, coal and diesel burning power stations; however, this is not enough to meet local demand (INCUNFCC, 2002) necessitating the country to source the balance, amounting to more than 60%, from other countries within the Southern African region such as Zambia, South Africa, Zimbabwe and Mozambique; of which South Africa's contribution is dominant at 53% (von Oertzen, 2012). Despite the current situation, the energy consumption in Namibia follows an upward trajectory because of the unavoidable dependency of national development on the availability, supply, demand and use of energy (Ajayi & Ajayi, 2013). Namibia will thus have to develop, as a matter of urgency, its own capacity to generate electricity (Kapika & Eberhard, 2010).

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The EIA process would also provide an opportunity for the public and key stakeholders to provide comments and participate in the process. It will also serve the purpose of informing the proponent's decision-making, and that of MEFT.

1.2 Project Location

The proposed sites for both phase one and two are located within the Zambezi Region of Namibia, in the proclaimed town boundaries west of Katima Mulilo town (see **Figure 1** for the locality map of Katima Mulilo town), on Portion 3. **Figure 2** illustrates the ±20Ha area that is available for the Phase 1 development. **Figure 3** illustrates the ±83.9Ha area that is available for the Phase 2 development. See **Figure 4** for the proposed transmission line route. The site for Phase 1 is found at coordinates, Latitude: -17.505500°, Longitude: 24.234286° whereas Phase 2 site is at Latitude: -17.508502°, Longitude: 24.240274°.

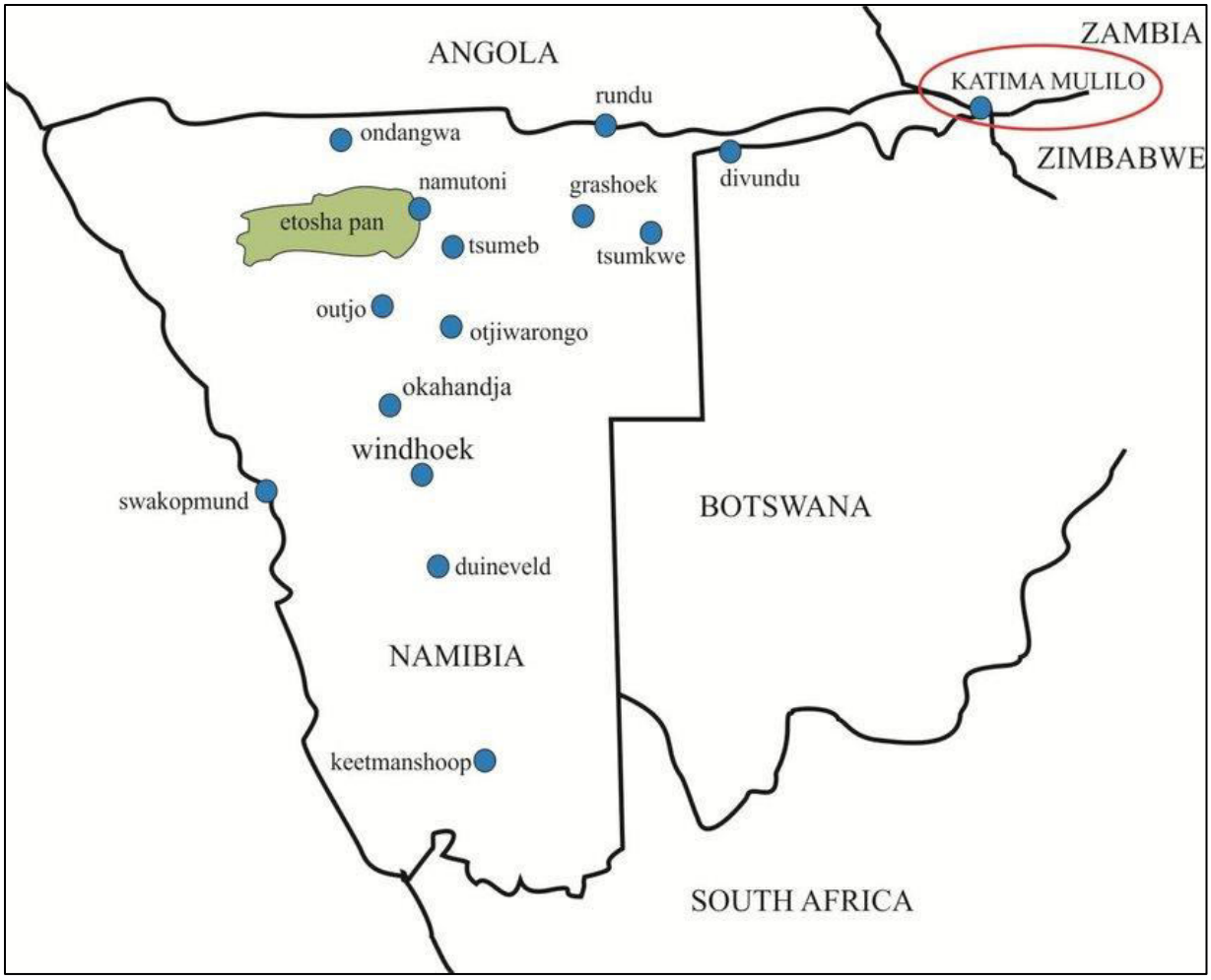

Figure 1: Locality map of Katima Mulilo

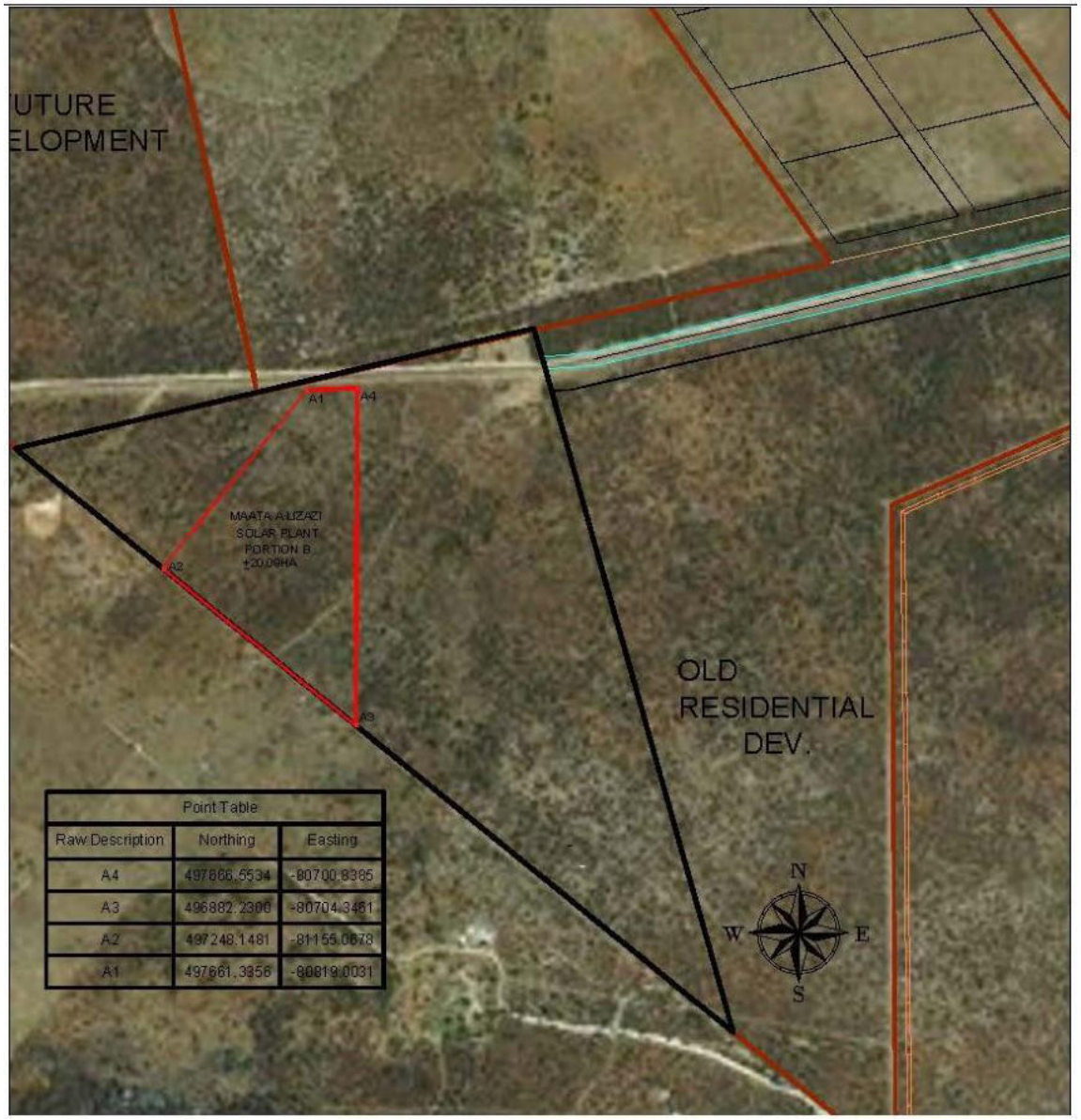

Figure 2: Locality map of the proposed Phase 1 (20ha)

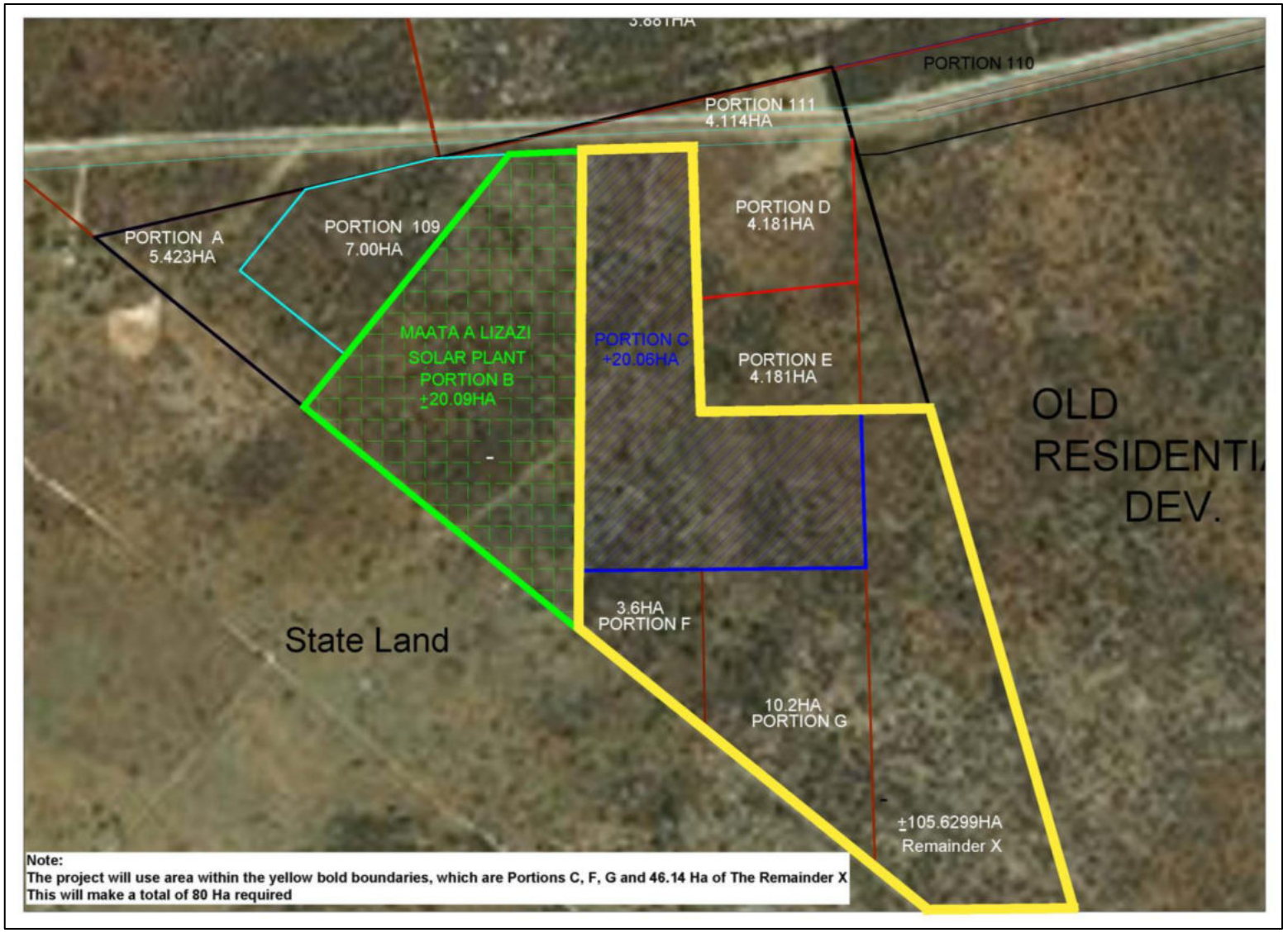

Figure 3: Combined Locality Map of Phase 1 and Phase 2 (83.9ha)

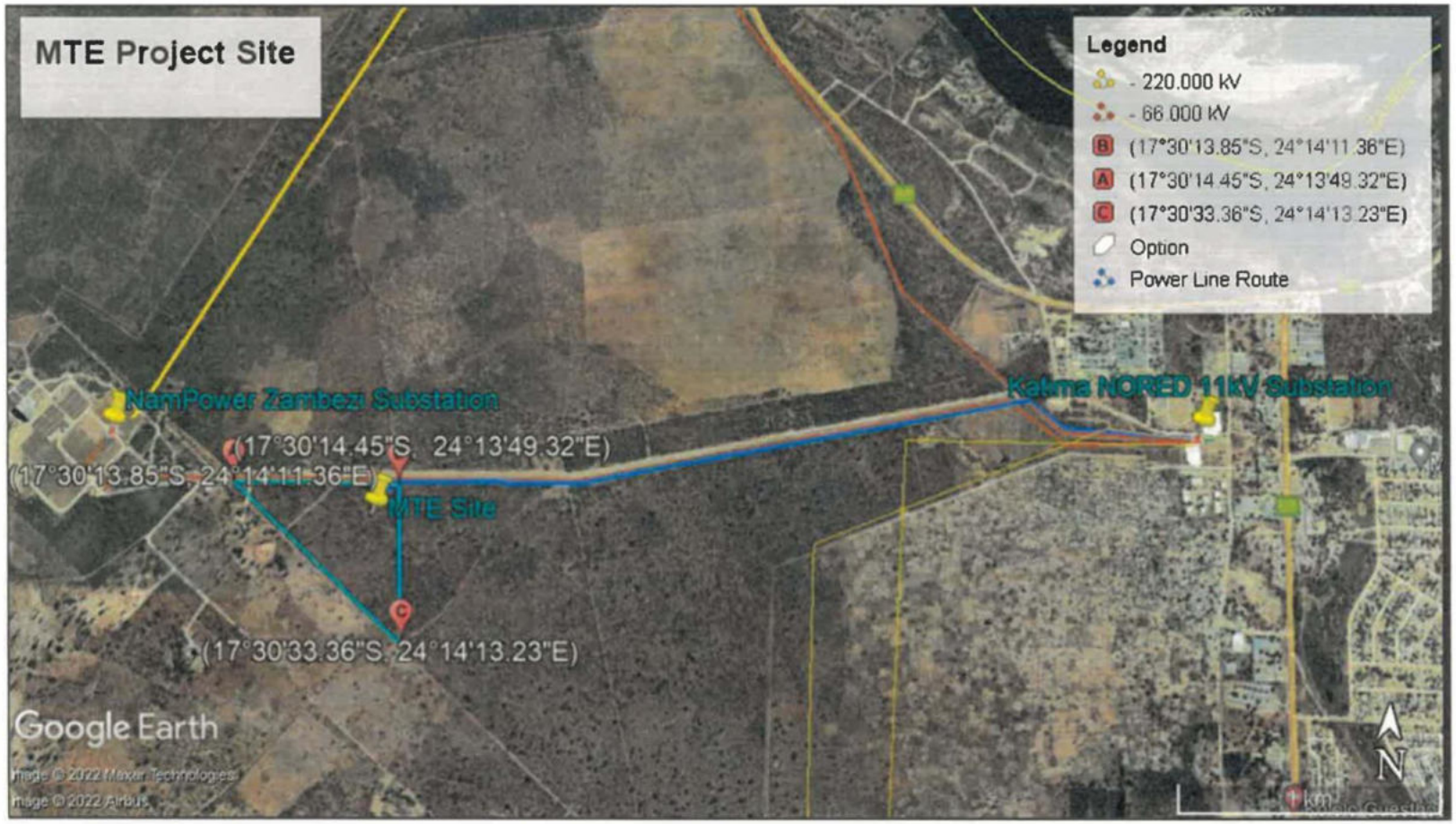

Figure 4: Transmission Line Route

1.3 Terms of Reference and Scope of Project

The scope of this project is limited to conducting an environmental impact assessment and applying for an Environmental Clearance Certificate for the Construction of a 50MWac Solar Power Plant on Portion 3 of Katima Mulilo, Zambezi Region and associated infrastructure as indicated in section 1.1 above. This includes consultations with client; site investigations and analysis; stakeholder consultations; impact analysis; mitigation formulation; report writing; and draft Environmental Management Plan.

1.4 Assumptions and Limitations

In undertaking this investigation and compiling the Environmental Assessment, the following assumptions and limitations apply:

- Assumes the information provided by the proponent is accurate and discloses all information available.
- Various layout alternatives were initially considered by the proponent, having taken due regard of the natural and environmental constraints, and the unique character and appeal of Katima Mulilo. The current designs thus present the most feasible results.

1.5 Content of Environmental Scoping Report

In terms of Section 8 of the gazetted EIA Regulations certain aspects must be included in a Scoping Report. **Table 1** below delineate, for ease reference, where this content is found in the Environmental Scoping Report.

Table 1: Contents of the Scoping / Environmental Assessment Report

Section	Description	Section of ESR/ Annexure
8 (a)	The curriculum vitae of the EAPs who prepared the report;	Refer to **Annexure E**
8 (b)	A description of the proposed activity;	Refer to Chapter 4
8 (c)	A description of the site on which the activity is to be undertaken and the location of the activity on the site;	Refer to Chapter 3
8 (d)	A description of the environment that may be affected by the proposed activity and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed listed activity;	Refer to Chapter 3
8 (e)	An identification of laws and guidelines that have been considered in the preparation of the scoping report;	Refer to Chapter 2

Section	Description	Section of ESR/ Annexure
8 (f)	Details of the public consultation process conducted in terms of regulation 7(1) in connection with the application, including	Refer to Chapter 5
	(i) the steps that were taken to notify potentially interested and affected parties of the proposed application	Refer to Chapter 5
	(ii) proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given;	Refer to **Annexures A** and **B** for site notices and advertisements respectively.
	(iii) a list of all persons, organisations and organs of state that were registered in terms of regulation 22 as interested and affected parties in relation to the application;	Refer to **Annexure D**
	(iv) a summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues;	Refer to **Annexure D**
8 (g)	A description of the need and desirability of the proposed listed activity and any identified alternatives to the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives have on the environment and on the community that may be affected by the activity;	Refer to Chapter 4
8 (h)	A description and assessment of the significance of any significant effects, including cumulative effects, that may occur as a result of the undertaking of the activity or identified alternatives or as a result of any construction, erection or decommissioning associated with the undertaking of the proposed listed activity;	Refer to Chapter 7
8 (i)	terms of reference for the detailed assessment;	Refer to Chapter 1
8 (j)	An environmental management plan	Refer to **Annexure F**

1. LEGAL, POLICY AND INSTITUTIONAL FRAMEWORK

The principle environmental regulatory agency in Namibia is the Office of the Environmental Commissioner within the Directorate of Environmental Affairs of the Ministry of Environment, Forestry and Tourism. Most of the policies and legislative instruments have their basis in two clauses of the Namibian Constitution, i.e., Article 91 (c) and Article 95 (l); however, good

environmental management finds recourse in multiple legal instruments. **Table 2** below provides a summary of the legal framework considered to be relevant to this development and the environmental assessment process.

Table 2: Legislation applicable to the proposed development

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
The Constitution of the Republic of Namibia as Amended	Article 91 (c) provides for duty to guard against "the degradation and destruction of ecosystems and failure to protect the beauty and character of Namibia." Article 95(l) deals with the "maintenance of ecosystems, essential ecological processes and biological diversity" and sustainable use of the country's natural resources.	Sustainable development should be at the forefront of this development.
Environmental Management Act No. 7 of 2007 (EMA)	Section 2 outlines the objective of the Act and the means to achieve that. Section 3 details the principle of Environmental Management	The development should be informed by the EMA.
EIA Regulations GN 28, 29, and 30 of EMA (2012)	GN 29 Identifies and lists certain activities that cannot be undertaken without an environmental clearance certificate. GN 30 provides the regulations governing the environmental assessment (EA) process.	**Activity 1 (a)** The generation of electricity. **Activity 1 (b)** The transmission and supply of electricity.
Convention on Biological Diversity (1992)	Article 1 lists the conservation of biological diversity amongst the objectives of the convention.	The project should consider the impact it will have on the biodiversity of the area.
Draft Procedures and Guidelines for conducting EIAs and compiling EMPs (2008)	Part 1, Stage 8 of the guidelines states that if a proposal is likely to affect people, certain guidelines should be considered by the proponent in the scoping process.	The EA process should incorporate the aspects outlined in the guidelines.
Namibia Vision 2030	Vision 2030 states that the solitude, silence and natural beauty that many areas in Namibia provide are becoming sought after commodities and must be regarded as valuable natural assets.	Care should be taken that the development does not lead to the degradation of the natural beauty of the area.
Water Act No. 54 of 1956	Section 23(1) deals with the prohibition of pollution of underground and surface water bodies.	The pollution of water resources should be avoided during construction and operation of the development.
The Ministry of Environment, Forestry and Tourism (MEFT) Policy on HIV & AIDS	MEFT has developed a policy on HIV and AIDS. In addition, it has also initiated a programme aimed at mainstreaming HIV and gender	The proponent and its contractor/s have to adhere to the guidelines provided to manage the aspects of HIV/AIDS. Experience with

LEGISLATION/POLICIES	RELEVANT PROVISIONS	RELEVANCE TO PROJECT
	issues into environmental impact assessments.	construction projects has shown that a significant risk is created when construction workers interact with local communities.
Urban and Regional Planning Act (Act of 2018).	Urban and Regional Planning Act (Act of 2018) regulates subdivisions of portions of land falling within a proclaimed Local Authority area.	Section 16 of Chapter 3 deals with the Ministers' declaration of authorised planning authorities and establishment of joint committees.
Local Authorities Act No. 23 of 1992	The Local Authorities Act prescribes the manner in which a town or municipality should be managed by the Town or Municipal Council.	The development has to comply with the provisions of the Local Authorities Act
Labour Act no 11 of 2007	Chapter 2 details the fundamental rights and protections. Chapter 3 deals with the basic conditions of employment.	Given the employment opportunities presented by the development, compliance with the labour law is essential.
Public Health Act no 36 of 1919	Section 119 prohibits persons from causing nuisance.	The developer and contractors are to comply with these legal requirements.
Nature Conservation Ordinance no 4 of 1975	Chapter 6 provides for legislation regarding the protection of indigenous plants	Indigenous and protected plants have to be managed within the legal confines.
Atmospheric Pollution Prevention Ordinance (No. 11 of 1976).	The Ordinance objective is to provide for the prevention of the pollution of the atmosphere, and for matters incidental thereto.	All activities on the site will have to take due consideration of the provisions of this legislation.
Roads Ordinance 17 of 1972	This Ordinance consolidates the laws relating to roads.	The provisions of this legislation have to be taken into consideration in as far as access to the development site is concerned.
Roads Authority Act, 1999	Section 16(5) of this Act places a duty on the Roads Authority to ensure a safe road system.	Some functions of the Roads Ordinance 17 of 1972 have been assigned to the Roads Authority.
Katima Mulilo Town Planning Scheme.	The town planning scheme has as its general purpose the co-ordinated and harmonious development of the local authority area, or the area or areas situate therein.	The proposed site has to adhere to the correct land use.
Electricity Act, 2007 (Act No. 4 of 2007)	The Act provides for the requirements and conditions for obtaining licences for the provision of electricity.	Compliance with this legislation is essential.

This EIA process will be undertaken in accordance with the EIA Regulations. A Flow Diagram (refer to **Figure 5** below) provides an outline of the EIA process to be followed.

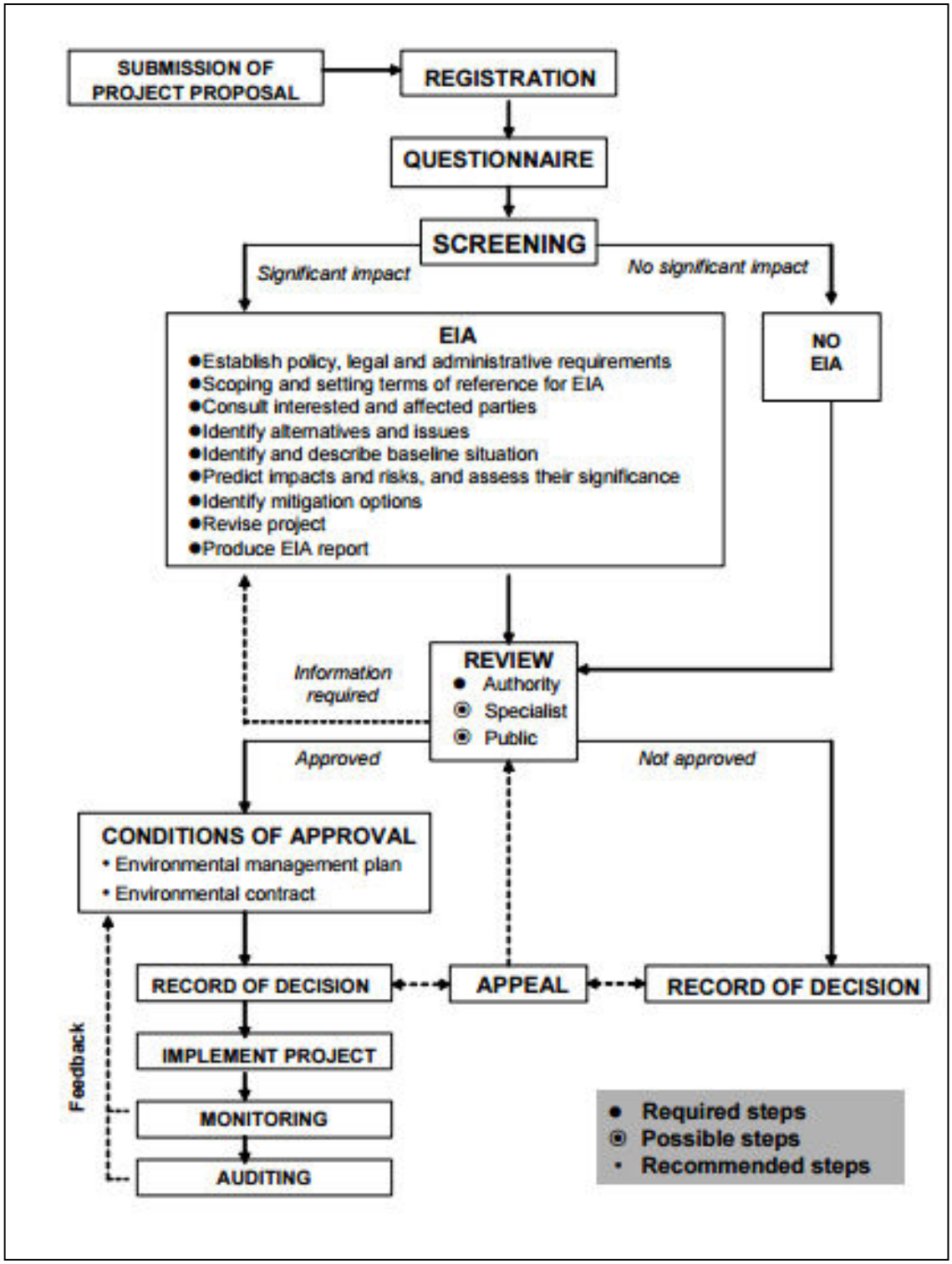

Figure 5: EIA Flowchart for Namibia (SELH, 2012)

2. ENVIRONMENTAL BASELINE DESCRIPTION

2.1. Social Environment

2.1.1. Socio-Economic Context

Katima Mulilo is located in the Zambezi Region. According to the 2011 Census, the total population enumerated in Zambezi Region is estimated at 90,596. The total population of Katima Mulilo urban constituency to be specific is 28,362 of which 15,319 are females and 13,043 are males. The literacy rate of the age group 15 years and up, is 96%. Of all people above the age of 15 5% have never attended school, 21% are currently attending school and 73% left school at the time, in the constituency (NPC, 2011).

Approximately 66% of the population aged 15 years and up belong to the labour force (i.e., economically active) in the Katima Mulilo. 49% of the population is employed while 51% are unemployed. The inactive group, which consists of homemakers 24%, students 65% and the severely disabled, retired or old age income recipients 11%, makes up the rest of the constituency's population.

The main source of income is from wages and salaries at 57%. Business and non-farming activities at 28% and farming at 2%. Cash remittance makes up 8% of the income, while the older age group contributes 3% of the income (NPC, 2011). The following data is presented from a regional perspective. The main languages spoken at home in the Zambezi Region are Zambezi languages at 90%. There are 21,283 private households with an average size of 4.2 members. Approximately 31% of the total population is located in urban parts and 69% in rural parts of the region (NPC, 2011).

2.1.2. Archaeological and Heritage Context

It is unlikely that the development site will have any significant archaeological resources; however, an accidental find procedure may be required. If any heritage or culturally significant artefacts are found during the construction, construction must stop and the National Heritage Council of Namibia immediately notified.

2.2. Bio-Physical Environment

2.2.1. Air Quality

Air quality in Katima Mulilo is characterised to be comparatively good. Any construction activity will result in fugitive dust, which is both a nuisance and a health risk. Dust may be generated by a variety of activities on site, but given the existing background dust levels, the increase resulting from this activity will be negligible under normal circumstances or when considered in combination with other activities.

2.2.2. Climate

The climate in the Zambezi Region is peculiarly more tropical than any other region in Namibia. Due to the higher rainfall, less evaporation and warmer winters that the rest of the country it

is home to many tropical plants that will not be able to survive in other parts of Namibia. While the region experiences the highest rainfall in Namibia, it is highly variable from year to year and from place to place, it is not uncommon to experience serious droughts at times. The rain falls mostly during the summer months from October to April, peaking in January and February. Farmers usually start growing their crops in November (Mendelsohn & Roberts, 1997). See **Figure 6** for rainfall figures for Katima Mulilo.

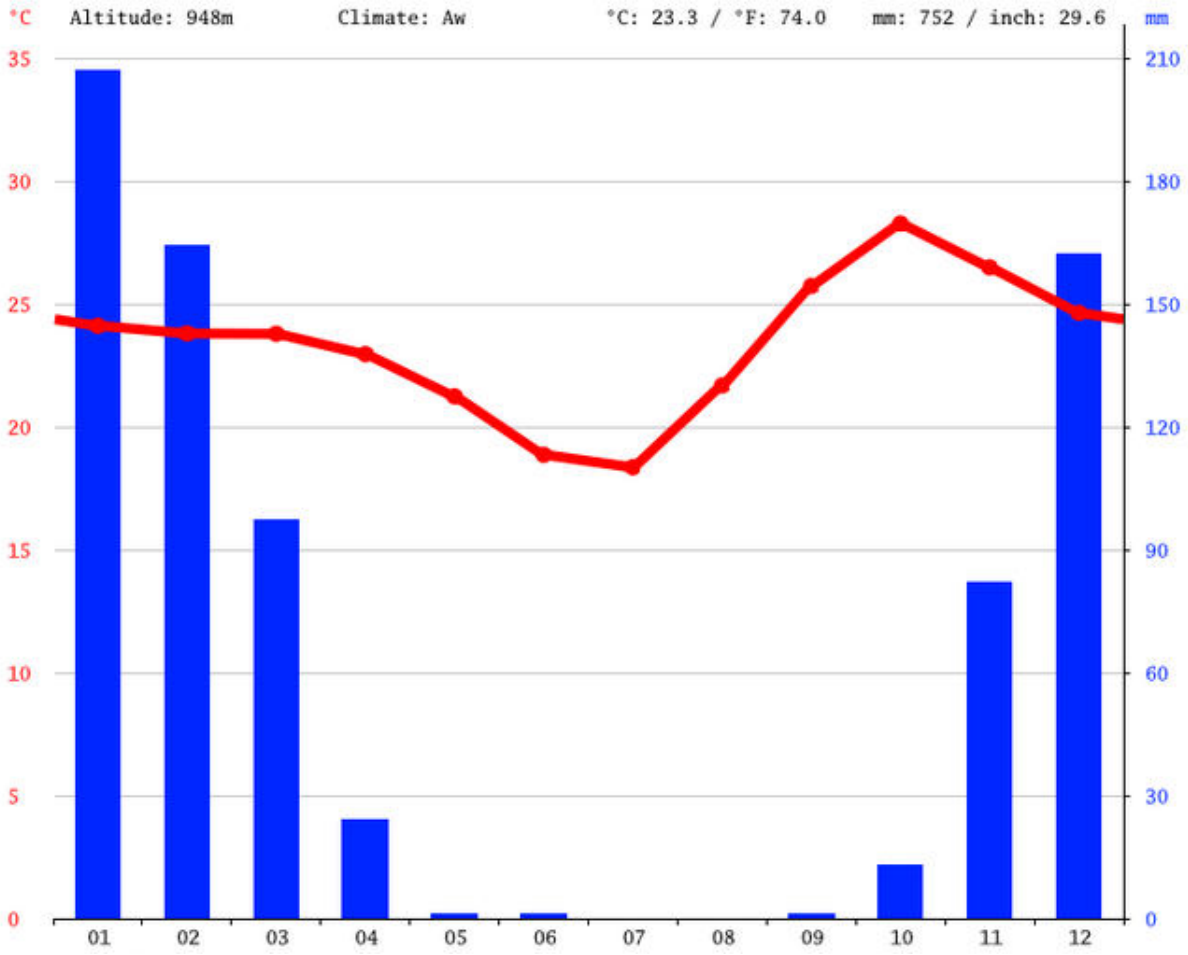

Figure 6: Average annual temperature and rainfall for Katima Mulilo (en.climate-data, 2023)

Summer days in the Zambezi Region are often cloudy, becoming more so during the morning and afternoon. This results in temperatures being fairly low, particularly during the middle to late summer months. During times of low cloud cover during September, October and November, the temperatures are at the highest with average daily maximum temperatures ranging between 32°C and 35 °C and the average minimum temperatures about 20 °C in summer and around 5 °C in winter. Frost is unusual, but in some years, it may occur in the low-lying river valleys, especially in the western parts of the region. Winter months experience fairly high average maximum temperatures due to the clear skies, but cooling off at night as the

daytime heat escapes. The temperature range in winter is thus greater than in summer (Mendelsohn & Roberts, 1997). See the temperature data for Katima Mulilo in **Figure 6** above.

2.2.3. Topography, Geology and Hydrogeology

Topographically, Zambezi region can be described as particularly flat without a single feature recognisable as a hill. The highest areas are found in the extreme west with elevations of about 1100m above sea level, which gradually drop to 930m near Impalila Island in the east. Slight changes can be observed in the elevations in river valleys and between the vegetated dunes and dune valleys; however, they are often not more than 30m. The region is covered in thick deposits of Kalahari sands, exposing very little of the underlying geology, except along some sections of the river courses and on Impalila Island. The landscape is shaped by two major features, which are the extensive Kalahari sands and the rivers with their associated floodplains, channels and deposits (Mendelsohn & Roberts, 1997).

The major distinction between the Zambezi region and the rest of Namibia is the abundance of water. Of the five permanently flowing rivers in the country, three – the Okavango, Kwando and Zambezi – are found in the Zambezi region. The waters from these large rivers often flood over vast areas in years of high rainfall. The seasonal changes in the levels and volumes of these rivers are reflective of the seasonal changes in rainfall. The increased volumes are only noticeable in the Zambezi region after the summer rains in the catchment areas have fallen. At Katima Mulilo and Mukwe, the flows in the Zambezi and Okavango rivers peak in march, April and May, and lowest in October and November (Mendelsohn & Roberts, 1997).

In the rural areas 32% of households obtain their water from rivers and other open, surface waters, 26% from wells, 16% from boreholes while 24% of the rural households consume piped water. Almost all of the water in Katima Mulilo is piped. While the Region boasts more river and open waters than any other region in the country, the region's people encounter the greatest problems with water supply. Underground water reserves are generally fairly abundant in most areas of the Zambezi Region, but they differ considerably in quality. The quality of the water in the Katima Mulilo area is generally classified as excellent (Mendelsohn & Roberts, 1997).

2.2.4. Terrestrial Ecology

The Zambezi Region has six land types forming broad vegetation communities, they are: open water; floodplains; riverine woodlands; mopane woodlands; Kalahari woodlands; and Impalila woodlands. The entire Zambezi Region could be described in terms of the six land types, however there are significant variations within the classifications where certain plants are found in abundance in some areas and provide important resources, while they will be absent in others. Equally the same species of tree may be tall and well grown in one part and be small and shrubby in a different part of the region (Mendelsohn & Roberts, 1997). Some of the plant species found in the Katima Mulilo area include: *Phragmites australis, Cyperus papyrus, Salvinia molesta, Nymphaea spp., Polygonum spp.*, and many sedge species. Other vegetation in the area are: *Cynodon dactylon* lawns, which are a valuable grazing resource, while the large, dry

sandy areas are dominated by *Eragrostis pallens, Tristachya superba*, and *hyparrhenia spp.*, which are poor for grazing (Mendelsohn & Roberts, 1997).

A variable proportion of different grass species occur with the typical species being *Vetiveria nigritana, Aristida sipitata, Loudetia simplex, Andropogon schirensis, Setaria sphacelata, Eragrotis rotifer,* and *Imperata cylindrica*. The grasslands are not of good grazing quality and are thus not fully utilised by livestock owners. Tall trees found in the area consists largely of *Parinari, Kigelia Africana, Diospyros mespiliformis, Trichilia emetica, Acacia sieberana, Lonchocarpus capassa* and *Afzelia quanzensis*. The sandy areas are largely covered by high Terminalia sericea woodlands, the river channels on the other hand would have margins of reeds and stands of *Syzygium guineense, Rhus quartiniana, Trichilia emetic, Garcinia livingstonei,* and *Kigelia africana* on the drier margins (Mendelsohn & Roberts, 1997).

The project location is characterized by vegetation structure of low shrubs, trees, and grasses. Besides fulfilling many ecological functions, the vegetation in the study area can be considered as a highly valuable resource for people. The area displays relatively medium levels of vegetation species diversity, with only a few protected species. The general area has approximately 183 species, with no indication of endemism throughout the area (Table 1). The greatest variants affecting the diversity of plants are habitat and climate. Thus, the medium plant diversity within this area is generally associated with rainfall. Four tree species (4) expected in the area is protected by the Forest Act No. 12 of 2001. In addition, all species with some form of conservation status are viewed as important, and especially species with unique habitat/ or usage (e.g., Boscia albitrunca, Baikiaea plurijuga, Burkea Africana, and Pterocarpus angolensis).

Table 3 below provides a list of plant species expected to occur within the site boundary of this proposed project. This table further highlights the conservation status of some species.

Table 3: Generated plant list expected to occur within the project grind (extracted from the Botanical Record and Herbarium Management Systems (BRAHMS)

SPECIES	PROTECTED	IUCN1	IUCN2
Annona stenophylla Engl. & Diels subsp. nana (Exell) N.Robson			
Barleria lancifolia T.Anderson subsp. lancifolia			
Hypoestes forskaolii (Vahl) R.Br. subsp. forskaolii			
Justicia heterocarpa T.Anderson subsp. dinteri (S.Moore) Hedrén			
Diplorhynchus condylocarpon (Müll.Arg.) Pichon			
Asparagus nelsii Schinz			
Commiphora mossambicensis (Oliv.) Engl.			
Boscia albitrunca (Burch.) Gilg & Gilg-Ben.	Forestry Protected		
Boscia mossambicensis Klotzsch			
Combretum celastroides Welw. ex M.A.Lawson subsp. celastroides			
Combretum collinum Fresen. subsp. gazense (Swynn. & Baker f.) Okafor			
Combretum elaeagnoides Klotzsch			

SPECIES	PROTECTED	IUCN1	IUCN2
Combretum engleri Schinz			
Combretum imberbe Wawra			
Ipomoea magnusiana Schinz			
Kalanchoe lanceolata (Forssk.) Pers.			
Cucumis meeusei C.Jeffrey			
Momordica balsamina L.			
Zehneria marlothii (Cogn.) R.Fern. & A.Fern.			
Diospyros chamaethamnus Dinter ex Mildbr.			
Diospyros mespiliformis Hochst. ex A.DC.			
Euclea angustifolia Benth.			
Acalypha indica L. var. indica			
Croton gratissimus Burch. var. gratissimus			
Erythrococca menyharthii (Pax) Prain			
Euphorbia crotonoides Boiss. subsp. crotonoides			
Pseudolachnostylis maprouneifolia Pax var. dekindtii (Pax) Radcl.-Sm.			
Seidelia firmula (Prain) Pax & K.Hoffm.			

SPECIES	PROTECTED	IUCN1	IUCN2
Vitex angolensis Gürke			
Vitex mombassae Vatke			
Hibiscus mastersianus Hiern			
Sida ovata Forssk.			
Commicarpus plumbagineus (Cav.) Standl. var. plumbagineus			
Ochna cinnabarina Engl. & Gilg			
Ceratotheca sesamoides Endl.			
Aristida meridionalis Henrard			
Brachiaria dura Stapf var. dura			
Bromus catharticus Vahl			
Cynodon dactylon (L.) Pers.			
Digitaria eriantha Steud.			
Echinochloa colona (L.) Link			
Eragrostis nindensis Ficalho & Hiern			
Eragrostis pallens Hack.			
Hyperthelia dissoluta (Nees ex Steud.) Clayton			
Leptocarydion vulpiastrum (De Not.) Stapf			
Panicum heterostachyum Hack.			
Panicum repens L.			

SPECIES	PROTECTED	IUCN1	IUCN2
Perotis patens Gand.			
Pogonarthria fleckii (Hack.) Hack.			
Schizachyrium jeffreysii (Hack.) Stapf			
Trachypogon spicatus (L.f.) Kuntze			
Tricholaena monachne (Trin.) Stapf & C.E.Hubb.			
Tristachya superba (De Not.) Schweinf. & Asch.			
Willkommia sarmentosa Hack.			
Gaillonia crocyllis (Sond.) Thulin			
Psydrax livida (Hiern) Bridson			
Spermacoce senensis (Klotzsch) Hiern			
Tarenna luteola (Stapf) Bremek.			
Vangueria infausta Burch. subsp. infausta			
Grewia subspathulata N.E.Br.			
Streptopetalum serratum Hochst.			
Lantana angolensis Moldenke			
Ampelocissus obtusata (Welw. ex Baker) Planch. subsp. kirkiana (Planch.) Wild & R.B.Drumm.			
Cardiospermum corindum L.			

SPECIES	PROTECTED	IUCN1	IUCN2
Bidens schimperi Sch.Bip. ex Walp.			
Chamaebryum pottioides Thér. & Dixon			
Acacia fleckii Schinz			
Acacia galpinii Burtt Davy			
Baikiaea plurijuga Harms	Forestry Protected	Near Threatened	Near Threatened
Bauhinia urbaniana Schinz			
Burkea africana Hook.	Forestry Protected		
Dalbergia martinii F.White			
Dalbergia melanoxylon Guill. & Perr.		Near Threatened	
Erythrophleum africanum (Welw. ex Benth.) Harms			
Indigofera arenophila Schinz			
Indigofera astragalina DC.			
Ormocarpum kirkii S.Moore			
Pterocarpus angolensis DC.	Forestry Protected	Near Threatened	Near Threatened
Pterocarpus lucens Lepr. ex Guill. & Perr. subsp. antunesii (Taub.) Rojo			
Tephrosia cephalantha Welw. ex Baker var. decumbens Welw. ex Baker [emend. Brummit]			
Vigna frutescens A.Rich. subsp. frutescens var. frutescens			

SPECIES	PROTECTED	IUCN1	IUCN2
Empogona kirkii Hook.f. subsp. kirkii			
Annona stenophylla Engl. & Diels subsp. nana (Exell) N.Robson			

Sensitivity

There is a low number of valuable tree species that are protected, therefore area surveyed within this portion has a moderate sensitivity rating.

Potential Impacts

- Loss of biodiversity.
- Formation of extensive bare patches, recolonized slowly with annual grasses.
- Extensive coppicing of low shrubs.
- Encroachment by *Dichrostachys cinerea*

Figure 7: Vegetation on Portion 3 of the proposed project site

In terms of amphibians about 26 species of toads and frogs, some of which serve as a protein source for the locals, have been collected in the East Zambezi region (Channing 1989). As far as large animals are concerned, elephants and Red Lechwe (*Kobus leche*) received amongst the highest counts in historical censuses followed by buffalo (*Syncerus caffer*). Other animals found in the Zambezi Region are Hippopotamus, zebra, warthog, sable, kudu, crocodile and tsessebe (*Damaliscus lunatus*) (Schlettwein et al., 1990).

Three bird studies in east Zambezi provide an indication of the species occurring there. Kemp (1971) recorded 260 species, Koen (1988), listed 359 species, while Branfield (1990) added 49 new species. Grass owl (*Tyto capensis*), pink-backed pelican, redchested and buffspotted flufftails have been recorded in the region. The watteled crane nests and juveniles have been seen in the Mamili National Park suggesting that they do breed there. Vultures and bateleur are widespread in the area (Schlettwein et al., 1990).

2.3. Surrounding Land Use

The project site for Phase 1 is situated approximately 2.6 kilometres from the Katima Mulilo Nored Substation to the East. The project site for Phase 2 is situated approximately 3.8 kilometres from the Katima Mulilo Nored Substation to the East and approximately 1.5km from the NamPower Zambezi Substation to the West. The general area is partly developed with NamPower Zambezi Substation to the West, and communal residential dwellings to the east. Although allocations have been made to various entities for future developments including an LPG facility in the immediate surrounds of the sites, the particular sites are largely undeveloped.

2.4. Physical Environment

The infrastructure needs of the proposed project can be categorised into two broad classifications namely:

- Basic infrastructure that includes electricity and roads.
- Environmental infrastructure that consists of water supply, sewage and drainage systems, and solid waste management.

There is an existing 11kV overhead line which will connect the solar plant with Nored substation, an existing 66 kV Nampower powerline runs from the Zambezi substation to the Katima Mulilo substation. This powerline has a 25 meters servitude in favour of Nampower on both sides.

The service infrastructure such as water, sewer, drainage, electricity and roads will be designed by registered professional engineers to integrate with the existing infrastructure. These will be carried out in consultation with the Katima Mulilo Town Council and other relevant authorities such as Namwater and Nored.

Both sites are accessed via the B8 highway which is approximately 3 kilometres from the site. An access road will be constructed giving access to the PV power plant. Internal roads of 4m will be constructed and will connect all three MVS's with the main building and the access gate. The fence will be constructed enclosing the complete plant with an access gate. The internal

road network will be designed and the construction thereof supervised by professional engineers as part of the service infrastructure.

3. PROJECT DESCRIPTION

3.1. Site Description

As previously outlined in Section 1.1, the proposed project involves the construction of a 50MWac Solar Power Plant in Katima Mulilo, Zambezi Region. The overall solar PV development will be rolled out in two phases. Phase one will be a 10MWac PV power plant. Whereas phase two will be a 40MWac PV power plant. As for Phase 1, the PV Power Plant is made up by three blocks. Each block has one MV station consisting of a LV DB, a MV Transformer and MV Switchgear. A total of 40 inverters are installed and thus up to 14 inverters are connected to one MV station. Each inverter has 24 inputs and up to 24 strings with 27 modules per string connected. Each MV station is connected to the 11kV Switchgear housed inside the Transfer Station inside the Main Administrative Building.

The transfer station is connected via an OHL to the Katima Mulilo substation. A system overview is listed in **Table 4**.

Table 4: System Overview

DC Capacity	12.5 MWp
AC Capacity	10 MWac
DC/AC Ratio	1.25
Tracking Range of Tracker	+-55°
Pitch	6m
Interconnection voltage	11kV
Interconnection OHL length	3.8km
Interconnection Substation	NORED Katima Mulilo
ELECTRICAL SYSTEM	
PV Module Type	Mono-crystalline PERC, JAM72D30-545-MB
Module Rating	545Wp
Total Modules	22950
Modules per String	27
Number of Strings	850
Modules per Tracker	Up to 216
No of Trackers	137
Strings per Inverter	Up to 21
No of Inverters	40
Inverter Type	String, Sungrow SG350SX
MVS Type	Sungrow MVS4480-LV
No of MVS	3

The proposed Plant is designed with high efficiency mono-crystalline half-cell PERC PV modules mounted on single axis trackers to maximize power output. The offered tracker has a market leading technical concept allowing high robustness and reliability, by its low gravity, wind tunnel tested drive design. The PV modules are connected in strings and are feeding three MV stations (MVS) via string inverters. Each MVS has a capacity of 4480kVA forming a total installed capacity of 12.8MVA with 40 inverters at an ambient temperature of 40°C and 11.8MVA at 50°C.

Per MVS the AC outputs the inverters are stepped up to 11kV by a 11/0.8kV transformer feeding the medium voltage switchgear, all housed inside a 20ft container with partitions. All delivered pre-manufactured, factory tested in one 20ft container. All equipment (transformer, switchgear, etc) are of high international quality.

Each 11kV output form the MVS' switchgear is fed to the designated 11kV feeder of the 11kV switchgear housed inside the main control room building. The output of the 11kV switchgear is connected to the 11kV overhead line (OHL). The 10MW plant is connected via a 3.8km long OHL to the extended switchgear at the Katima Mulilo Substation. The metering point will be at the transfer station at the PV plant. Main and Check meters will be installed.

The interface of the PV power plant with the grid operator will be through the SEL RTAC installed in the transfer station. The complete PV power plant will be earthed as per local regulations. An earth grid will be laid earthing all structures within the plant to guarantee safe step and touch potentials. A lightning study will be conducted and lightning protection arrangements will be installed to comply with the local and specified regulations.

All civil works will be SANS compliant. The buildings and the foundations of the inverter stations will be reinforced, of adequate MPa rating and protected against. All AC cabling is SANS compliant as per local regulations. The DC cabling is as per equivalent international standards. All cables will be routed on their most efficient way finding the optimum between their lengths and the necessary trenching works resulting in a reduced cost and reduced environmental impact. All cables will be laid in backfilled trenches as per SANS regulations. An access road will be constructed giving access to the PV power plant. Internal roads of 4m will be constructed and will connect all three MVS's with the main building and the access gate. The fence will be constructed enclosing the complete plant with an access gate as per the proponent's Requirements. Further details are contained in the document named "DETAILED TECHNICAL PROPOSAL" attached as **Annexure G**.

3.2. Decision Factors

The following factors served as informants and were considered when preparing the layout designs for the proposed development:

- Katima Mulilo Town Planning Scheme.
- Character of the general area.
- Proximity to supporting infrastructure.

3.3. No - Go Alternative

The no-go alternative would essentially entail maintaining the current situation, whereby sufficient local power generation, from a regional and national perspective, remains a challenge. The country will continue to be reliant on exports from other countries. In addition, no construction or operational jobs that come with the envisaged project will be created.

4. PUBLIC PARTICIPATION PROCESS

4.1. Public Consultation Process Phase 1

In terms of Section 21 of the EIA Regulations a call for public consultation with all I&APs during the EIA process is required. This entails consultation with members of the public and providing them an opportunity to comment on the proposed project. The Public Consultation Process does not only incorporate the requirements of Namibia's legislation, but also takes account of national and international best practises. Please see **Table 5** below for the activities undertaken as part of the public participation process.

Table 5: Table of Public Consultation Activities

ACTIVITY	REMARKS
Placement of site notices/posters in Katima Mulilo	See **Annexure A**
Placing advertisements in two newspapers for two consecutive weeks, namely Confidente and Windhoek Observer	See **Annexure B**
Written notice to Interested and Affected Parties via Email	See **Annexure D**
Public meeting in Katima Mulilo	27/01/2023

A public meeting was arranged for 27 January 2023 at the Zambezi Vocational Training Centre in Katima Mulilo. While properly publicised, the attendance was disappointing as I&Aps did not turn up. The comment period of the initial public participation process commenced on **13 January 2023** and ended on **03 February 2023.**

4.2. Public Consultation Process Phase 2

The second phase of the Public Consultation Process involve the lodging of the Draft Environmental Scoping Report (DESR) to all registered I&AP for comment. Registered and potential I&APs were informed of the availability of the DESR for public comment. An Executive Summary of the DESR was included in the communication that went out to the registered I&APs. I&APs were given time until **27 April 2023** to submit comments or raise any issues or concerns they may have with regard to the proposed project.

5. ASSSESSMENT METHODOLGY

Impact assessments depend on the nature and magnitude of the proposed activity, as well as the type of environmental control envisaged for the particular project. Given the nature of the proposed activity, i.e., a construction project, the identification and assessment of the

potential impacts will be based on the type and scale of the various activities associated with the project.

Assessment of the predicted significance of impacts for a proposed development is by its nature, inherently uncertain. To deal with such uncertainty in a uniform manner, standardised and internationally recognised methodologies have been developed. One such accepted methodology is applied in this study to assess the significance of the potential environmental impacts of the proposed development, outlined as follows in **Table 6**.

Table 6: Impact Assessment Criteria

CRITERIA	CATEGORY
Impact	Description of the expected impact
Nature Describe type of effect	**Positive**: The activity will have a social / economical / environmental benefit. **Neutral**: The activity will have no effect **Negative**: The activity will have a social / economical / environmental harmful effect
Extent Describe the scale of the impact	**Site Specific:** Expanding only as far as the activity itself (onsite) **Small:** restricted to the site's immediate environment within 1 km of the site (limited) **Medium:** Within 5 km of the site (local) **Large:** Beyond 5 km of the site (regional)
Duration Predicts the lifetime of the impact.	**Temporary:** < 1 year (not including construction) **Short-term:** 1 – 5 years **Medium term:** 5 – 15 years **Long-term:** >15 years (Impact will stop after the operational or running life of the activity, either due to natural course or by human interference) **Permanent:** Impact will be where mitigation or moderation by natural course or by human interference will not occur in a particular means or in a particular time period that the impact can be considered temporary
Intensity Describe the magnitude (scale/size) of the Impact	**Zero:** Social and/or natural functions and/ or processes remain unaltered **Very low:** Affects the environment in such a way that natural and/or social functions/processes are not affected **Low:** Natural and/or social functions/processes are slightly altered **Medium:** Natural and/or social functions/processes are notably altered in a modified way **High:** Natural and/or social functions/processes are severely altered and may temporarily or permanently cease
Probability of occurrence Describe the probability of the Impact actually occurring	**Improbable:** Not at all likely **Probable:** Distinctive possibility **Highly probable:** Most likely to happen **Definite:** Impact will occur regardless of any prevention measures

CRITERIA	CATEGORY
Degree of Confidence in predictions State the degree of confidence in predictions based on availability of information and specialist knowledge	**Unsure/Low:** Little confidence regarding information available (<40%) **Probable/Med:** Moderate confidence regarding information available (40-80%) **Definite/High:** Great confidence regarding information available (>80%)
Significance Rating The impact on each component is determined by a combination of the above criteria.	**Neutral:** A potential concern which was found to have no impact when evaluated **Very low:** Impacts will be site specific and temporary with no mitigation necessary. **Low:** The impacts will have a minor influence on the proposed development and/or environment. These impacts require some thought to adjustment of the project design where achievable, or alternative mitigation measures **Medium:** Impacts will be experienced in the local and surrounding areas for the life span of the development and may result in long term changes. The impact can be lessened or improved by an amendment in the project design or implementation of effective mitigation measures. **High:** Impacts have a high magnitude and will be experienced regionally for at least the life span of the development, or will be irreversible. The impacts could have the no-go proposition on portions of the development in spite of any mitigation measures that could be implemented.

*NOTE: Where applicable, the magnitude of the impact has to be related to the relevant standard (threshold value specified and source referenced). The magnitude of impact is based on specialist knowledge of that particular field.

For each impact, the EXTENT (spatial scale), MAGNITUDE (size or degree scale) and DURATION (time scale) are described. These criteria are used to ascertain the SIGNIFICANCE of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The decision as to which combination of alternatives and mitigation measures to apply lies with the proponent, and their acceptance and approval ultimately with the relevant environmental authority.

The SIGNIFICANCE of an impact is derived by taking into account the temporal and spatial scales and magnitude. Such significance is also informed by the context of the impact, i.e. the character and identity of the receptor of the impact.

6. MITIGATION HIERACHY

The mitigation hierarchy is a tool aimed at helping to manage biodiversity risk, and is commonly applied in Environmental Impact Assessments. The most common reference point for banks providing project finance is mitigation measures; this provides the financial institutions with information on how environmental and social risks will be managed (See **Figure 8** below). These cover avoidance, minimization, restoration and compensation amongst other things. It is possible and considered sought after to enhance the environment by ensuring that positive gains are included in the proposed activity or project. If negative impacts occur then the hierarchy indicates further steps.

Figure 8: Mitigation Hierarchy

Impact avoidance: This step is most effective when applied at an early stage of project planning. It can be achieved by:

- not undertaking certain projects or elements that could result in adverse impacts;
- avoiding areas that are environmentally sensitive; and
- putting in place preventative measures to stop adverse impacts from occurring.

Impact minimization: This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:

- scaling down or relocating the proposal;
- redesigning elements of the project; and
- taking supplementary measures to manage the impacts

Restoration: This step is taken to improve degraded or removed ecosystems following exposure to impacts that cannot be completely avoided or minimised. Restoration tries to return an area to the original ecosystem that occurred before impacts. Restoration is frequently needed towards the end of a project's life-cycle, but may be possible in some areas during operation.

Impact compensation: This step is usually applied to remedy unavoidable residual adverse impacts. It can be achieved by:

- rehabilitation of the affected site or environment, for example, by habitat enhancement;
- restoration of the affected site or environment to its previous state or better; and
- replacement of the same resource values at another location (off-set), for example, by wetland engineering to provide an equivalent area to that lost to drainage or infill. Offsets are often complex and expensive; it is therefore preferable to pay attention to earlier steps in the mitigation hierarchy.

7. POTENTIAL IMPACTS

This Chapter describes the potential impacts on the biophysical and socio-economic environments, which may occur due to the proposed activities. These include potential impacts, which may arise during the planning and design phase, potential construction related impacts (i.e., short to medium term) as well as the operational impacts of the proposed development (i.e., long-term impacts).

The assessment of potential impacts will help to inform and confirm the selection of the preferred project plan and design to be submitted to MEFT: DEA for consideration. In turn, MEFT: DEA's decision on the environmental acceptability of the proposed project and the setting of conditions of authorisation (should the project be authorised) will be informed by this chapter, amongst other information contained in this Report.

The baseline and potential impacts that could result from the proposed development are described and assessed with mitigation measures recommended. Finally, comment is provided on the potential cumulative impacts which could result should this development, and others like it in the area, be approved.

7.1. Planning and Design Phase Impacts

During the planning and design phase consideration is given to aspects such as surface and groundwater; land use; fauna and flora; existing infrastructure; traffic; and visual and sense of place impacts.

7.1.1. Surface and Groundwater

There are currently no visible surface water bodies to be considered with regard to the immediate proposed sites, the Zambezi River is located around 3000m from the site, this does however put the surface and ground water resources in the area at risk of pollution. This is likely to happen in the absence of a well designed and constructed storm water drainage infrastructure. Poorly constructed and maintained service infrastructure in general may also lead to seepage of waste water into the water bodies. Surface and ground water contamination may also result from nonpoint source runoff from commercial and residential developments (Sosiak and Dixon, 2006). Uncontrolled solid waste management is another potential pollutant of the surface water.

7.1.2. Land Use Change

The proposed site is mostly surrounded by undeveloped land that is earmarked for future developments; the portion earmarked for the construction of the solar power plant is relatively undeveloped with a significant cover of vegetation. Solar power plants require a large piece of land for setting up the modules and the related equipment such as inverters, this results in the reduction of land available for other developments and activities. The length of time needed for the land to recover from the effects of the development after decommissioning may also

be a factor in determining the significance of impact on soil fertility for example. Forest recovery time for photovoltaic power plants is assumed to average 10 years in comparison to 50 years following strip mining for fossil fuels (Turney & Fthenakis, 2011). The type of support structures for the panels will have limited effect on the soil fertility as they are directly sunk into the ground

7.1.3. Fauna and Flora (Biodiversity)

The area is densely covered by a mixture of vegetation including grass, shrubs and large trees, as listed in **Table 3** above. The site will be cleared substantially to make way for the development and the installation of bulk infrastructure services as the nature of the proposed development requires the removal of many trees and vegetation.

Construction activities could result in the alteration of the site's habitat and thus potentially disturb existing habitats (flora, fauna, and avifauna) and result in the displacement of exclusion of species particularly threatened, endemic, or endangered species which might be present within the Project site and surrounding areas. Other impacts on the biodiversity of the site are mainly from improper management of the site which could include improper conduct and housekeeping practices by workers (i.e. hunting of animals, discharge of hazardous waste to land, etc.).

The Zambezi region in general and Katima Mulilo in particular experiences high vegetation relative to the rest of the Namibian localities and it is challenging to find an undeveloped area with low or no growth.

The overall impact on the local fauna and flora and associated habitat would be significant, and would therefore require strong mitigation measures to be formulated. That will include consultation with the regional Forestry authority, to identify protected and important indigenous species, as well as to develop a removal program and ultimately apply for a harvesting permit.

A transmission line will be constructed from the solar power plant to feed into the NORED substation, this will have added flora and fauna impacts along the route to be used for this purpose. It is therefore recommended that the proponent engages Nampower to allow them to follow the same route as the existing transmission line which extends from Zambezi substation to Katima Mulilo substation to minimize habitat degradation. The proponent should also consider participating in an "off-set" scheme where trees are planted elsewhere in lieu of those that have been removed and cannot be transplanted. The proposed development areas and associated infrastructure would however, only have localised negative implications on the environment and associated fauna and flora.

7.1.4. Existing Service Infrastructure Impacts

The engineering services such as water pipelines, sewer reticulation, access roads, electricity supply, storm water management etc. for the development will be designed and constructed

to connect to and fully integrate with the existing network supplying the surrounding land uses, the proponent will appoint the engineering company that will design and supervise the installation of the engineering services. It is important to note that the country in general is constrained and faced with a crisis in terms of water and electricity availability; and an increased demand for these amenities will further add to the predicament.

The proposed development will make use of added infrastructure specifically regarding electricity and water. This additional demand is expected to be fairly Medium-Low. It is recommended that electricity demand for the operations be met with the same technology utilised in generation. The plant operations are not water intensive; however, a negligible amount of water may be required to wash the panels, estimated at only $6m^3$ – 24 per^3 annum.

By applying a series of the mitigation measures as proposed for the development it is believed that any potential impacts can be significantly reduced. The water volumes and electrical demands for the project is not expected to have a significant negative impact on the infrastructure. It is critical that any service infrastructure be designed and construction supervised by a qualified and registered and engineering professional.

7.1.5. Traffic Impacts

There will be movement of traffic during the operational phase of the project. Due to the nature of the development and the land use, vehicles that will frequent the area would mostly consist of vehicles used by workforce, and is not expected to be significant.

7.1.6. Visual and Sense of Place Impacts

The proposed site which is intended for the photovoltaic power plant development is currently vacant and undeveloped, but is densely vegetated and will now be developed with various infrastructure.

Site preparation activities will include the installation of arrays and the various project components, including transmission cables, access roads and internal road network, storage buildings, etc. These activities will result in land clearance, ground levelling, excavations, and grading. From the start of construction activities, visual changes will occur from the modified ground surface and the presence of construction equipment and machinery (excavators, trucks, front end loaders, compactors, and others).

Individuals who frequent the area on a regular basis will experience a change in their sense of place of the area. The extent of this disturbance will depend on how high they valued the initial aesthetic quality of the site. Therefore, the aesthetics quality of the new structures has to be pleasing and designed to blend in with the natural surrounds.

7.2. Construction Phase Impacts

During the construction phase the following potential impacts have been identified: pressure on the existing infrastructure; surface and ground water; health, safety and security impacts; air quality; noise, traffic; solid waste management; hazardous substances; and social impact.

7.2.1. Pressure on existing infrastructure

During the construction phase there will be an additional demand for basic municipal services such as water, electricity and sewer. The services will be used for both human consumption and for construction purposes. These impacts will however only be limited to the construction phase and will thus have minimal short-term impact. The risk of wastage and pollution may occur if no proper management actions are implemented.

7.2.2. Surface and Ground Water Impacts

Surface and ground water impacts may be encountered during the construction phase, especially if construction takes place during the rainy season. The risk of contaminating such water sources can be increased by accidental spillage of oils and fuels and any other equipment used during construction; chemical contamination from construction materials such as cement, paint and mechanical fluids. This risk is minimised by the fact that the construction period will be a short-term activity.

7.2.3. Health, Safety and Security Impacts

Due to a high demand of construction workers during this phase of the project, the deployment of a temporary construction workforce in Katima Mulilo may be necessary. These types of projects, where construction workers have the opportunity to interact with the local community, create a significant risk for the development of social conditions and behaviors that contribute to the spread of HIV, AIDS and Covid-19. The Ministry of Environment, Forestry and Tourism has initiated a programme aimed at mainstreaming HIV and gender issues into environmental impact assessments. Safety and security aspects are a critical part of any construction activity and high standards have to be upheld for the duration of the construction period

7.2.4. Air Quality

During the construction phase fugitive dust and exhaust gases generated have a potential impact on the air quality of the area and its surroundings. Dust is a major component of air pollution and could negatively affect the health of nearby communities if not mitigated. These are however short-term impacts. Dust is generated mainly from the following activities:

- Excavations and stockpiles during site clearance;
- Use of heavy vehicles, machinery and equipment;
- Procurement and transport of construction materials to the site.

The allocated properties in the vicinity are undeveloped for the most part, and dust would therefore not interfere significantly on the community during the short-term construction phase

7.2.5. Noise Impacts

Noise is perceived as one of the most undesirable consequences of a construction activity. The most common reported impacts are interference in oral communication and sleep disturbance. The construction of the services, and other structures will result in associated noise impacts. These noise impacts will mainly be associated with construction machinery and vehicles, concrete and mixing; and excavation for foundations. The project area is however a distance away from the main residential areas and other developments and would therefore not interfere significantly on the community during the short-term construction phase, however about two households are located on the southwestern end of the proposed site for phase one, and close liaison with these households is encouraged.

7.2.6. Traffic Impacts

Traffic is expected to increase during the construction phase of the project. A number of trucks and other heavy machinery will be required to deliver, handle and position construction materials as well as to remove spoil material. Not only will the increase in traffic result in associated noise impacts, it will also impact on the vehicular traffic in the area. The use of slow-moving heavy construction trucks has the potential to cause traffic jams.

7.2.7. Solid Waste Management

The construction activities will lead to the generation of significant amounts of solid waste mainly in the form of construction building rubble. This could have a negative environmental impact if not managed well. Therefore, enough waste bins and skip containers should be availed to manage the solid waste. All solid waste should be disposed of at the designated landfill site of Katima Mulilo as approved by the local authority.

7.2.8. Storage and Utilisation of Hazardous Substances

Hazardous substances are regarded by the Hazardous Substance Ordinance (No. 14 of 1974) as those substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure in certain circumstances. It covers manufacture, sale, use, disposal and dumping as well as import and export. During the construction period, the use and storage of these types of hazardous substances, such as shutter oil, curing compounds, types of solvents, primers and adhesives and diesel, on-site, could have negative impact on the surrounding environment, if these substances spill and enter the environment.

7.2.9. Social Impacts

The project will result in long-term positive impacts as far as the social welfare of the affected community is concerned. There is potential of an influx of migrant workers into the town of Katima Mulilo. This would boost the local economic development of the town as a result of an increase in consumers of goods, and spending power. The local community will benefit through preferential recruitment of local labour and procurement as far as possible.

7.3. Operational Phase Impacts

The operational phase impacts that have been identified are: environmental monitoring and evaluation; surface and ground water; air quality; noise; impact on human health; waste management; and social.

7.3.1. Environmental Monitoring and Evaluation

The Environmental Commissioner requires regular environmental monitoring and evaluations on environmental performance to be conducted on approved developments, as well as the setting and monitoring of targets for improvement. As part of this exercise bi-annual reports have to be submitted to the Office of the Environmental Commissioner for the duration of the environmental clearance certificate.

7.3.2. Surface and Ground Water Impacts

Surface and ground water impacts may be encountered during the operational phase, especially if the infrastructure is poorly constructed and maintained. The provision of properly designed and constructed municipal services, which are regularly monitored and maintained, to the development will minimise the potential pollution of water sources.

7.3.3. Air Quality

The air quality in the area is considered to be good; although impacts of dust and emissions may result from the movement of vehicles. These are however expected to have insignificant impacts when properly managed. The plant operation itself is not expected to generate dust or emissions as compared to the fossil fuel-based electricity generation plants, which emit greenhouse gases and other noxious gases. The plant needs to be controlled and managed as required by the Public Health Act (Act No. 36 of 1919) and Atmospheric Pollution Prevention Ordinance (No. 11 of 1976).

7.3.4. Noise Impacts

The sound emissions during the operational phase will be those caused by the inverters and transformers necessary for the operation of the power plant. Sound emissions will only occur during daylight hours because the two sources emit sound power while operating. The inverters are located inside cabins consisting of prefabricated concrete boxes. The boxes will be ventilated by aeration grilles. The level perceived at the receptor in this case (considering that the emissions mostly take place during the day) are less than 30dBA and can therefore be considered completely negligible (30 dB is the measurable sound level inside a silent room). The noise level by the vehicle movement is also negligible as it is not above the general noise level of normal traffic in the area.

By applying a series of the mitigation measures as proposed for general developments of this nature it is believed that any potential nuisance can be significantly reduced. The nearest developments are also a fair distance away.

7.3.5. Impact on Human Health

Concerns about the effect of solar power plants on human health include electromagnetic radiation from the high voltage equipment used in the operations, for example the transformers and transmission lines. Others include the glare effect from the solar panels, and impacts on aesthetics and recreational opportunities.

In terms of the transformer cabins, staff must not remain within a certain distance from an electromagnetic source for more than four hours, in this case a distance of 2.62 m. Given that no prolonged human presence is anticipated in the area, the photovoltaic plant will not have a significant impact on the nearest receptors. As far as the glare effect is concerned, the major apprehension relates to air traffic controllers and pilots arriving at an airport on final approach; while the solar plant is located in the vicinity of an airport, solar panels have been designed to absorb light rather than reflect it, in order to maximize electricity generation. The project area is also a safe distance away from most of the existing and planned residential areas and other developments, and would therefore not interfere significantly on the communities in the vicinity.

7.3.6. Waste Management

Waste generated is likely to include empty storage containers and packaging, general litter, by-products of any vehicle maintenance (including petroleum products, coolants, degreasing agents, sediment, rubber particles, detergents), and other hazardous materials. All waste should be disposed of in line with the national waste management directives.

7.3.7. Social Impact

The construction and operation of the photovoltaic plant will have a positive impact on the socio-economic status of Katima Mulilo and its residents. This is due to the job opportunities that will be created both directly related to the plant operations and indirectly from supporting services; as well as the opportunities for skills development and on-site training. During the construction phase the required jobs will be higher but will scale down afterwards when operations commence and fewer people are needed on a permanent basis.

There will be a team employed permanently. They will be based on site fulfilling the following tasks:

- Security
- Site clearing (e.g. cutting of grass, etc.)
- Cleaning of solar panels and other equipment
- First level of technical maintenance

Furthermore, there will be one technician and one engineer in the central office in Windhoek

with the following tasks:

- Monitoring of system performance (24/7)
- Preventive maintenance
- Trouble shooting in emergency cases
- High level of routine maintenance

The establishment of the power plant will have a positive effect on the cost of energy in Katima Mulilo, although the direct cost benefits will only be determined by the off-take client, who in this case is the regional energy distributor NORED.

8. SUMMARY OF POTENTIAL IMPACTS

A summary of the significance of the potential impacts from the proposed project assessed above is included in **Table 7**. The **Tables 8 – 10** provide a summary of the mitigation measures proposed for the impacts.

Table 7: Overview of the significance of the potential impacts

Impacts	Negative		Positive		No Impact
	Short Term	Long Term	Short Term	Long Term	
Planning and Design Phase					
1. Surface and ground water	X				
2. Fauna and flora	X				
3. Existing infrastructure				X	
4. Traffic	X				
5. Visual	X				
Construction Phase					
6. Pressure on existing infrastructure	X				
7. Surface and groundwater	X				
8. Health, safety and security	X				
9. Air quality	X				
10. Noise	X				
11. Traffic	X				
12. Waste management	X				
13. Hazardous substances	X				
14. Social			X		
Operational Phase					
15. Environmental monitoring and evaluation		X			

Impacts	Negative		Positive		No Impact
	Short Term	Long Term	Short Term	Long Term	
16. Surface and ground water		X			
17. Air quality		X			
18. Noise		X			
19. Impact on human health		X			
20. Waste management		X			
21. Infrastructure				X	
22. Quality of life				X	

Table 8: Proposed mitigation measures for the planning and design phase

PLANNING AND DESIGN PHASE IMPACTS	
Impact	**Mitigation Measures**
Surface and Ground Water	• Appoint professional engineers to develop a detailed storm water management design as part of the infrastructure service provision of the development. • The service infrastructure should be designed and constructed by suitably qualified engineering professionals. • Develop and implement a preventative maintenance plan for the service infrastructure. • No dumping of waste products of any kind in or in close proximity to any water bodies. • Ensure that surface water accumulating on-site are channelled and captured through a proper storm water management system to be treated in an appropriate manner before disposal into the environment. • Wastewater should not be discharged directly into the environment. • Disposal of waste from the development should be properly managed.
Land Use	• Do not use herbicides to manage plant growth. • Introduce additional vegetation and landscaping to supplement lost vegetation. • Clearly demarcate or fence off the plant area to prevent unwanted movement of people and animals into the site.
Fauna and Flora	• Consult with the regional Forestry authority, to identify protected and important indigenous species. • Develop a tree removal program. • Apply for a tree harvesting permit from the regional Forestry department. • The proponent should also consider participating in an “off-set” scheme where trees are planted elsewhere in lieu of those that have been removed and cannot be transplanted. • It is t recommended that the proponent engages Nampower to allow them to follow the same route for their transmission line as the existing Nampower transmission line which extends from Zambezi substation to Katima Mulilo substation to minimize habitat degradation.
Existing Service Infrastructure	• Ensure professional design and construction of service infrastructure from qualified and registered engineers. • Ensure consultation and compliance with relevant authorities responsible for services, such as the Town Council, NAMPOWER, NORED and Namwater. • It is recommended that electricity demand for the operations be met with the same technology utilised in generation. • Designs and building materials should be as such to reduce dependency on artificial heating and cooling in order to limit the overall energy demand.

PLANNING AND DESIGN PHASE IMPACTS	
Impact	**Mitigation Measures**
	• Water saving mechanisms should be incorporated within the proposed development's design and plans in order to further reduce water demands. • Re-use of treated waste water should be considered wherever possible to reduce the consumption of potable water. • Train employees on the importance of water and energy savings. • Adhere to water quality guidelines in terms of The Water Act, 1956.
Traffic	• Ensure that road junctions have good sightlines. • Limit the type of vehicles to use the internal roads e.g., heavy trucks. • Adhere to the speed limit. • Implement traffic control measures where necessary.

Table 9: Proposed mitigation measures for the construction phase

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
Fauna and flora	• Prevent contractors from collecting wood, veld food, etc. during the construction phase. • Do not clear cut the entire development site, but rather keep the few individual shrubs not directly affecting the development as part of the landscaping. • Transplant removed vegetation where possible, or plant new trees in lieu of those that have been removed.
Pressure on existing infrastructure	• Educate workforce on water saving measures. • Ensure all potable water points are metered and regularly read. • Ensure that the workforce is provided with temporary toilets during the construction phase.
Surface and Ground Water	• It is recommended that construction takes place outside of the rainy season in order to limit flooding on site and to limit the risk of ground and surface water pollution. • No dumping of waste products of any kind in or in close proximity to water bodies. • Heavy construction vehicles should be kept out of any surface water bodies and the movement of construction vehicles should be limited where possible to the existing roads and tracks.

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
	• Ensure that oil/ fuel spillages from construction vehicles and machinery are minimised and that where these occur, that they are appropriately dealt with. • Drip trays must be placed underneath construction vehicles when not in use to contain all oil and spillages that might be leaking from these vehicles. • Contaminated runoff from the construction sites should be prevented from entering the surface and ground water bodies. • All materials on the construction site should be properly stored. • Disposal of waste from the site should be properly managed and taken to the Katima Mulilo landfill site. • Construction workers should be given ablution facilities at the construction site that are located at least 30 m away from any surface water and these should be regularly serviced. • Washing of personnel or any equipment should not be allowed on site. Should it be necessary to wash construction equipment this should be done at an area properly suited and prepared to receive and contain contaminated waters.
Health, Safety and Security	• Construction personnel should not overnight at the site, except for security personnel. • Ensure that all construction personnel are properly trained depending on the nature of their work. • Provide for first aid kit and properly trained personnel to apply first aid when necessary. • A wellness program should be initiated to raise awareness on health issues, especially the impact of sexually transmitted diseases and Covid-19. • Provide free condoms in the workplace throughout the construction phase. • Facilitate access to Antiretroviral medication for construction personnel. • Restrict unauthorised access to the site and implement access control measures. • Clearly demarcate the construction site boundaries along with signage of no unauthorised access. • Clearly demarcate dangerous areas and no-go areas on site. • Staff and visitors to the site must be fully aware of all health and safety measures and emergency procedures. • The contractor/s must comply with all applicable occupational health and safety requirements. The workforce should be provided with all necessary Personal Protective Equipment where appropriate.
Air quality	• All loose material should be kept on site for the shortest possible time.

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
	• It is recommended that dust suppressants such as Dustex be applied to all the construction clearing activities to minimise dust. • Construction vehicles to only use designated roads. • During high wind conditions the contractor must make the decision to cease works until the wind has calmed down. • Cover any stockpiles with relevant cover material to minimise windblown dust. • Ensure construction vehicles are well maintained to prevent excessive emission of smoke.
Noise	• No amplified music should be allowed on site. • Inform neighbouring communities of construction activities to commence and provide for continuous communication between them and contractor. • Limit construction times to acceptable daylight hours. • Install technology such as silencers on construction machinery. • Do not allow the use of horns/hooters as a general communication tool, but use it only where necessary as a safety measure. • Provide protective equipment such as ear muffs and ear plugs to workers.
Traffic	• Limit and control the number of access points to the site. • Ensure that road junctions have good sightlines. • Construction vehicles' need to be in a road worthy condition and maintained throughout the construction phase. • Transport the materials in the least number of trips as possible. • Adhere to the speed limit. • Implement traffic control measures where necessary. • Minimise the movement of heavy vehicles during peak time.
Waste Management	• It is recommended that waste from the temporary toilets be disposed of at the Katima Mulilo Wastewater Treatment Works, on a regular basis. • A sufficient number of waste bins should be placed around the site for the soft refuse. • A sufficient number of skip containers for the heavy waste and rubble should be provided for around the site. • The waste containers should be able to be closed to prevent birds and other animals from scavenging.

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
	• Solid waste will be collected and disposed of at an appropriate local landfill in Katima Mulilo, in consultation with the local authority.
Hazardous Substances	• All chemicals and other hazardous substances must be stored and maintained in accordance with the Hazardous Substances Ordinance (No. 14 of 1974), with all relevant licences and permits to be obtained where applicable. • Given the potential harm to human health during handling and use of any of hazardous substances it is essential that all staff be trained with regards to the proper handling of these substances as well as First Aid in the case of spillage or intoxication. • Storage areas for all substances should be bunded and capable to hold 120% of the total volume of a given substance stored on site.
Social	• Ensure locals enjoy priority in terms of job opportunities, to the extent possible, for skills that are available locally. • Ensure local procurement where commodities are available locally.

Table 10: Proposed mitigation measures for the operational phase

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Environmental monitoring and Evaluation	• An Environmental Practitioner should monitor the implementation of the EMP, and recommend any changes to this document when necessary. • The Environmental Practitioner should inspect the site on a regular basis (preferably monthly or bi-monthly). • Biannual reports are to be submitted to the Environmental Commissioner.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Surface and Ground Water	• A no-go buffer area of at least 30 m should be allocated to any water bodies in the area. • No dumping of waste products of any kind in or in close proximity to any water bodies. • Contaminated runoff from the various operational activities should be prevented from entering any water bodies. • Should it be necessary to wash equipment such as panels, wastewater should be prevented from contaminating ground or any surface water sources. • Ensure that surface water accumulating on-site are channelled and captured through a proper storm water management system to be treated in an appropriate manner before disposal into the environment. • Wastewater should not be discharged directly into the environment. • Disposal of waste from the development should be properly managed and taken to the relevant disposal facilities. • Bi-annual monitoring of erosion especially in the vicinity of PV arrays should be conducted regularly to ensure erosion sites can be identified and remedied early enough. • Ensure that oil/ fuel spillages from vehicles and machinery are minimised and that where these occur, that they are appropriately dealt with. • Ensure regular inspections and maintenance of equipment. • All materials on the site should be properly stored. • Disposal of waste from the site should be properly managed and taken to an approved landfill site. • Ablution facilities at the site should not allow any possible contact with ground water resources. These facilities should be regularly serviced. • Site equipment should be refueled in paved areas with a collection point in case of any spillage. • The service infrastructure should be designed and constructed by suitably qualified engineering professionals. • Develop and implement a preventative maintenance plan for the service infrastructure.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Visual and Sense of Place	• It is recommended that more 'green' technologies be implemented within the architectural designs and building materials of the development where possible in order to minimise the visual prominence of such a development within the more natural surrounding landscape. • Natural colours and building materials such as wood and stone should be incorporated.
Noise	• Limit the types of activities that generate excessive noise. • All areas where noise levels are above 85 dB should be managed and controlled in accordance with the relevant guidelines. • Continuous monitoring of noise levels should be conducted to make sure the noise levels do not exceed acceptable limits. • Maintain equipment used during the operation and keep them in a good state such that they do not emit excessive noise. • No activity having a potential noise impact should be allowed after 18:00 if possible.
Impact on human health	• Prolonged exposure in the vicinity of transformers should not exceed 1 hour at a distance of not less than 2.62 m. • The prescribed servitudes to be observed.
Air quality	• The plant operation itself is not expected to give off dust or emissions as compared to the fossil fuel-based electricity generation plants, which emit greenhouse gases and other noxious gases.
Waste management	• The area will be kept free of waste, except in designated waste storage areas. Any wastes distributed by winds will be regularly cleaned up. • A sufficient number of waste bins should be placed around the site for the soft refuse. • A sufficient number of skip containers for the heavy waste and rubble should be provided for around the site. • Solid waste will be collected and disposed of at an appropriate local land fill. • Place priority on waste reduction, waste reuse and waste recycling, in that order.
Quality of life	• Ensure locals enjoy priority in terms of job opportunities, for skills that are available locally, to the extent possible. • Ensure local procurement where commodities are available locally.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Infrastructure development	• Ensure that the infrastructure is designed and supervised by suitably qualified engineering professionals.

8.1. Decommissioning

At the end of its useful life, the plant will be completely dismantled so as to restore the area to *ante operam* conditions. Each production unit will be uninstalled; therefore the following waste will be produced:

- Panels: aluminium, glass, cells and polymer waste;
- Electricity lines: copper and metallic elements;
- Pipes;
- Supporting structures: metallic elements;

Unless these materials are disposed of properly, they can cause irreversible damage to the environment (surface and underground water, vegetation and animals), as well as to human health due to pollution of aquifers for example, and the deterioration of environmental conditions.

A full decommissioning plan should be developed within the first 24 months of operation; however, the following management actions are recommended as a minimum:

- Reusable, recyclable and scrapable components will be selected.
  - Disposal will consist of disassembling the modules and sending them to a suitable recycling platform which will carry out the following recovery work:
    - recovery of aluminium frames;
    - recovery of glass material;
    - recovery of cells;
    - decommissioning of the polymer material covering the cells.
  - The electricity lines of all the systems such as lighting will be removed by carrying out only the absolute necessary excavation work.
  - Copper from electricity cables and windings as well as other metallic parts will be sent to specialised centres for recovery and recycling.
  - Appliances such as inverters, control panels and transformers will be disassembled and sent to specialised companies for disposal.
  - Piping and electrical drawpits will be removed by excavating a set size excavation and the original situation will be restored using the excavated material.

- The exposed parts of the photovoltaic module supporting structures will be removed mechanically, whereas the foundation piles sunk into the ground will be extracted.

9. CONCLUSION AND RECOMMENDATIONS

9.1. Construction Phase Impacts

With reference to **Table 9**, most of the construction phase impacts were deemed to have a negative impact without mitigation. However, these were mostly short-term and can be significantly reduced with the mitigation measures proposed.

9.2. Operational Phase

During the operational phase the impacts of surface and ground water; air quality; noise; and solid waste were assessed to have a long-term negative effect without mitigation. The impacts will however be significantly reduced when the recommended mitigation measures in the scoping report and environmental management plan (EMP) are implemented.

The impacts on the quality of life of the residents and on the infrastructure, development is deemed to be high positive. This development is not only important to provide electricity to the Zambezi Region, but it also promotes local economic development.

9.3. Level of Confidence in Assessment

With reference to the information available at this stage, the confidence in the environmental assessment undertaken is regarded as being acceptable for decision-making, in terms of the environmental impacts and risks. The Environmental Assessment Practitioner believes that the information contained within this ESR is adequate to allow MEFT: DEA to determine the environmental viability of the proposed project.

It is acknowledged that the project details may evolve during the detailed design and construction phases. However, these are unlikely to change the overall environmental acceptability of the proposed project and any significant deviation from what was assessed in this ESR should be subject to further assessment. If this was to occur, an amendment to the Environmental Authorisation may be required in which case the prescribed process would be followed.

9.4. Mitigation Measures

With the implementation of the recommended mitigation measures in this report as well as in the EMP, the significance of the planning and design, construction and operational phase impacts is likely to be reduced to a ***Low (negative)***. It is further extremely important to include an Environmental Control Officer (ECO) on site during the construction phase of the proposed project to ensure that all the mitigation measures discussed in this report and the EMP are enforced.

It is strongly advised that the proponent appoint suitably qualified professionals to design and supervise the construction of the services and other infrastructure. It is also advised to develop

and implement a preventative maintenance plan, which shall be monitored and evaluated regularly.

It is noted that where appropriate, these mitigation measures and any others identified by the EC could be enforced as Conditions of Approval in the Environmental Authorisation.

9.5. Opinion with respect to the Environmental Authorisation

Regulation 15(j) of the EMA, requires *that the EAP include an opinion as to whether the listed activity must be authorised and if the opinion is that it must be authorised, any condition that must be made in respect of that authorisation*.

Solar powered electricity generation is experiencing rapid growth. A major motivation for deploying solar power is to reduce emissions of carbon dioxide caused by traditional power generation (Turney & Fthenakis, 2011) for the same quantity of energy produced. The size of land required by the photovoltaic plant is less than what would be required by a fossil fuel-based power plant of the same capacity. Photovoltaic power plant impacts are reversible in the short-term because after decommissioning, the area can be returned to its previous state and become available for other activities. In addition to producing clean energy the power plant can contribute to the promotion of biodiversity, by providing a refuge for plants and animals, in particular smaller animals such as invertebrates.

Another advantage of a photovoltaic power plant over the conventional power plant is that as the lifetime of the solar power plant gets longer, the land transformation per capacity does not change, even when considering the impacts on land use. All high priority impacts are in favour of solar power displacing traditional power generation while all the harmful impacts from solar power are of low priority (Turney & Fthenakis, 2011).

Based on the evidence produced during the assessment process, it is very unlikely that this project will have any significant negative impacts on the environment. It is therefore recommended that a clearance certificate be issued for the project.

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