EIA REPORT

Proposed Construction of an 18MW Solar Power Plant on Lease 16 of Farm 38, Walvis Bay, Erongo Region

Environam Consultants Trading (ECT)

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ANNEXURES

Annexure A: Proof of site notices/ posters
Annexure B: Proof of advertisements
Annexure C: Photo Plates
Annexure D: Public Participation process
1) I&AP database & Registered List
2) Notification sent of BID
3) Comments received (Phase 1)

Annexure E: Curriculum Vitae of Environmental Assessment Practitioner
Annexure F: Environmental Management Plan

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 Euarestos Asset Management, the proponent, has embarked on this opportunity to contribute towards energy self-sufficiency and efficiency by constructing an 18MW Solar Power Plant at a portion of Farm 38 in the town of Walvis Bay in the Erongo Region. The Municipality of Walvis Bay has allocated the proponent a 29 ha portion of Farm 38 for this purpose.

The above activity is discussed in more detail in Chapter 4. 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 site is located on a portion of Farm 38 in the Rooikop area of Walvis Bay in Erongo Region, south of the C14 Main Road. It is also otherwise identified as Lease No.16 of the Farm No.38. The site is found on the south-east of Walvis Bay town, wedged between Farms 19, 29,33 and 37, Farm 19 accommodates the Walvis Bay International Airport. A portion of approximately 29 hectares of the Farm 38 has been earmarked for this development. The general area is partly developed with industrial infrastructure and is earmarked for further industrial developments, whereas the particular site is largely undeveloped.

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. **Table 2** provides a summary of the legal framework considered to be relevant to this development and the environmental assessment process.

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 consist of water supply, sewage and drainage systems, solid waste management and landscaping.

An existing Namwater pipeline runs to the west of 29 ha portion of Farm 38 across the centre of the total extent of Farm 38. 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 Municipality and other relevant authorities such as Namwater and Erongo Red.

Access to the site will be obtained from the D1983 Road off the Main Road C14. 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. Please see **Table 4** for the activities undertaken as part of the public participation process.

A public meeting would normally be held as part of the public consultation process, however due to the restrictions brought about as a result of the Covid-19 pandemic this was not possible. The comment period of the initial public participation process commenced on **04 June 2020** and ended on **18 June 2020.**

The second phase of the Public Consultation Process involved 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 **23 October 2020** 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;

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;
- Social; and
- Visual impact.

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).

It is against this background that Euarestos Asset Management, the proponent, has embarked on this opportunity to contribute towards energy self-sufficiency and efficiency by constructing an 18MW Solar Power Plant on a Portion of Farm 38 in the town of Walvis Bay in the Erongo Region. It is otherwise also identified as Lease No.16 of the Farm No.38. The Municipality of Walvis Bay has allocated the proponent a leasehold of 29 ha on a portion of Farm 38 for this purpose.

The above activity is discussed in more detail in Chapter 4. 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.

1.2 Project Location

The proposed site is located on Lease 16 of Farm 38 in the Rooikop area of Walvis Bay in Erongo Region, south of the C14 Main Road. The site is found on the south-east of Walvis Bay town, wedged between Farms 19, 29,33 and 37, Farm 19 accommodates the Walvis Bay International Airport. A portion of approximately 29 hectares of the farm has been earmarked for this development. The general area is partly developed with industrial infrastructure and is

earmarked for further industrial developments, whereas the particular site is largely undeveloped. See **Figures 1 to 5** below for the locality maps of Walvis Bay and Farm 38.

Figure 1: Locality map of Walvis Bay

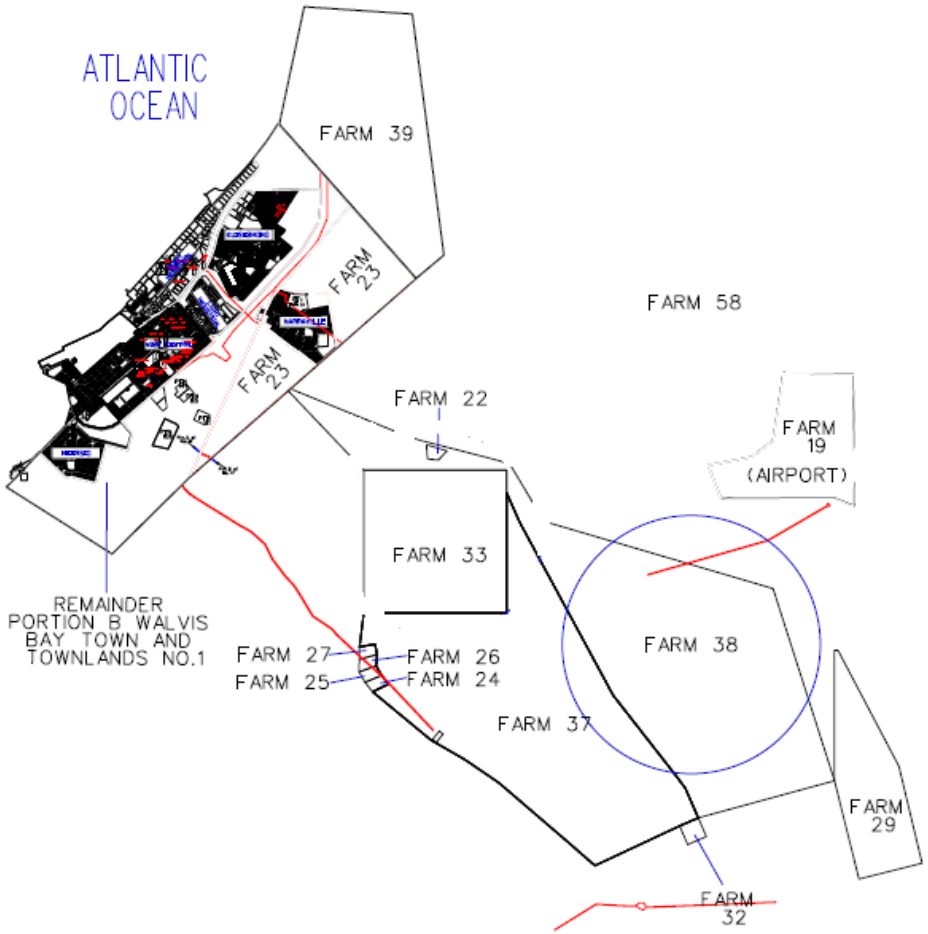

Figure 2: Locality map of the proposed development

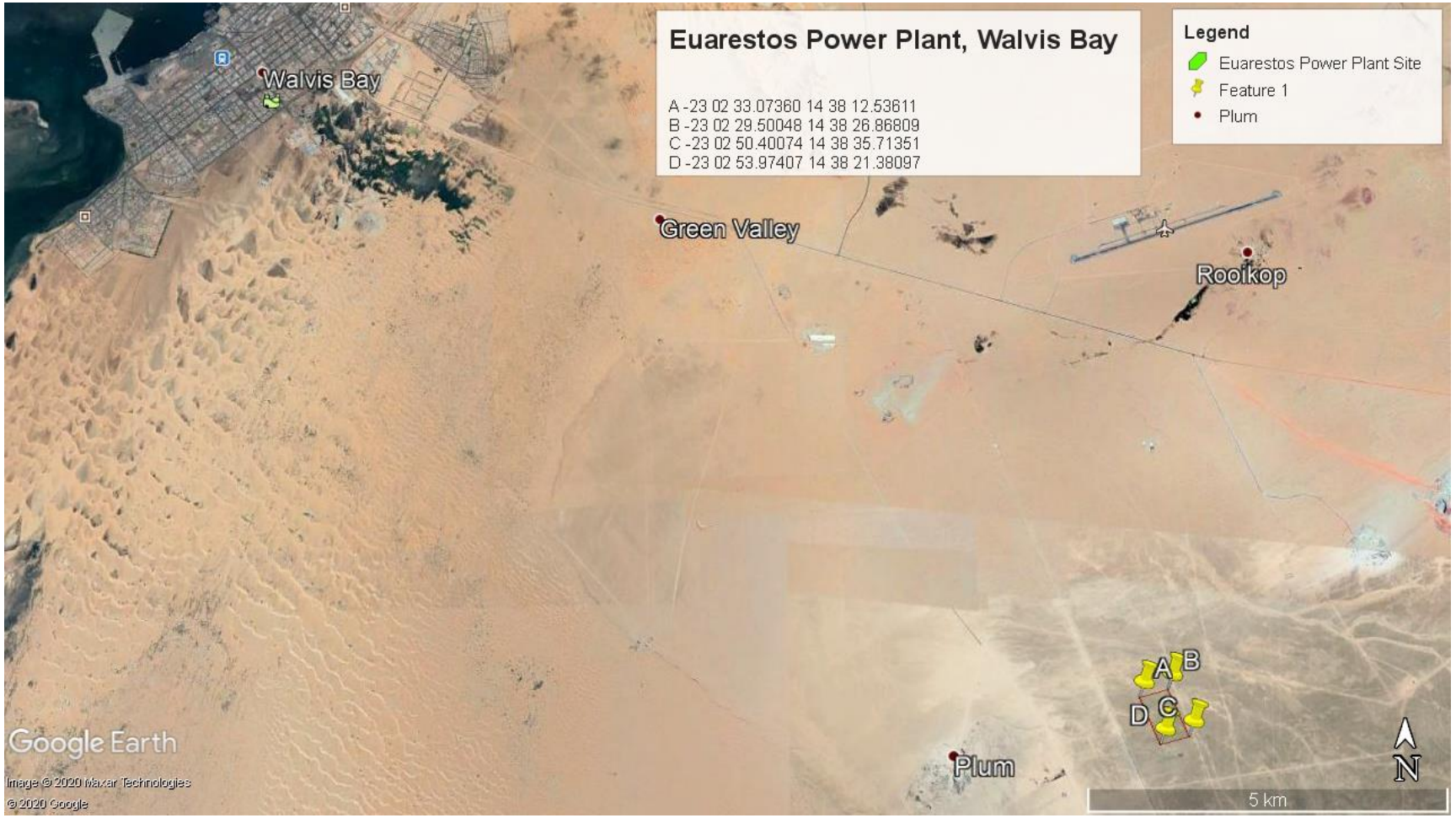

Figure 3: Google map of the proposed development

Figure 4: Google map of the Solar Plant Site

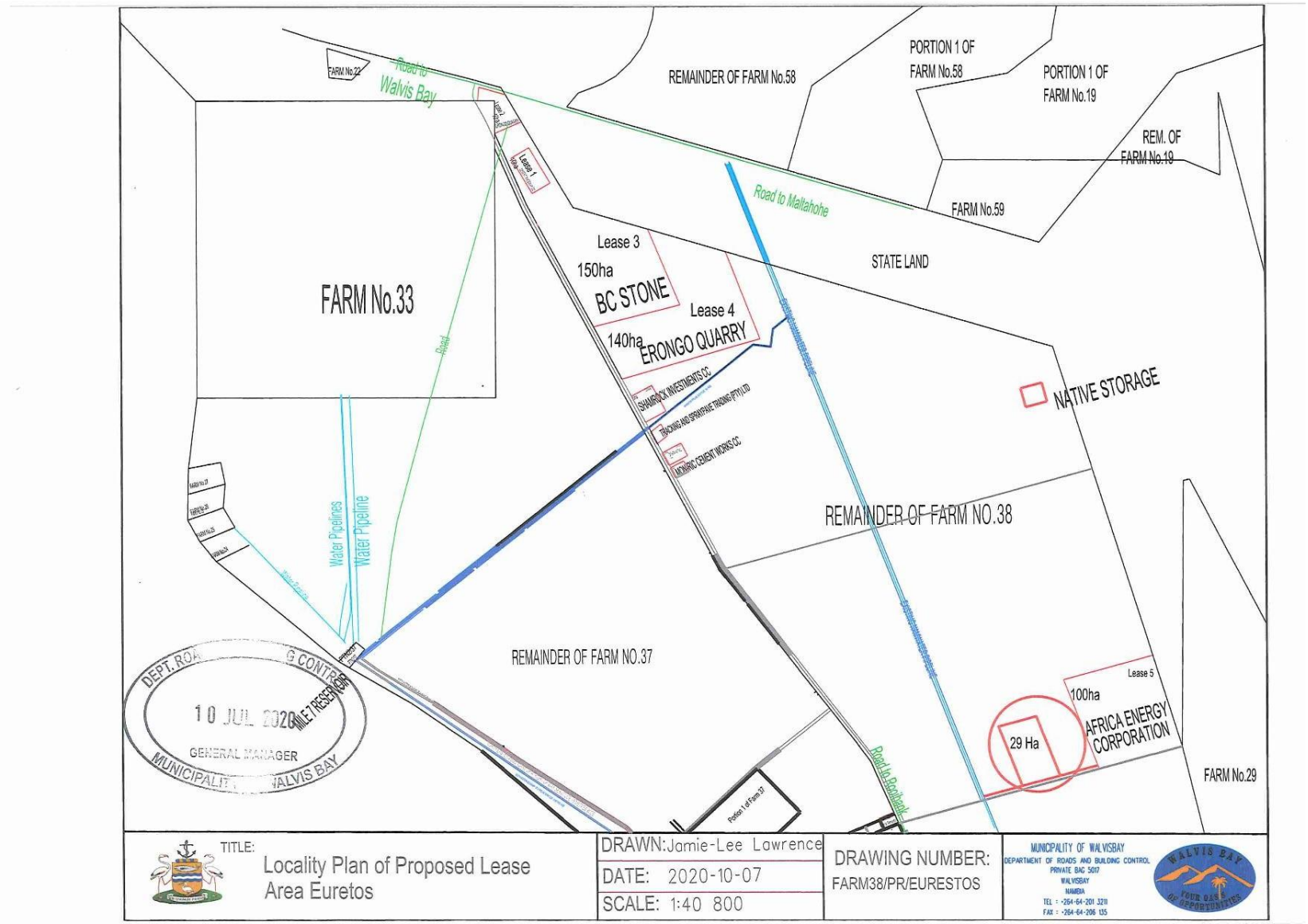

Figure 5: Locality plan of the development

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 an 18MW Solar Power Plant on Farm 38, Walvis Bay 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 Walvis Bay. 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. Sections 34-47 make provision for the aspects of water and sewerage.	The development has to be 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.
Walvis Bay 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.	Farm 38 is zoned as "Undetermined" in terms of the Walvis Bay Town Planning Scheme.

This EIA process will be undertaken in accordance with the EIA Regulations. A Flow Diagram (refer to **Figure 6** below) provides an outline of the EIA process to be followed.

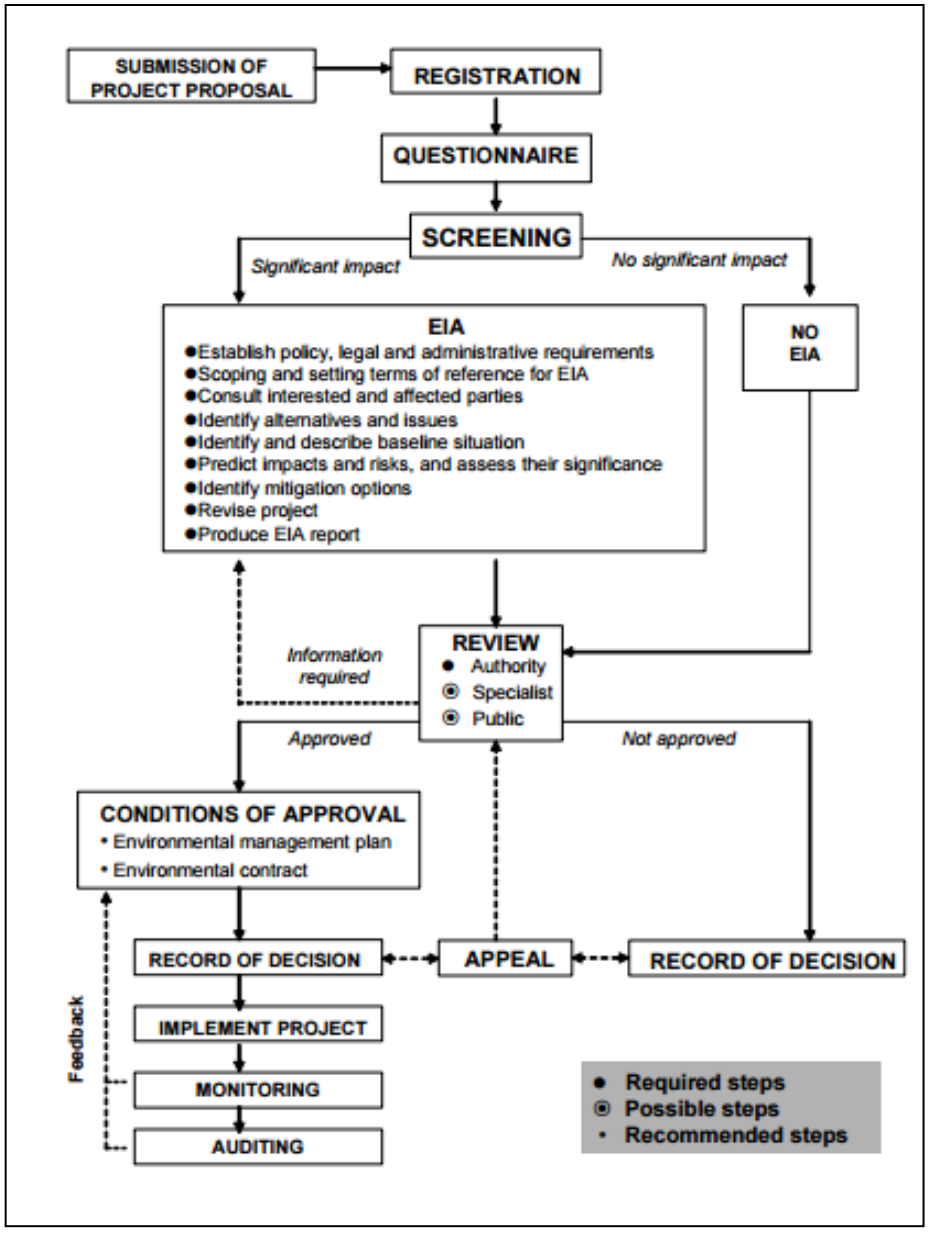

Figure 6: EIA Flowchart for Namibia (SELH, 2012)

2. ENVIRONMENTAL BASELINE DESCRIPTION

2.1. Social Environment

2.1.1. Socio-Economic Context

The statistics shown in **Table 3** below are derived from the 2011 Namibia Population and Housing Census (NSA, 2011):

Table 3: Statistics of Walvis Bay Urban Constituency

WALVIS BAY URBAN CONSTITUENCY	
Population	35,828
Females	16,478
Males	19,350
Private Households	10,317
Population under 5 years	10%
Population aged 5 to 14 years	14%
Population aged 15 to 59 years	72%
Population aged 60 years and above	
Female: male ratio	100:117
Literacy rate of 15 years old and above	99%
Head of household - Females	33%
Head of household - Males	67%
People above 15 years who have never attended school	3%
People above 15 years who are currently attending school	9%
People above 15 years who have left school	86%
People with disability	2%
People aged 15 years and up who belong to the labour force	81%
Population employed	73%
Homemakers	12%
Students	47%
Retired, too old etc.	40%
Income from pension	2%
Income from business and non-farming activities	9%
Income from farming	0%
Income from cash remittance	5%
Wages and salaries	80%

2.1.2. Archaeological and Heritage Context

While many archaeological sites have been found along the Namibian coast and some sites provide evidence of coastal occupation for a long time, many of these are considered "lucky finds" since the chances of artefacts surviving long and then being found are obviously small. As a result, the number of known archaeological sites with very old artefacts is few (Raison, 2016). 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. Climate

Walvis Bay is considered to have a desert climate. During the year, there is virtually no rainfall. The Köppen-Geiger climate classification is BWk. In Walvis Bay, the average annual temperature is 16.6 °C. In a year, the average rainfall is 11 mm. The least amount of rainfall occurs in May. Most precipitation falls in March, with an average of 5 mm. The temperatures are highest on average in February, at around 19.2 °C. In September, the average temperature is 13.7 °C. It is the lowest average temperature of the whole year (Climate-data, 2019). See **Figure 7** for an average temperature graph and **Figure 8** for an average rainfall data for Walvis Bay.

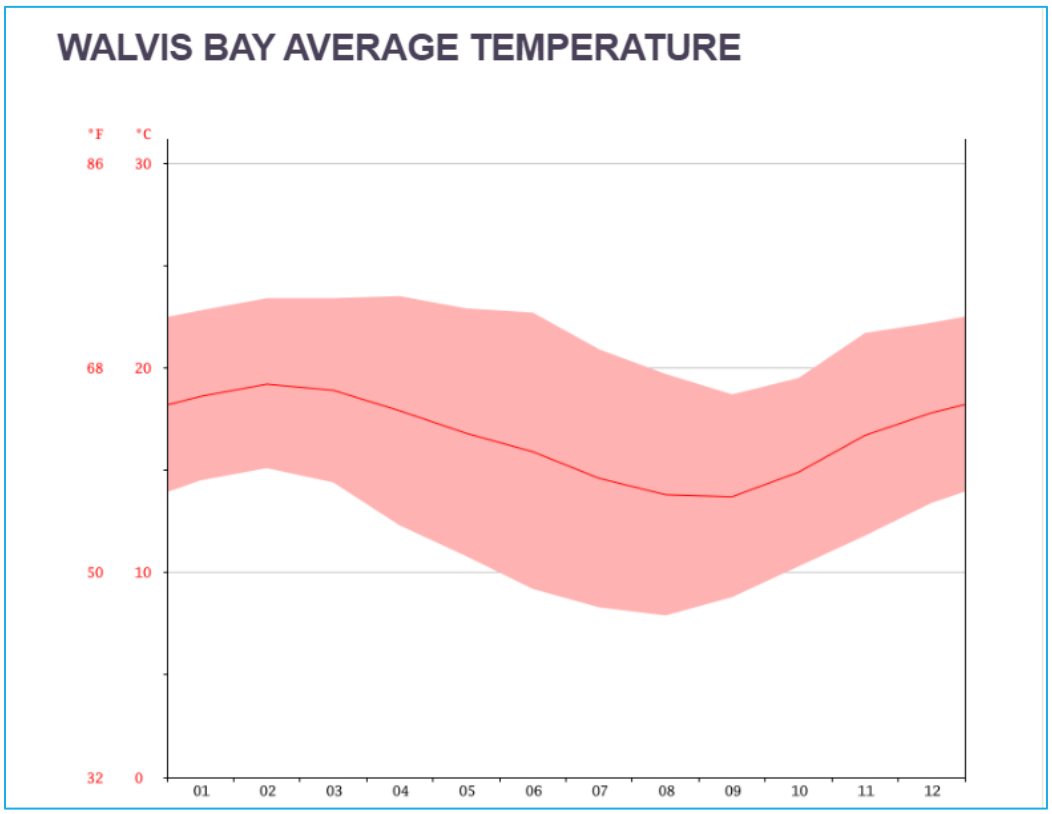

Figure 7: Average temperature graph for Walvis Bay (Climate-data, 2020a)

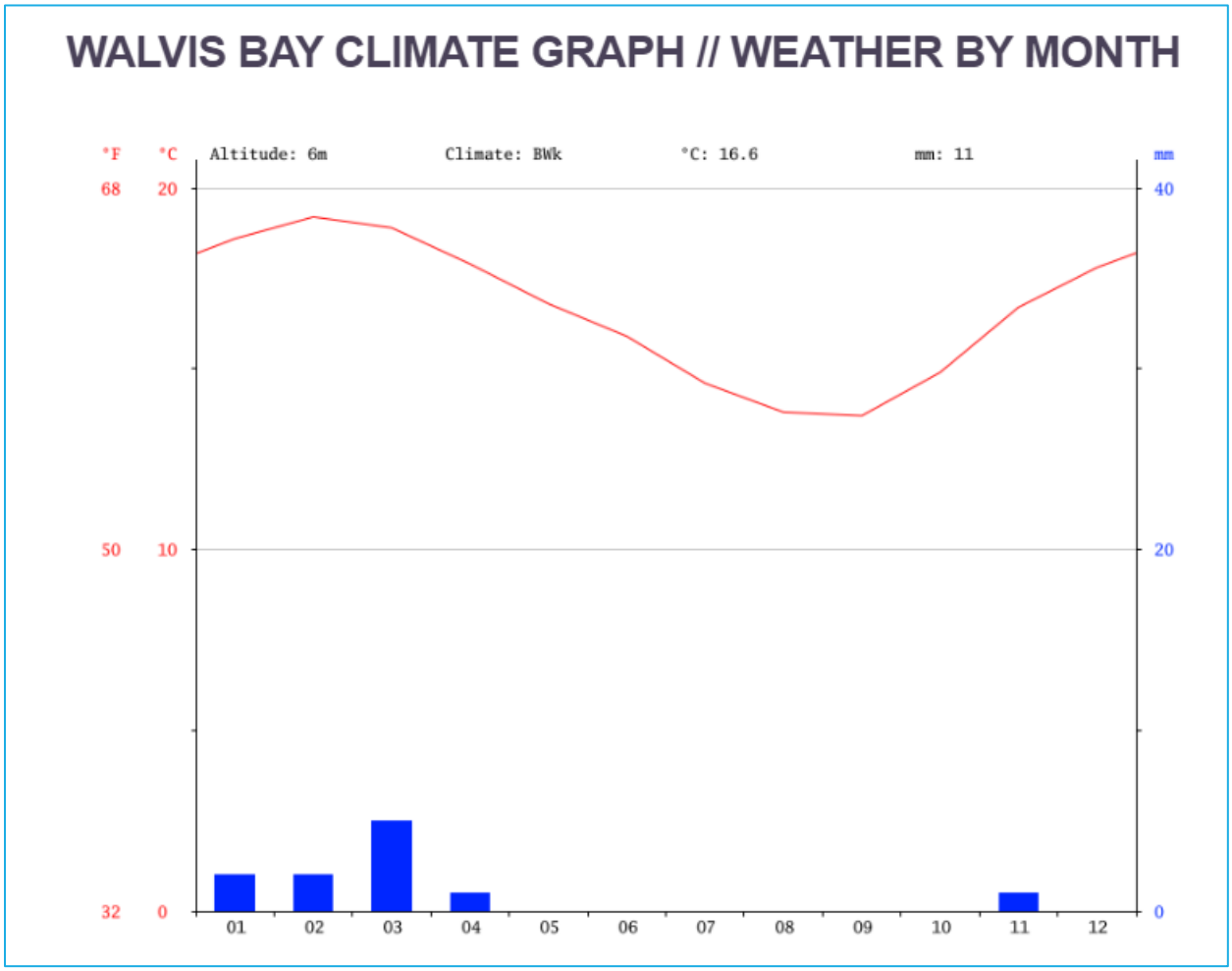

Figure 8: Average monthly rainfall graph for Walvis Bay (Climate-data, 2020b)

2.2.2. Topography, Geology and Hydrogeology

The Erongo Region, stretches from the Central Plateau westwards across the Central-Western Plains and Escarpment to the Central Namibian coast roughly over a distance between 200 and 350 km, and Northwards from the Ugab River in the north to the Kuiseb river in the south over a distance of up to 300 km, covers an area of 63,586 km^2, which is 7.7 per cent of Namibia's total area of about 823,680 km^2. On the Western side it is flanked by the Atlantic Ocean. Erosion cutting eastwards into the higher ground led to the formation of the Central-Western Plains, leading to the formation of the catchment area of several major ephemeral rivers such as the Khan, Omaruru, Swakop and Ugab, the water of these rivers reach the sea when in full flood during a good rainy season (ERC, 2020).

The Southern boundary of the Kuiseb River distinctively divides the gravel plains to the North and the large sea of dunes to the South, however this river does not reach the sea during times of flood but the water instead disappears into the sand at the Kuiseb Delta, from which the town of Walvis Bay extracts underground water for its supplies.

In the Erongo Region, the land rises steadily from sea level to about 1,000 m across the breadth of the Namib. The Namib land surface is mostly flat to undulating gravel plains, punctuated with occasional ridges and isolated 'inselberg' hills and mountains. The eastern edge of the Namib is marked by the base of the escarpment in the southern part of the region. In the northern part, the escarpment is mostly absent and there is a gradual rise in altitude to over 1,500 m (SAIEA, 2011). The proposed site on which the development will be undertaken can be described as relatively flat.

The desert geology consists of sand seas near the coast, while further inland there is an occurrence of gravel plains and scattered mountain outcrops. Some of the highest sand dunes, up to around 300 m high, can be found here (ERC, 2020). Water for domestic and industrial use in Walvis Bay comes maily from the Kuiseb aquifer in the lower Kuiseb River. These aquifers are recharged by runoff from the central highlands in central Namibia where rainfall is more reliable and more significant than at the coast (Nacoma, 2010). The site earmarked for development is relatively flat with little to no vegetation across the area.

2.2.3. Terrestrial Ecology

The bare gravel plains within an area of about 40 km of the coast, receive frequent fog moisture providing an ideal home to rich growths of lichens, many of which are endemic to Namibia. Lichen help to bind the soil rendering it less vulnerable to wind erosion, they do this by forming a "carpet" on the surface pavement of small stones and gravel, or by creating a surface crust on the soil (Nacoma, 2010). No significant amount of vegetation could be found on the proposed sites which is bare for the most part.

Some endemic coastal invertebrates and reptiles inhabit a narrow belt of dune hummocks within the Namibian coastal strip. This zone also supports marine life and surf zone species. Damara terns, which are near endemic to Namibia and near threatened, are found in concentrated numbers along the coastline stretching from south of Walvis Bay to about the Ugab river, where they nest on gravel plains within 3 – 5 km of the shore and forage over the shallow Bay water, over reefs or in salt ponds (Nacoma, 2010).

There are artificially high densities of jackals and gulls due to the increase in numbers of seal colonies and line fishermen which apply heavy predator pressure on the nesting terns. The central Namib coast is also home to the two vulnerable flamingo species, the greater and the lesser (Nacoma, 2010). There are no protected or red data listed plants or animal species found on the site. **Figure 9** below provides a view of the general area and surrounds of the proposed development site.

Figure 9: General area of the proposed development site.

2.3. Surrounding Land Use

The proposed site is mostly surrounded by undeveloped land that is earmarked for further Industrial developments. Farm 19 to the North-west is where the Walvis Bay International Airport is found. The Remainder of Farm 38 has a number of properties allocated to various industrial investors such as BC Stone and Erongo Quarry, which are active and others such as Shamrock Investments, Native Storage, Monric Cement Works etc. which are at various stages of development. A residential development is planned approximately 6km to the northwest of Farm 38, on a Portion of Farm 37.

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 consist of water supply, sewage and drainage systems, solid waste management and landscaping.

An existing Namwater pipeline runs to the west of 29 ha portion of Farm 38 across the centre of the total extent of Farm 38. 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 Municipality and other relevant authorities such as Namwater and Erongo Red.

Access to the site will be obtained from the D1983 Road off the Main Road C14. 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 18MW Solar Power Plant on a portion of Farm 38, Rooikop, Walvis Bay, Erongo Region. It is otherwise identified as Lease No.16 of the Farm No.38. The Photovoltaic (PV) plant will consist of sub-systems that will be connected to 12 transformer stations. These sub-systems will be of a fixed structure with an optimum tilt and with 2,693 strings of 17 PV modules in series. In total, the installed and AC power will be 19MWp and the contracted capacity will be 18MWp. The specific yield is at 2,013kWh/kWp/year with an annual production of 38,235MWh. The development will include the installation of inverters that will convert the direct current output of the photovoltaic solar panels into alternating current which can be fed into the grid. Transmission cables will also be laid for the bulk transfer of the electricity from the generating power plant to the electrical substation

Orientation is a critical factor in the design of PV plants so as to maximize the efficiency of the solar installation. In this instance a landscape array has been found to be most suitable to avoid the possibility of shading loss in a portion of the module which can stop the generation of power. The PV plant will be located on a flat terrain with no mountains or other high objects around that could create shadows over the panels. The Polycrystalline Solar Cell Modules to be applied during this project are expected to guarantee a nominal power output of at least 83.67% of the labelled power output during the first year with nominal power decline of less than 0.7% for the subsequent years up to 25 years. In total the nominal output by the end of the 25th year should be at least 80.7% of the labelled power output.

3.2. Decision Factors

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

- Walvis Bay Town Planning Scheme.
- Character of the general area.

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 4** below for the activities undertaken as part of the public participation process.

Table 4: Table of Public Consultation Activities

ACTIVITY	REMARKS
Placement of site notices/posters in Walvis Bay	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**

A public meeting would normally be held as part of the public consultation process, however due to the restrictions brought about as a result of the Covid-19 pandemic this was not possible. The comment period of the initial public participation process commenced on **04 June 2020** and ended on **18 June 2020.**

4.2. Public Consultation Process Phase 2

The second phase of the Public Consultation Process involved 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 **23 October 2020** 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 5**.

Table 5: 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
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	**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.

CRITERIA	CATEGORY
combination of the above criteria.	**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 10** 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 10: 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; and traffic.

7.1.1. Surface and Groundwater

While Walvis Bay is a coastal town, the proposed development site is located not less than 18km from the shoreline, this does however puts 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 Industrial developments, the portion earmarked for the construction of the solar power plant is relatively undeveloped with a negligent cover of vegetation or faunal habitat. Solar power plants require a large piece of land for setting up the modules and the related equipment such as inverters, this result 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 are 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 general area is sparsely populated with flora, and not much vegetation visible. The existing vegetation is more characteristic and typical of a coastal environment, in particular the Kuntze's brownanthus bushes are found in the general area, but the proposed area is open with no vegetation visible. The proposed development areas and associated infrastructure would be relatively small and thus only have localised negative implications on the environment and associated fauna and flora. The overall impact on the local fauna and flora and associated habitat would be relatively small. The general area is by no means pristine with various anthropogenic influences having affected the area over an extended period.

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 Farm 38 and surrounds, 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 per 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.

7.2. Construction Phase Impacts

During the construction phase the following potential impacts have been identified: fauna and flora; 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. Flora and Fauna

There are no protected or red data listed plants or animal species found on the site however care should be taken that no risk is posed to the adjacent marine ecosystem, including seabirds, that may be found in the area during the construction phase.

7.2.2. 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.

7.2.3. 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.

7.2.4. 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 Walvis Bay 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

7.2.5. 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. Due to the proximity of the development site to the C14 Main Road as well as to the D1983, traffic

on these roads is also at risk of being impacted by dust. 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 project area is a safe distance away from the nearest and planned residential areas and other developments, and dust would therefore not interfere significantly on the community during the short-term construction phase

7.2.6. 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 residential areas and other developments, and would therefore not interfere significantly on the community during the short-term construction phase.

7.2.7. 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. Traffic moving along the adjacent C14 Main Road as well as to the D1983 may be impacted the most during this phase.

7.2.8. 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 off at the designated landfill site of Walvis Bay as approved by the local authority.

7.2.9. 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.

7.2.10. 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 Walvis Bay. 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; social; and visual impact.

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

7.3.8. Visual and Sense of Place Impacts

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

8. SUMMARY OF POTENTIAL IMPACTS

A summary of the significance of the potential impacts from the proposed project assessed above is included in **Table 6**. The **Tables 7 – 9** provide a summary of the mitigation measures proposed for the impacts.

Table 6: Overview of potential impacts

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

18. Noise		X			
19. Impact on human health					
20. Waste management		X			
21. Infrastructure				X	
22. Quality of life				X	
23. Visual				X	

Table 7: Proposed mitigation measures for the planning and design phase

PLANNING AND DESIGN 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.
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	• Maintain the small shrubs found on the site and only remove vegetation that has an impact on the development. • 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	• Adapt the proposed development to the local environment – e.g. small adjustments to the site layout to avoid potential features such as existing vegetation. • Plant local indigenous species of flora as part of the landscaping as these species would require less maintenance than exotic species. • Prevent the introduction of potentially invasive alien ornamental plant species such as; Lantana, Opuntia, Prosopis, Tecoma, etc. as part of the landscaping as these species could infestate the area further over time.
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 Municipality, Erongo Red and Namwater.

PLANNING AND DESIGN PHASE IMPACTS	
Impact	**Mitigation Measures**
	• 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. • 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 8: 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 individuals 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	

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
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. • 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 Walvis Bay 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 a first aid kit and a 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. • Conform to the stipulated protocols related to Covid-19. • Restrict unauthorised access to the site and implement access control measures. • Clearly demarcate the construction site boundaries along with signage of no unauthorised access.

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
	• 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. • 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 plastic 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. • Plan construction around the school programme to minimise disruptions of the school activities.
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 amount of trips as possible. • Adhere to the speed limit. • Implement traffic control measures where necessary.

CONSTRUCTION PHASE IMPACTS	
Impact	**Mitigation Measures**
	• Minimise the movement of heavy vehicles during peak time. • Minimise the movement of vehicles on or close to the C14 Main Road as well as to the D1983.
Waste Management	• It is recommended that waste from the temporary toilets be disposed of at the Walvis Bay 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. • Solid waste will be collected and disposed off at an appropriate local landfill in Walvis Bay, 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 9: Proposed mitigation measures for the operational phase

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Surface and Ground	• A no-go buffer area of at least 30 m should be allocated to any water bodies in the area.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
Water	• 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.
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.

OPERATIONAL PHASE IMPACTS	
Impact	**Mitigation Measures**
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. • Placing the transmission line underground as opposed to overhead.
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 off 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.
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. Because each production unit will be uninstalled, 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 8**, 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 are deemed to be high positive. This development is not only important to provide electricity to the Erongo 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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