

**ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT ENVIRONMENTAL IMPACT REPORT**

**PROPOSED GIHON SOLAR ENERGY FACILITY NEAR
BELA-BELA, LIMPOPO PROVINCE
DEA Ref. No: 14/12/16/3/3/2/576**

**DRAFT FOR PUBLIC REVIEW
28 February 2014- 30 March 2014**

Prepared for:

Networx Renewables (Pty) Ltd
20 The Piazza, 2nd Floor
Melrose Arch
2076 Johannesburg
South Africa

Prepared by:

Savannah Environmental Pty Ltd

BLOCK 2, FIRST FLOOR
5 WOODLANDS DRIVE OFFICE PARK,
CORNER WOODLANDS DRIVE & WESTERN
SERVICE ROAD, WOODMEAD, GAUTENG
PO BOX 148, SUNNINGHILL, 2157
TEL: +27 (0)11656 3237
FAX: +27 (0)86 684 0547
E-MAIL: INFO@SAVANNAHSA.COM
WWW.SAVANNAHSA.COM



PROJECT DETAILS

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Authors	: Savannah Environmental (Pty) Ltd Steven Ingle Karen Jodas
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Province for Networx Renewables (Pty) Ltd

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PURPOSE OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Networx Renewables (Pty) Ltd (hereafter referred to as Networx) an Independent Power Producer (IPP), is proposing the establishment of a commercial solar electricity generating facility and associated infrastructure on Portions 1, 2, 5 and 7 of the farm Turfbult 494 KR, located approximately 4 km south of Bela-Bela in the Limpopo Province. The proposed facility will be known as the **Gihon Solar Energy Facility** and will have a generating capacity of up to 75 megawatts (MW).

Networx has appointed Savannah Environmental as the independent Environmental Assessment Practitioner to undertake the Environmental Impact Assessment (EIA) for the proposed project. The EIA process has been undertaken in accordance with the requirements of the Department of Environmental Affairs (DEA) (as per the acceptance of Scoping) and the EIA Regulations of June 2010 (GNR543) promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

The Draft EIA Report consists of nine sections:

- » Chapter 1 provides background and an introduction to the proposed project and the environmental impact assessment.
- » Chapter 2 describes the proposed project and explains the overall project requirements from a technical perspective.
- » Chapter 3 explains the regulatory and legal context for electricity generation projects and the EIA process.
- » Chapter 4 explains the approach to undertaking the EIA phase.
- » Chapter 5 describes the existing biophysical and socio-economic environment.
- » Chapter 6 describes the assessment of environmental impacts associated with the proposed Gihon solar energy facility.
- » Chapter 7 describes the assessment of cumulative environmental impacts associated with the proposed solar energy facility.
- » Chapter 8 presents the conclusions of the impact assessment as well as an impact statement.
- » Chapter 9 contains a list of references for the EIA report and specialist reports.

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required within the EIA Phase. The EIA Phase addresses those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the

environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The release of a draft EIA Report provides stakeholders with an opportunity to verify that the issues they have raised to date have been captured and adequately considered within the study. The Final EIA Report will incorporate all issues and responses prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project.

INVITATION TO COMMENT ON THE DRAFT EIA REPORT

Members of the public, local communities and stakeholders are invited to comment on the draft EIA Report which has been made available for public review and comment at the following locations from **28 February 2014- 30 March 2014**.

- » Bela-Bela Library situated next to the Bela-Bela Municipality, Chris Hanani Drive.
- » www.savannahSA.com

Please submit your comments to
Gabriele Wood of Savannah Environmental (Pty) Ltd PO Box 148, Sunninghill, 2157, Gauteng
Tel: 011 656 3237 Fax: 086 684 0547 E-mail: gabriele@savannahsa.com
The due date for comments on the Draft EIA Report is 30 March 2014

Comments can be made as written submission via fax, post, or e-mail.

EXECUTIVE SUMMARY

Networx Renewables (Pty) Ltd (hereafter referred to as Networx) an Independent Power Producer (IPP), is proposing the establishment of a commercial solar electricity generating facility and associated infrastructure on Portions 1, 2, 5 and 7 of the farm Turfbult 494 KR, located approximately 4 km south of Bela-Bela in the Limpopo Province. The proposed facility will be known as the **Gihon Solar Energy Facility**.

The proposed Gihon Solar Energy Facility will make use of photovoltaic (PV) technology and will have a generating capacity of up to 75MW and will comprise of the following infrastructure:

- » Arrays of PV panels and respective inverter stations;
- » Appropriate mounting structures for panels;
- » Cabling between the projects components, to be laid underground where practical;
- » On-site transformers to step up the power and an on-site substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- » An overhead power line to loop-in and loop out of the existing Pelly-Warmbad 132kV power line located at the northern boundary of the site (the combined line consisting of sections SAR Warmbad – Warmbad, SAR

Pienaarsrivier - SAR Warmbad and Pelly-SAR Pienaarsrivier);

- » Building for maintenance, control and storage;
- » Internal access roads; and
- » Fencing.

The nature and extent of this facility, as well as potential environmental impacts associated with the construction and operation of a facility of this nature are explored in more detail in this Environmental Impact Assessment (EIA) Report

OVERALL CONCLUSION (IMPACT STATEMENT)

From the assessment of potential impacts undertaken within this EIA, it is concluded that there are no environmental fatal flaws associated with the proposed site identified for the development of the Gihon Solar Energy Facility. Potential environmental impacts and some areas of high sensitivity were however identified. In summary, the most significant environmental impacts associated with the project, as identified through the EIA, include:

- » Potential impacts on flora and fauna
- » Potential impact on listed floral species
- » Potential impacts on migrating small animals from the Forever Resorts Nature Reserve and avifauna nesting within the reserve

- » Potential impacts on the local soils, land capability and agricultural potential of the site
- » Potential visual impacts mainly due to the different heights between the PV technologies
- » Potential heritage impacts
- » Potential social and economic impacts
- » Potential cumulative impacts

OVERALL RECOMMENDATION

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the Gihon Solar Energy Facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the identified impacts can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

The following conditions would be required to be included within an authorisation issued for the project:

- » No development activities may occur to the west of the railway line or between the Forever Resorts Nature Reserve and the railway line.
- » All activities which may result in impacts extending beyond the boundaries of the site (especially in the section west of the R101

must be avoided (drilling may lead to disturbance of sensitive fauna occurring within the Forever Resorts Nature Reserve) or sufficient notice provided to adjacent landowners where such impacts are expected but cannot be avoided.

- » The movement of protected animal species from Forever Resorts onto the section of the site to the west of the R101 must be anticipated and appropriate measures taken in conjunction with the nature reserve for the relocation of such species.
- » If any protected plant or tree species will be removed/destroyed by the developer, a collection/destruction permit to be obtained from LEDET and/or DAFF for the protected species found on site. Compliance with the permitting requirements for listed species identified on the site must be observed. A walk-through survey of the site development footprint by the ECO will be required prior to construction commencing.
- » The use of PV technology consistent with a lower visual profile is recommended in order to mitigate the potential visual impacts on the neighbouring visual receptors identified.
- » The draft Environmental Management Programme (EMPr) as contained within Appendix K of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility,

and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMPr should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.

- » All relevant practical and reasonable mitigation measures detailed within this report and the specialist reports contained within Appendices E to J must be implemented.
- » An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMPr for the duration of the construction period.
- » A detailed stormwater management plan must be developed and implemented for the facility following final design.
- » Should the abandoned farmhouse structure be impacted by the project, it is recommended that a conservation architect assess the site prior to its alteration, use or destruction. If the site is older than 60 years a demolition permit will be required before commencement of alteration or demolition.
- » Should substantial archaeological or paleontological (fossils) remains be exposed during

construction, the ECO should safeguard these, preferably in situ, and alert SAHRA as soon as possible so that appropriate action (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.

- » Site rehabilitation of temporary laydown and construction areas to be undertaken immediately after construction.
- » Should the facility be decommissioned, the development footprint must be rehabilitated.
- » Alien invasive vegetation is to be managed or removed (as required) during construction, operations, decommissioning and post-closure of the facility.
- » Following the final design of the facility, a final layout must be submitted to DEA for review and approval prior to commencing with construction.
- » Applications for all other relevant and required permits required to be obtained by the developer and must be submitted to the relevant regulating authorities.

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DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Cumulative impacts: The impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

Drainage line: A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial, and riparian vegetation may or may not be present.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

- i. The land, water and atmosphere of the earth;
- ii. Micro-organisms, plant and animal life;
- iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment (EIA), as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental management programme: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Fossil: Mineralised bones of animals, shellfish, plants and marine animals. A trace fossil is the track or footprint of a fossil animal that is preserved in stone or consolidated sediment.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800

Indirect impacts: Indirect or induced changes that may occur as a result of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups and the general public.

Perennial and non-perennial: Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contains flows for short periods, such as a few hours or days in the case of drainage lines.

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare".

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Wetland: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

Water course: as per the National Water Act means -

- (a) a river or spring;
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows; and
- (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CO ₂	Carbon dioxide
DEA	National Department of Environmental Affairs
DEADP	Department of Environment Affairs and Development Planning
DoE	Department of Energy
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GHG	Green House Gases
GWh	Giga Watt Hour
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IPP	Independent Power Producer
km ²	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
MAR	Mean Annual Rainfall
m ²	Square meters
m/s	Meters per second
MW	Mega Watt
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NGOs	Non-Governmental Organisations
NWA	National Water Act (Act No. 36 of 1998)
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited
SDF	Spatial Development Framework

INTRODUCTION

CHAPTER 1

1.1. Project Background

Networx Renewables (Pty) Ltd (hereafter referred to as Networx) an Independent Power Producer (IPP), is proposing the establishment of a commercial solar electricity generating facility and associated infrastructure on Portions 1, 2, 5 and 7 of the farm Turfbult 494 KR, located approximately 4 km south of Bela-Bela in the Limpopo Province. The proposed facility will be known as the **Gihon Solar Energy Facility** and will have a generating capacity of up to 75 megawatts (MW).

Networx has appointed Savannah Environmental as the independent Environmental Assessment Practitioner to undertake the Environmental Impact Assessment (EIA) for the proposed project. The EIA process has been undertaken in accordance with the requirements of the Department of Environmental Affairs (DEA) (as per the acceptance of Scoping) and the EIA Regulations of June 2010 (GNR543) promulgated in terms of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

The proposed Gihon Solar Energy Facility will make use of photovoltaic (PV) technology and will have a generating capacity of up to 75MW and will comprise of the following infrastructure:

- » Arrays of PV panels and respective inverter stations;
- » Appropriate mounting structures for panels;
- » Cabling between the projects components, to be laid underground where practical;
- » On-site transformers to step up the power and an on-site substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- » An overhead power line to loop-in and loop out of the existing Pelly-Warmbad 132kV power line located at the northern boundary of the site (the combined line consisting of sections SAR Warmbad – Warmbad, SAR Pienaarsrivier - SAR Warmbad and Pelly-SAR Pienaarsrivier);
- » Building for maintenance, control and storage;
- » Internal access roads; and
- » Fencing.

The project was introduced in the Scoping phase as having a generating capacity up to 150MW. Subsequently the total generating capacity of the project has been revised to 75MW only. In addition, further areas of the Farm Turfbult 494 KR

(same portion numbers) were provided by the landowner for investigation and assessment in response to issues relating to ecological sensitivity and proximity to the Forever Resorts Nature Reserve identified during the Scoping process. This EIA Report therefore evaluates and assesses the impacts of the Gihon 75MW Solar Energy Facility and associated infrastructure.

The nature and extent of the proposed Gihon Solar Energy Facility, as well as the potential environmental impacts associated with the construction, operation and decommissioning associated with the proposed project is explored in more detail in this EIAR. This EIAR consists of the following chapters:

- » Chapter 1 provides background and an introduction to the proposed project and the environmental impact assessment.
- » Chapter 2 describes the proposed project and explains the overall project requirements from a technical perspective.
- » Chapter 3 explains the regulatory and legal context for electricity generation projects and the EIA process.
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- » Chapter 8 presents the conclusions of the impact assessment as well as an impact statement.
- » Chapter 9 contains a list of references for the EIA report and specialist reports.

1.2. Overview of the Proposed Development

The proposed Gihon Solar Energy Facility falls within the jurisdiction of the Bela-Bela Local Municipality within the Waterberg District Municipality of the Limpopo Province. The study area (made up of Portions 1, 2, 5 and 7 of the farm Turfbult 494 KR) is approximately 481 hectares (ha) in extent. The location of the study area is shown in **Figure 1.1**. Approximately 220ha of the site is required for the development of the proposed 75MW facility (or 46% of the land available for assessment within this EIA study), allowing for the avoidance of identified environmental sensitivities.

The scope of the EIA has applied to the PV development footprint and associated infrastructure. The proposed 75MW facility will accommodate several arrays of photovoltaic (PV) panels and associated infrastructure.

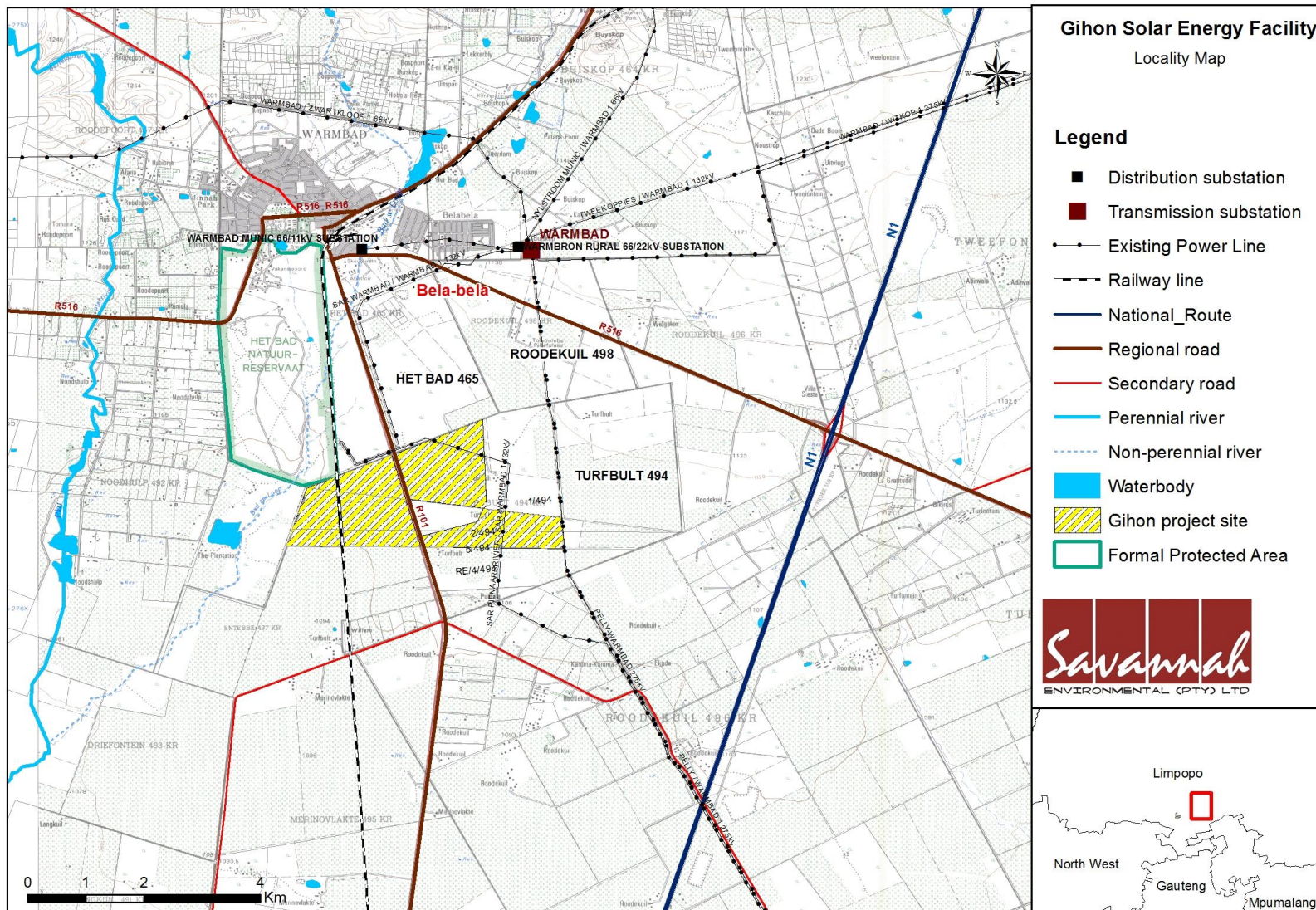


Figure 1.1: Locality map illustrating the location of the proposed Gihon Solar Energy Facility, near Bela-Bela, Limpopo Province

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required within the EIA Phase. The EIA Phase addresses those identified potential environmental impacts and benefits associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report aims to provide the environmental authorities with sufficient information to make an informed decision regarding the proposed project.

The release of a draft EIA Report provides stakeholders with an opportunity to verify that the issues they have raised to date have been captured and adequately considered within the study. The Final EIA Report will incorporate all issues and responses prior to submission to the National Department of Environmental Affairs (DEA), the decision-making authority for the project.

1.3. Conclusions from the Scoping Phase

Specialist input: Several desktop specialist studies were undertaken for the purposes of identifying potential impacts and potential fatal flaws relating to the proposed Gihon Solar Energy Facility. The impacts identified as potentially resulting from the project broadly included social, agricultural, ecological, heritage and visual impacts. From these studies, and through engaging adjacent landowners, it became apparent that ecological and visual impacts were, in light of the nature of the adjacent land uses to the proposed facility, to be a key focus of the EIA Phase.

Public participation: During the public participation process conducted during Scoping, the proposed project was generally well received from the recipient community, interested and affected parties as well as stakeholders. In response to concerns from the neighbouring Forever Resorts, additional areas of the Farm Turfbult (same farm portions and same landowner) were provided for assessment with the aim of mitigating the potential ecological and visual impacts associated with the proposed Gihon Solar Energy facility. Of all adjacent parties notified about the project, Forever Resorts provided the only comments of consequence which have been taken into consideration for the preparation of the facility layout plan as part of the EIA phase.

Approval of the Scoping Report: No environmental or social fatal flaws were identified to be associated with the broader site during the Scoping stage of the EIA process and the Final Scoping Report was accepted by DEA in December 2013.

1.4. Requirement for an Environmental Impact Assessment Process

The proposed Gihon Solar Energy Facility is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998). This section provides a brief overview of the EIA Regulations and their application to this project and contains the requirements of the DEA.

EIA Regulations overview: NEMA is the national legislation that provides for the authorisation of "listed activities". In terms of Section 24 (1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and thereby considered to be of national importance, the National Department of Environmental Affairs (DEA) is the competent authority and the Limpopo Department of Economic Development, Environment and Tourism (LEDET) will act as a commenting authority for the application.

Compliance with the requirements of the EIA Regulations ensures that decision-makers are provided with an opportunity to consider the potential environmental impacts of a project early in the project development process and to assess if potential environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision. An application for authorisation has been accepted by DEA for the proposed project under application reference number **14/12/16/3/3/2/576**.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the developer with the opportunity of being fore-warned of potential environmental issues. Subsequently it may assist with the resolution of issues reported on in the Scoping and EIA Phases as well as promoting dialogue with interested and affected parties (I&APs) and stakeholders. In terms of sections 24 and 24D of NEMA, as read with the EIA Regulations R543, an EIA is required to be undertaken for this proposed project as the proposed project includes the following "listed activities" applicable to each of the four phases, in terms of GN R544, R545 and R546 (GG No 33306 of 18 June 2010 as amended).

Listed activities: The list of listed activities requiring Environmental Authorisation has been revised during the EIA Phase due to a clearer understanding of the project scope, its potential impacts and refinement of the

layout plan in the EIA Phase. This is made possible through the availability of detailed designs provided by the applicant in response to the identified environmental sensitivities.

A summarised description of each of the listed activities is provided in Table 1 below. A full description of the impacts associated with the listed activities is provided in the impact assessment chapter (Chapter 6 and 7). The Conclusions chapter (Chapter 8) provides a concluding statement for each of the listed activities applied for and concludes whether the listed activity should be authorised, based on the outcome of the evaluation, impact assessment and relationship of the project footprint to the environment.

Table 1.2: Listed Activities applied for in terms of GN R 544, GN R 546 and GN R 547 for the proposed Gihon Solar Energy Facility. Note that Activities which have been stricken from the table below are no longer applied for, will not require authorisation.

Relevant Notice	Activity No	Description of listed activity
R. 544, 18 June 2010 (Listing Notice 1 of 2010)	Activity 10 (i)	<p><i>The construction of facilities or infrastructure for the transmission and distribution of electricity –</i></p> <p><i>(i) Outside urban areas or industrial complexes with a capacity of more than 33kV but less than 275kV.</i></p> <p>The project will require the construction of a new overhead power line (outside an urban area) in order to loop in and out of the existing Pelly-Warmbad 132kV power at the northern boundary of the site</p>
GN 544, 18 June 2010 (Listing Notice 1 of 2010)	Activity 11 (xi)	<p><i>The construction of:</i></p> <p><i>(xi) infrastructure or structures covering 50 square metres or more</i></p> <p><i>Where such construction occurs within a watercourse or within 32 metres of a watercourse, measures from the edge of a watercourse, excluding where such construction will occur behind the development setback line.</i></p> <p>The eastern-most section of the proposed Gihon Solar Energy facility is located within 32m from a watercourse delineated on the project site</p>
R. 544, 18 June 2010 (Listing Notice 1 of 2010)	Activity 13	<p><i>The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.</i></p> <p>Infrastructure (storage tanks) for the cumulative storage of hazardous substances (diesel and lubricants) on the project site, for the refuelling and maintenance of vehicles and machinery will be in the region of 20m³ – 30m³ and will not exceed 80m³ at any time.</p>
R. 544, 18 June 2010 (Listing Notice 1 of 2010)	Activity 18(i):	<p><i>The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from a watercourse</i></p> <p>The positioning of the PV array and placement of the power line towers and roads associated with the project may intercept with</p>

		watercourses or drainage lines whereby the dredging, excavation, removal or moving of soil, sand, pebbles or rock from the watercourse may occur.
R. 544, 18 June 2010 (Listing Notice 1 of 2010)	Activity 22 (ii) of	The construction of a road, outside urban areas, (ii) where no road reserve exists where the road is wider than 8 metres. The proposed development would involve construction of an access road and internal roads approximately 3.5m in width.
R. 544, 18 June 2010 (Listing Notice 1 of 2010)	Activity 26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). This activity does not apply to the proposed development as there is no activity/process defined in terms of the Gazette, section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
R. 544, 18 June 2010 (Listing Notice 1 of 2010)	Activity 47 (ii)	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (ii) where no reserve exists, where the existing road is wider than 8 metres— excluding widening or lengthening occurring inside urban areas. The proposed development would involve widening of existing internal access roads to a standard width of 3.5m to ensure the ease of construction and maintenance of the solar facility.
R. 545, 18 June 2010 (Listing Notice 2 of 2010)	Activity 1	The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more. The solar energy facility will have a generating capacity of up to 75MW. Power lines and a substation are required as ancillary/support infrastructure
R. 545, 18 June 2010 (Listing Notice 2 of 2010)	Activity 15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more. The development footprint for the proposed

		<p>solar energy facility will cover an area greater than 20 hectares, as approximately 220 hectares is required in order to realise the full proposed 75MW generation capacity. Agricultural land will be transformed to an industrial land use.</p>
<p>R. 546, 18 June 2010 (Listing Notice 3 of 2010)</p>	<p>Activity 4 (a)(ii)(gg)</p>	<p>The construction of a road wider than 4 metres with a reserve less than 13,5 metres (ii) outside urban areas, in: (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve.</p> <p>The proposed development would involve the construction of internal roads of between 3.5m to 4m wide (<u>less than 4m wide</u>) but within 5 kilometres of and adjacent privately owner nature reserve (Forever Resorts).</p>
<p>R. 546, 18 June 2010 (Listing Notice 3 of 2010)</p>	<p>Activity 10 (a)(ii)(gg)</p>	<p>The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (ii) outside urban areas, in (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve.</p> <p>Infrastructure (storage tanks) for the cumulative storage of hazardous substances (diesel and lubricants) on the project site, for the refuelling and maintenance of vehicles and machinery will be in the region of 20m³ – 30m³ and will not exceed 30m³ at any time, but will occur within 5 kilometres of and adjacent privately owner nature reserve (Forever Resorts).</p>
<p>R. 546, 18 June 2010 (Listing notice 3 of 2010)</p>	<p>Activity 12 (b)</p>	<p>The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation (b) Within critical biodiversity areas identified in bioregional plans</p> <p>The proposed development does not fall within a Critical Biodiversity Area</p>
<p>R. 546, 18 June 2010 (Listing</p>	<p>Activity 13 (2)(c)(ii)(ff)</p>	<p>The clearance of vegetation of an area of 1 hectares or more of vegetation where 75% or more of the</p>

<p>Notice 3 of 2010)</p>		<p><i>vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for</i></p> <p><i>(2) (the undertaking of a linear activity falling below the thresholds in Notice R544 of 2010.</i></p> <p><i>(c) In Limpopo,</i></p> <p><i>(ii) Outside urban areas, the following</i></p> <p><i>(ff) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA, or core area of biosphere reserve</i></p> <p><i>The development may result in the clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation within 5km from a protected area (Forever Resorts nature reserve) – The site shares a border with the Forever Resort private nature reserve.</i></p>
<p>R. 546, 18 June 2010 (Listing Notice 3 of 2010)</p>	<p>Activity 14</p>	<p><i>The clearance of vegetation of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for:</i></p> <p><i>(1) purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority for agriculture or afforestation purposes.</i></p> <p><i>(2) The undertaking of a process or activity included in the list of waste management activities published in terms of the Waste Act</i></p> <p><i>The undertaking of a linear activity falling below the thresholds in Notice 544 of 2010</i></p> <p><i>The development may result in the clearance of more than 5 hectares of indigenous vegetation, whereby 75% or more of the vegetative cover may constitute indigenous vegetation outside urban areas in Limpopo.</i></p>

1.5. Objectives of the EIA Process

The Scoping Phase for the proposed Gihon Solar Energy Facility was completed in October 2013 and the Plan of Study for EIA approved by DEA in December 2013. The scoping phase served to identify potential impacts associated with the proposed project and to define the extent of studies required within the EIA Phase. The Scoping Phase included input from the project proponent, specialists with experience in the study area and in EIAs for similar projects, as well as a public consultation process with key stakeholders that included both government authorities and interested and affected parties (I&APs).

This EIA Phase (i.e. the current phase) and EIA report addresses identified environmental impacts (direct, indirect, and cumulative as well as positive and negative) associated with the different project development phases (i.e. design, construction, operation, and decommissioning). The EIA Phase also recommends appropriate mitigation measures for potentially significant environmental impacts. The release of a draft EIA Report provides stakeholders with an opportunity to verify that issues they have raised through the EIA Process have been captured and adequately considered. The final EIA Report incorporates all issues and responses raised during the public review phase prior to submission to DEA. The EIA phase was conducted in accordance with the requirements of the EIA Regulations in terms of Section 24(5) of NEMA.

1.6. Details of the Environmental Assessment Practitioner and Specialist Team

Savannah Environmental was appointed by Networx as the independent EAP to undertake the EIA process for the proposed project. Neither Savannah Environmental nor any of its specialist sub-consultants are subsidiaries of or are affiliated to Networx. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed project.

Savannah Environmental is a specialist environmental consultancy which provides a holistic environmental management service, including environmental assessment and planning to ensure compliance with relevant environmental legislation. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures.

The EAPs from Savannah Environmental who are responsible for this project are:

- » Steven Ingle - Steven Ingle, the principal author of this report is a senior environmental consultant with over 7 years of experience in the environmental field and holds a degree in Environmental Management. His competencies lie in environmental impact assessments for large scale infrastructure, property and mining projects, environmental due diligence and risk assessment, environmental compliance monitoring, waste management licensing and strategic environmental assessment.
- » Karen Jodas - a registered Professional Natural Scientist and holds a Master of Science degree. She has 16 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country and is the EAP on this project.

Savannah Environmental has developed a detailed understanding of impacts associated with the construction and operation of renewable energy facilities through their involvement in numerous EIA processes for these projects. In order to adequately identify and assess potential environmental impacts, Savannah Environmental has appointed specialist consultants as required.

In order to adequately identify and assess potential environmental impacts associated with the proposed project, the following specialists were consulted to conduct specialist impact assessments:

- » Ecology – Marianne Strohbach (Savannah Environmental) and Gerhard Botha
- » Geology, soils, and erosion and agricultural potential – Johann Lanz
- » Heritage resources – Heritage Contracts and Archaeological Consulting CC (HCAC)
- » Visual – Lourens du Plessis (MetroGIS (Pty) Ltd)
- » Social – Candice Hunter (Savannah Environmental) and Neville Bews (Neville Bews & Associates)

Curricula vitae for the Savannah Environmental project team and its specialist sub-consultants are included in Appendix A.

DESCRIPTION OF THE PROPOSED PROJECT

CHAPTER 2

The following chapter provides an overview of the proposed Gihon Solar Energy Facility and provides details regarding the rationale and purpose of the project, details regarding the site selection process and methodology for designing the facility in response to the identified sensitivities.

The chapter further provides an overview of the project scope which includes the planning and design, construction, operation and decommissioning phases. The project will be submitted in line with the DoE requirements under the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. This chapter also explores the "Do-Nothing" alternative - that is the alternative of not establishing the proposed Gihon Solar Energy Facility.

2.1. Need and justification for the Proposed Project

2.1.1 Strategic Infrastructure Projects under the National Infrastructure Plan

According to South African Government Online¹ the South African Government adopted a National Infrastructure Plan (NRP) in 2012 that intends to transform South Africa's economic landscape while simultaneously creating significant numbers of new jobs and to strengthen the delivery of basic services. Under the NRP, Government will, over the three years from 2013/14, invest R827 billion in the building of new and the upgrading of existing infrastructure. In order to address these challenges and goals, Cabinet established the Presidential Infrastructure Coordinating Committee (PICC) and under their guidance developed 18 Strategic Integrated Projects (SIPs), three of which are energy-related SIPs and include:

- » SIP 8: Green energy in support of South African economy - Support sustainable green energy initiatives on a National scale through a diverse range of clean energy options envisaged in the IRP.
- » SIP 9: Electricity Generation to support socio-economic development: Accelerate construction of new electricity capacity in accordance with the IRP to meet the need of the economy and address historical imbalance.

In fulfilment of SIP 8 (green energy) and to meet the targets set in the Integrated Resource Plan (IRP 2010), the Department of Energy has introduced the REIPPP Programme, which is now in its fourth year. The proposed Gihon

¹ <http://www.gov.za/issues/national-infrastructure-plan /index.html#energy>

Solar Energy Facility will contribute towards SIP 8 and SIP 9 due to the addition of clean energy to the grid and the project will create significant socio-economic benefits at a local, regional and national scale.

2.1.2 Rationale for the proposed project

The purpose of the Gihon Solar Energy Facility is to add new capacity for generation of renewable energy to the national electricity supply (which is short of generation capacity to meet current and expected demand) and to aid in achieving the goal of a 30% share of all new power generation being derived from independent power producers (IPPs), as targeted by the Department of Energy (DoE).

The power generated from the project will be sold to Eskom to feed into the national electricity grid. Networx will be required to apply for a generation license from the National Energy Regulator of South Africa (NERSA), as well as sign a power purchase agreement with Eskom (typically for a period of 20 years) in order to build and operate each facility. As part of the agreement, the IPP will be remunerated per kWh by Eskom who will be financially backed by Government. Depending on the economic conditions following the lapse of this period, each solar energy facility can either be decommissioned, or the power purchase agreement may be renegotiated and extended for a further period.

Globally there is increasing pressure on countries to increase their share of renewable energy generation due to concerns such as climate change and exploitation of non-renewable resources. In order to meet the long-term goal of a sustainable renewable energy industry, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~42% of all new build power generation being derived from renewable energy forms by 2030. This is, however, dependent on the assumed learning rates and associated cost reductions for renewable options.

It is considered viable that long-term benefits for the community and/or society in general can be realised should the project prove to be acceptable from a technical and environmental perspective. The project has the potential to contribute to the national electricity supply and to increase the security of supply to consumers as well as supporting South Africa's commitment to reducing greenhouse gas emissions. Over 90% of South Africa's electricity generation is coal-based, resulting in annual per capita carbon emissions of approximately 8.9 tons per person, according to 2008 World Bank estimates. According to the Carbon Dioxide Information Analysis Centre, South Africa is the 13th largest

carbon dioxide emitting country, based on 2008 fossil-fuel CO₂ emissions. The nation is also the largest emitting country on the continent of Africa, pinpointing the importance of introducing greener solutions to the energy mix. Furthermore, it may provide both economic stimulus to the local economy through the construction process and long term employment (i.e. management and maintenance) during the operation phase.

2.1.3 Selection of the proposed project site

Due to the nature of the development (i.e. PV solar energy facilities), the location of the facilities are largely dependent on technical and environmental factors such as solar irradiation (i.e. the fuel source), climatic conditions, topography of the site, and access to the grid.

Receptiveness of the site to PV Development: The portions of the farm Turfbult which represent the study area are considered favourable from a due to the following site characteristics:

- » **Climatic conditions:** Climatic conditions determine the economic viability of a solar energy facility as it is directly dependent on the annual direct solar irradiation values for a particular area. Bela-Bela is situated in an area ranked 5th in South Africa in terms of solar irradiation (2 120 kWh/m² average per annum), but which still compares favourably to areas in the Northern Cape Province (up to 2 360 kWh/m² average per annum) as shown in Figure 2.1 below.
- » **Topographic conditions:** The site conditions are optimum for a development of this nature. For instance the site slope and aspect for the proposed site is predominantly flat. A level surface area (i.e. a gradient of 3% or less) is preferred for the installation of PV panels.
- » **Extent of the site:** Significant land area is required for the proposed development and therefore space is a constraining factor for a large-scale PV solar facility installation. The site is larger than the area required for development which would allow for the avoidance of any identified environmental or technical constraints. Considering that 220ha of land is required for the project and that the project site is 481ha in extent, there is sufficient space for the development of this project, allowing for the avoidance of the environmental sensitivities identified.
- » **Proximity:** Several electrical grid connection opportunities to the south of Bela-Bela are presented and which fall on or adjacent to the site. This is technically preferred in order to minimise electricity loss along the distribution network towards load centres.
- » **Site availability and access:** The land is available for lease by the developer. The proposed development site is traversed by the R101, broadly dissecting it into eastern and western portions. Access to the site is

provided directly from the R101. The site is therefore appropriately located for easy transport of components and equipment as well as labour movement to and from the site.

- » **Site slope and aspect:** A level surface area is preferred for the installation of PV panels. The slope of the proposed site is very flat and is considered to be desirable from a development perspective as it reduces the need for extensive earthworks and associated levelling activities, thereby minimising environmental impacts.
- » **Grid Connection:** The Warmbad Traction Substation is located within 500m from the northern boundary of the site. The SAR Pienaarsriver-SAR Warmbad 1 132kV power line extends from this substation running parallel to the northern boundary of the site before traversing the north-eastern corner of the site and running in a southerly direction. Similarly, the SAR Warmbad-Warmbad 1 132kV power line connects to the Warmbad Traction Substation and runs parallel to the boundary of the site before moving in a northerly direction to the Warmbron Rural Substation. The Pelly-Warmbad 132kV (which is the line made of sections: Sar Warmbad/Warmbad – Sar, Pienaarsrivier/Sar Warmbad, Pelly-Sar/Pienaarsrivier) distribution power line follows the northern boundary of the site.

Exploration phase: It was on the basis of South Africa's strategic imperatives, the optimised irradiation of the region and grid connectivity conditions that Networkx approached the landowner and presented a business case for the development of a renewable energy facility on the farm.

During negotiations between the developer and the landowner, Eskom was approached to determine whether capacity in the grid was available. It subsequently became apparent based on the extent of the site and feedback from Eskom that a project of up to 150MW could potentially be developed, and therefore a 150MW project was considered during Scoping.

Following the interpretation of the results of the Scoping Phase and considering all factors listed above, as well the potential constraints posed to a 150MW project (over two phases), the scope of the project was downscaled to a single 75MW facility. The 75MW project option is considered to be more viable from the developer's perspective.

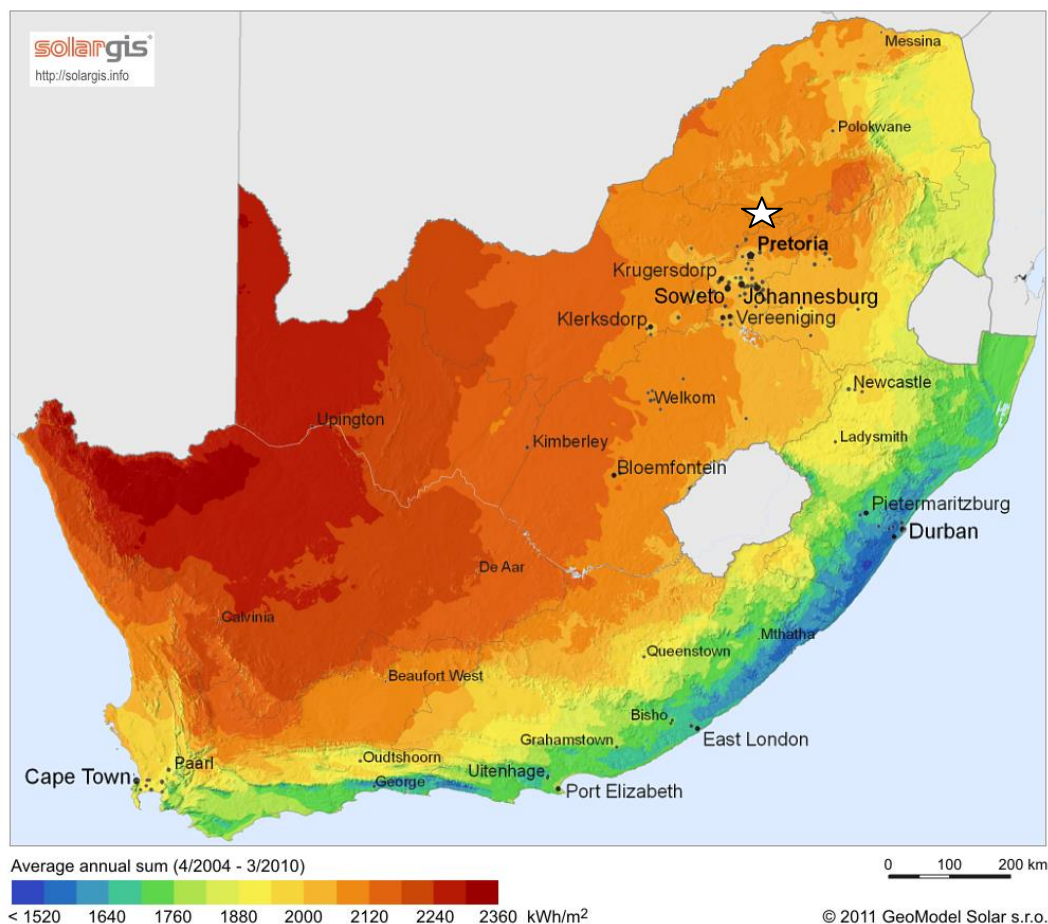


Figure 2.1: Solar irradiation map for South Africa (Source: GeoModel Solar, 2011) – proposed Gihon Solar Energy Facility indicated by star

2.1.4 Optimising the proposed PV facility within the site boundary and the consideration of alternative layouts

The Scoping process served to determine any areas of high environmental sensitivity and limit the extent of the greater farm portion available to PV development. This was done as a land capability assessment in order to evaluate and mitigate the impact on soil, land, air and water resources. Failure to manage land in accordance with its capability risks degradation of resources both on-site and off-site, leading to a decline in natural ecosystem values, agricultural productivity and infrastructure functionality. The land capability assessment was intended to allow the developer to test the merits of the site and discard other areas of the site which were under consideration due to environmental constraints.

Following presentation of a project area to the developer based on criteria determined during Scoping and EIA phase, technical requirements in terms of optimising the position of the PV array as well as the associated infrastructure within the boundaries of the project site were evaluated by the developer.

Alternative areas within the site provided for assessment were therefore discarded by the developer based on the following constraints identified through the land capability assessment:

- a) Environmental sensitivities identified during the Scoping phase which were confirmed or rejected by the environmental team during the EIA phase.
- b) Determining the requirements of the landowner based on any identified constraints from a farming or land use perspective.
- c) Requirements of adjacent landowners (notably Forever Resorts).

PV array: For the PV array, no feasible alternative locations within the broader site were identified as the PV array layout has been optimized based on the constraints identified during the land capability assessment undertaken at Scoping and optimization of the layout to accommodate the identified constraints during the EIA Phase. Minor adjustments to the PV array development footprint within the developable areas of the site are not considered significant, however any footprint or activity infringement on the project no-go areas identified through this process on the western and eastern margins of the project site may be significant due to the proximity to ecologically sensitive areas identified.

On-site Substation: An alternative, environmentally preferred site for the siting of the on-site substation has been identified by the developer in order to mitigate the potential ecological impacts identified (avoidance of sensitive habitat types identified) through the EIA process.

In summary, the development footprint of the proposed Gihon Solar Energy Facility was primarily informed by:

- » Presence of sensitive on-site ecological features within the project site, and
- » Proximity to nature reserves of high biodiversity and tourism value.

2.2. Project Description

The Gihon Solar Energy Facility is intended to generate electricity by harnessing solar energy (from the sun) by utilising photovoltaic (PV) technology and has a proposed generating capacity of up to 75MW. An area of approximately 220ha is proposed to be occupied by the PV module arrays and associated infrastructure. The main components of the proposed facility include:

- » Arrays of PV panels and respective inverter stations;
- » Appropriate mounting structures for panels;
- » Cabling between the projects components, to be laid underground where practical;

- » On-site transformers to step up the power and an on-site substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- » An overhead power line to loop-in and loop out of the existing Pelly-Warmbad 132kV power line located at the northern boundary of the site (the combined line consisting of sections SAR Warmbad – Warmbad, SAR Pienaarsrivier - SAR Warmbad and Pelly-SAR Pienaarsrivier);
- » Building for maintenance, control and storage, and
- » Internal access roads and fencing.

The project site is located approximately 4 km south of Bela-Bela in the Limpopo Province. The project site is 481ha in extent and traversed by the R101, broadly dissecting the site into an eastern portion (218ha) and a western portion (263ha). Access to the site is provided directly from the R101.

The proposed solar energy facility will connect to the Pelly-Warmbad 132 kV power line (the combined line consisting of sections of the abovementioned power lines) through a loop in and loop out configuration, thereby enabling direct connection to the grid within a short distance from the facility and no requirement for the construction of power lines outside the boundaries of the property. The entire length of the power line will be located within the site boundaries extending from the on-site substation, directly into the overhead power line (i.e. less than 50m in length).

Table 2.1 below provides relevant technical information for the proposed Gihon Solar Energy Facility

Table 2.1: Indicative dimensions or measurements of infrastructure for the proposed Gihon Solar Energy Facility

Aspect	Value
Number of PV panels required	287 500
Height of PV panels	< 10 m
Area of PV Array	220 ha
Number of inverters required	39
Area occupied by inverter / transformer stations / substations	10 000 m ²
Capacity of on-site substation	33/132kV; 80MVA
Area occupied by both permanent and construction laydown areas	5 ha
Area occupied by buildings	1 200 m ²
Length of internal roads	15 km
Width of internal roads	3.5 m

Proximity to grid connection	On-site (within 100m)
Construction phase water requirements	7200m ³ per annum
Operational phase water requirements	1350m ³ per annum

A layout of the proposed Gihon Solar Energy Facility site and associated infrastructure (such as on-site substation, power line, access roads, and laydown areas) considered within this EIA Report has been generated, which has responded to the environmental and social sensitivities identified. As far as possible, the direct impacts identified through the EIA process have been mitigated.

As can be seen in Figure 2.1 below, the proposed Gihon PV array footprint is split into five distinct areas separated by the R101 and power line servitudes over the farm.

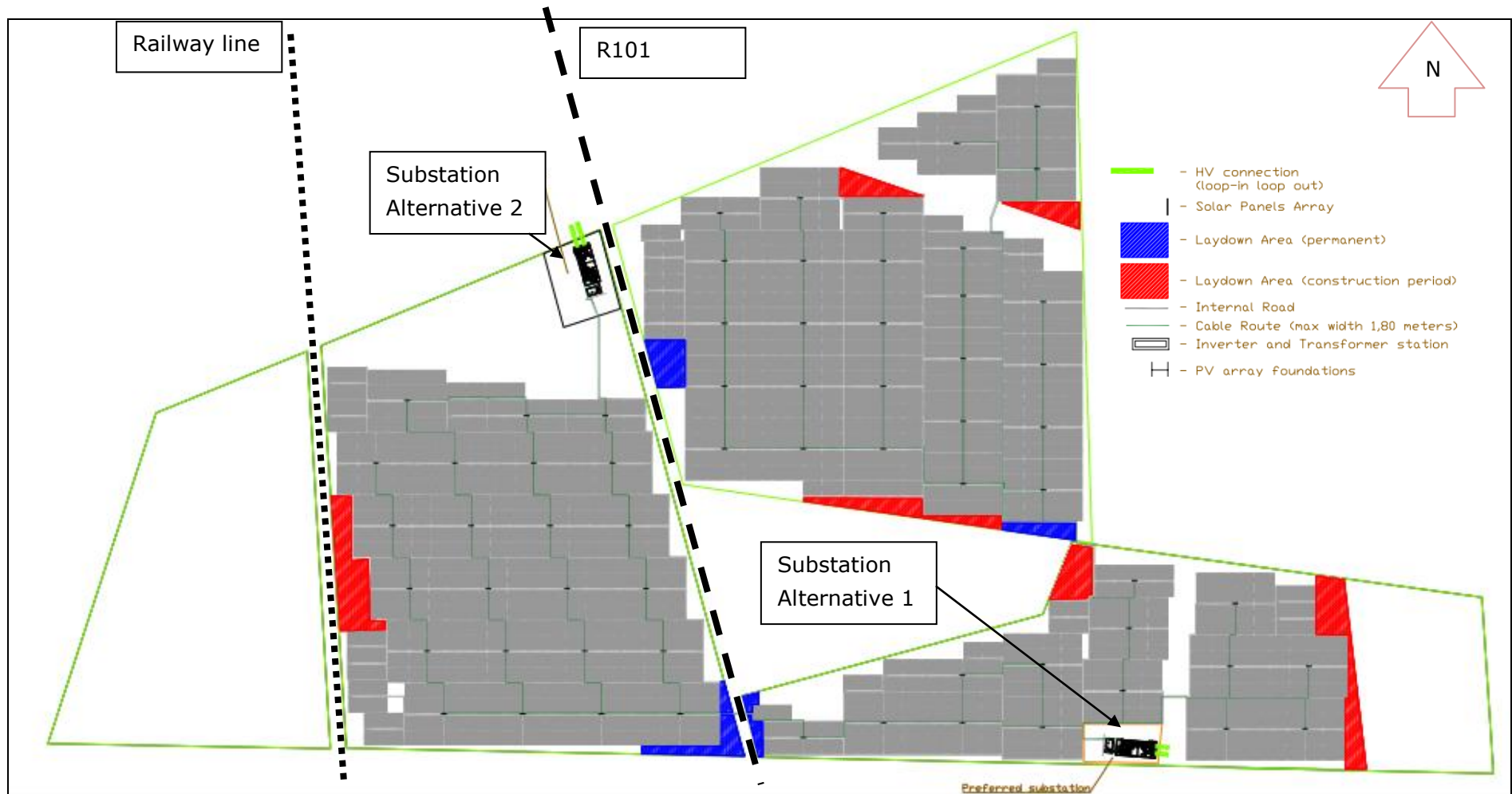


Figure 2.1: Layout for the proposed Gihon Solar Energy Facility also indicating the location of the PV arrays and associated infrastructure including the substation (two alternatives), access roads, temporary and permanent laydown areas.

2.3. Solar Energy as a Power Generation Technology

The generation of electricity can be explained as the conversion of energy from one form to another. Solar energy facilities operate by harnessing solar energy and converting it into a useful form (i.e. electricity). Solar technologies can be divided into two categories, those that harness solar energy to create thermal energy which in turn can be converted into electricity, and those that use the electromagnetic radiation of the sun and convert it directly into electricity. The latter is known as photovoltaic (PV) technology, which is proposed for this project, and is the direct conversion of sunlight into electricity without the use of water for power generation.

The use of solar energy for electricity generation is a non-consumptive use of a natural resource. Renewable energy is considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially, and economically sustainable future. The challenge now is ensuring solar energy projects are able to meet all economic, social, and environmental sustainability criteria in terms of NEMA.

2.4.1 How do Grid Connected Photovoltaic Facilities Function?

Solar energy facilities, such as those using PV technology use the energy from the sun to generate electricity through a process known as the Photoelectric Effect. A PV cell or solar cell is the semiconductor device that converts sunlight into electricity. These cells are interconnected to form panels which, in turn, are combined with associated structural and electrical equipment to create what are called arrays – the actual solar generation systems which connect to the energy grid. As sunlight hits the solar panel, photons can be reflected, absorbed, or pass through the panel. When photons are absorbed, they have the energy to knock electrons loose, which flow in one direction within the panel and exit through connecting wires as solar electricity.

There are several types of semiconductor technologies currently in use for PV solar panels. Two however, have become the most widely adopted: crystalline silicon and thin film. The former is constructed by first putting a single slice of silicon through a series of processing steps, creating one solar cell. These cells are assembled together in multiples to make a solar panel. The latter is made by placing thin layers, hence the name thin-film, of semiconductor material onto various surfaces, usually glass. This project proposes using a thin-film PV technology which encloses the semiconductor between two sheets of glass.

A solar energy facility typically uses the following components:

The **Photovoltaic Panels**

Solar photovoltaic (PV) panels consist primarily of glass and various semiconductor materials and in a typical solar PV project, will be arranged in rows to form solar arrays, as shown in Figure 2.2. The PV panels are designed to operate continuously for more than 20 years with minimal maintenance required.



Figure 2.2: Picture of a PV Panel



Figure 2.3: Picture of the installation of a typical PV array

The **Support Structure**

The photovoltaic (PV) modules will be mounted to steel support structures called tables. These can either be mounted at a fixed tilt angle, optimised to receive the maximum amount of solar radiation and dependent on the latitude of the proposed facility, or a tracking mechanism where at a maximum tilt angle of 45° the lowest part of the panel 30cm from the ground.

The **Inverter**

The photovoltaic effect produces electricity in direct current (DC). Therefore an inverter must be used to change it to alternating current (AC) for transmission in the national grid. The inverters convert the DC electric input into AC electric output, and then a transformer steps up the current to 33 kV for on-site transmission of the power. The inverter and transformer are housed within the power conversion station (PCS). The PV combining switchgear (PVCS), which are dispersed among the arrays, collect the power from the arrays for transmission to the project's substation.



Figure 2.5: Image of a typical inverter

2.4. Water Requirements and Availability

Boreholes: According to information provided by the landowner, twenty-one boreholes are situated over the farm, five of which occur west of the railway line, seven of which occur between the R101 and the railway line and nine of which are situated east of the R101. All boreholes are situated in close proximity to the proposed PV array. Three of the boreholes on the farm are currently used for stock watering purposes and to irrigate a 3ha section of lucerne that produces winter feed for the cattle.

Potable water: There is no current municipal supply of potable water to the farm. Currently all water to the households (which are rented out by the landowner) is supplied by water storage tanks located at the households.

Sanitation: Currently there are between four and five septic tanks used for the treatment of household effluent generated by the existing households situated on the farm. These facilities are used by renters on the property for household use and will unlikely be available or of sufficient capacity for construction purposes.

Water requirements of a PV facility: An operational PV plant does not require water for the generation of electricity. Water is required primarily for the construction of the facility and well as for human consumption (sanitation) during operation. In many instances, water is used to clean off dust or dirt that builds up on the panels.

The water requirement for the project is anticipated to be approximately 8 000 L/month/MW during the construction phase (165 000 litres per month). Approximately 1 500 L/month/MW of water is required for maintenance (cleaning panels) during the operational phase (112 500 litres per month and only during the months when cleaning of the solar panels is undertaken).

Confirmation of water supply: Networkx will be required to obtain confirmation of water availability for the project from the Department of Water Affairs (DWA), Limpopo Region. DWA is required to provide a non-binding indication of water availability to the project. This non-binding agreement would be required for the purposes of bidding the project to the DoE. A water use license application will be submitted to DWA, and a water use license received only after selection of the project by the DoE and on final design of the facility.

2.5. Project Alternatives

In accordance with the requirements of the EIA Regulations², alternatives are required to be considered within any environmental impact assessment (EIA) process, and may refer to any of the following:

- » Site alternatives
- » Design or layout alternatives
- » Technology alternatives
- » The No-go alternative

2.5.1 Site Alternatives

As indicated in Section 2.2.1, the land capability assessment undertaken at Scoping and EIA allowed the developer to test the merits of the site and discard other areas of the site which were under consideration, due to environmental constraints identified during the process. As indicated in Section 2.1.3, an increase in the extent of the overall study area considered for the proposed project was merited in order to avoid the identified constraints. This was done within the boundaries of the greater farm and did not overlap onto other farms in the areas. Alternative areas for development within the existing farm and consolidated into a development footprint have been considered. No other feasible site alternatives have been assessed for this project.

2.5.2 Layout Alternatives

PV array: As discussed in Section 2.1.3 and Section 2.1.4, the layout of the proposed Gihon Solar Energy Facility occupies the full extent of areas available for PV development, with other areas of the site having been discarded for development based on the land capability assessment. The layout plan for the PV array provided by the developer is, therefore, considered to be the most optimal layout from an environmental perspective and the ability to present further feasible layout alternatives is constrained on this basis.

On-site Substation: Two sites have been considered for the siting of the substation (refer to Figure 2.1):

- » **Substation Alternative 1** – is located adjacent to the Pelly-Warmbad 132 kV power line to the east of the R101 and at the southern boundary of the project site bordering onto the neighbouring farm. A power line would then connect from the eastern boundary of the substation to the Pelly-

² GNR543 27(e) calls for the applicant to identify feasible and reasonable alternatives for the proposed activity.

Warmbad 132 kV power line via a loop in / loop out configuration. Substation Alternative 1 would be surrounded by the PV array modules on 3 sides. The area required for the substation would be approximately 1 ha.

- » **Substation Alternative 2** – is located adjacent to the Pelly-Warmbad 132 kV power line to the west of the R101 and bordering onto the R101. A power line would then connect from the northern boundary of the substation to the Pelly-Warmbad 132 kV power line via a loop in / loop out configuration. Substation Alternative 2 would not be surrounded by PV arrays. The area required for the substation would be approximately 1 ha. The layout for this alternative was identified prior to the identification of the vegetation units on the site (refer to Section 5.5.2).

The current layout allows for avoidance of the identified broad-scale ecological impacts and in addition responds to the identified environmental sensitivities as demonstrated later in this report.

2.5.3 Technology Alternatives

As it is the intention of the developer to develop renewable energy projects as part of the DoE's REIPPP Programme, only renewable energy technologies are being considered. Solar energy is considered to be the most suitable renewable energy technology for this site, based on the site location, ambient conditions and energy resource availability (i.e. solar irradiation). Solar PV was determined as the most feasible option for the proposed site as large volumes of water are not needed for power generation purposes compared to concentrated solar power technology (CSP). PV is also preferred when compared to CSP technology due to the lower visual profile and lower water needs.

The environmental impacts of the PV technology choices are not the same. Therefore, the selection of technology will affect environmental impacts of the proposed development. The primary differences which affect the potential for environmental impacts relate to the extent of the facility, or land-take (disturbance or loss of habitat), as well as the height of the facility (visual impacts). The impacts associated with the operation and decommissioning of the facility will be the same irrespective of the technology chosen. Two solar energy technology alternatives are being considered for the proposed project and include:

- » Fixed mounted PV systems (static/fixed-tilt panels), and
- » Tracking PV systems (with solar panels that rotate around a defined axis to follow the sun's movement).

Fixed Mounted PV System

In a fixed mounted PV system (fixed-tilt), PV panels are installed at a pre-determined angle from which they will not move during the lifetime of the plant's operation. The limitations imposed on this system due to its static placement are offset by the fact that the PV panels are able to absorb incident radiation reflected from surrounding objects. In addition, the misalignment of the angle of PV panels has been shown to only marginally affect the efficiency of energy collection. There are further advantages which are gained from fixed mounted systems, including:

- » The maintenance and installation costs of a fixed mounted PV system are lower than that of a tracking system, which is mechanically more complex given that PV mountings include moving parts.
- » Fixed mounted PV systems are an established technology with a proven track record in terms of reliable functioning. In addition, replacement parts are able to be sourced more economically and with greater ease than with alternative systems.
- » Fixed mounted systems are robustly designed and able to withstand greater exposure to winds than tracking systems.
- » Fixed mounted PV systems occupy less space than the tracking systems.

Tracking PV System

Tracking PV Systems (single axis or dual axis trackers) are fixed to mountings which track the sun's movement. There are various tracking systems. A 'single axis tracker' will track the sun from east to west, while a dual axis tracker will in addition be equipped to account for the seasonal waning of the sun. These systems utilise moving parts and more complex technology, which may include solar irradiation sensors to optimise the exposure of PV panels to sunlight. Tracking PV panels follow the sun's rotational path all day, every day of the year giving it the best solar panel orientation and thereby enabling it to generate the maximum possible output power. The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance.

The PV panels are designed to operate continuously for more than 20 years, unattended and with low maintenance. The technology to be used will be the two alternative technologies is assessed further in Chapter 6.

2.5.4. Grid Connection Alternatives

A large degree of land disturbance has already occurred within the immediate area of the project site and on the site itself due to the construction of power line, substation, road and railway line infrastructure.

The proposed facility will connect to the Pelly-Warmbad 132 kV power line (which is the line comprising sections: Sar Warmbad/Warmbad – Sar, Pienaarsrivier/Sar Warmbad, Pelly-Sar/Pienaarsrivier) through a loop in and loop out configuration, thereby enabling direct connection to the grid within a short distance from the facility (less than 50m) and no requirement for the construction of power lines outside the boundaries of the property.

The power generated by the facility will be collected and transformed at an on-site substation situated within the site, occupying an area of approximately 1ha. As indicated in Section 2.5.2, two alternatives for the proposed on-site substation were considered. The alternative on-site substation options are as follows:

- » Alternative 1: To the west of the R101, at the northern most point of the site adjacent to the R101 in order to loop in and loop out of the existing SAR Pienaarsrivier to SAR Warmbad power line.
- » Alternative 2: To the east of the R101, at the southern-most point of the site in order to loop in and loop out of the existing SAR Pienaarsrivier to SAR Warmbad power line.

2.5.5. Do Nothing Alternative

The no-go or do-nothing option would mean that the proposed Gihon Solar Energy Facility including all associated infrastructure would not be developed. Should this alternative be selected, there would be no direct impacts on the area designated for the construction of a PV plant and the indirect impacts associated with the construction and operation of the facility would not be registered. The existing land use which is predominantly grazing and cultivation to a very limited extent would continue indefinitely.

The benefits of the continuation of the land use through the no-go alternative will include:

- » Maintaining rural character of the area and sense of place.
- » No social disruption due to construction phase impacts and disturbance of sense of place during operation.
- » Continued use of the site for grazing purposes.

The limitations of the continuation of the land use through the no-go alternative will include:

- » The land is not used for intensive agricultural purposes and its value as viable agricultural land is limited compared to areas immediately east and other areas further west of the Forever Resorts Nature Reserve.
- » Loss of a renewable energy opportunity and anticipated economic and social benefits.

It is noteworthy that receipt of an environmental authorisation for the project may not necessarily result in the project being implemented due to other external factors, including whether the developers are awarded preferred bidder status by the DoE.

The 'do nothing' alternative will do little to influence the macro-level renewable energy targets set by government due to competition in the sector, and the number of renewable energy projects being bid to the DoE. However, good irradiation and optimal grid connection opportunities would suggest that the project site could experience pressure to develop a PV facility there, as the more optimal sites (i.e. in the Northern Cape) are developed. Furthermore, development near to major urban areas such as Bela-Bela which is near Pretoria (both of which are high consumers of electricity) is desirable in order to avoid electricity inefficiencies (such as line losses). The 'do nothing' alternative is assessed further within this report however the socio-economic and environmental benefits of the Gihon Solar Energy Facility have been established to be significant and include:

- » **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of power supplementation. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.
- » **Resource saving:** Conventional coal fired plants are major consumers of water during their requisite cooling processes. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, when compared with wet cooled conventional power stations. This translates into revenue savings of R26.6 million. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability.
- » **Exploitation of our significant renewable energy resource:** At present, valuable national resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.
- » **Pollution reduction:** The releases of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation. The use of solar radiation for power generation is considered a non-consumptive use of a natural resource which produces zero greenhouse gas emissions.

- » **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of greenhouse gas (GHG) emissions. South Africa is estimated to be responsible for approximately 1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions.
- » **Support for international agreements:** The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol, and for cementing its status as a leading player within the international community.
- » **Employment creation:** The sale, development, installation, maintenance and management of renewable energy facilities have significant potential for job creation in South Africa.
- » **Acceptability to society:** Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.
- » **Support to a new industry sector:** The development of renewable energy offers the opportunity to establish a new industry within the South African economy.

The do-nothing alternative is assessed in Chapter 7.

2.6 Proposed Activities during the Project Development Stages

In order to construct the Gihon Solar Energy Facility and its associated infrastructure, a series of activities will need to be undertaken during the design, pre-construction, construction, operation, and decommissioning phases which are discussed in more detail below. Where possible, dimensions and figures of the relevant components are provided to assist the reader in better understanding the scope of the proposed project.

2.6.1 Design and Pre-Construction Phase

Pre-planning: Several post-authorisation factors are expected to influence the final design of the facility and could result in small-scale modifications of the PV array or associated infrastructure. While an objective of the Engineering, Procurement and Construction (EPC) Contractor who will be responsible for the overall construction phase of the project will be to comply with the approved facility design as far as possible, it should be understood that the construction process is dynamic and that unforeseen changes to the project specifications will result. This EIA Report therefore describes the project in terms of the best available knowledge at the time. The final facility design is required to be

approved by the DEA. Importantly, should there be any substantive changes or deviations from the original scope or layout of the project, the DEA will need to be notified and where relevant, approval obtained.

Conduct Surveys: Prior to initiating construction, a number of surveys will be required including, but not limited to confirmation of the micro-siting footprint (i.e. the precise location of the PV panels, substation and the plant's associated infrastructure) and a geotechnical survey. Geotechnical surveys are executed by geotechnical engineers and geologists to acquire information regarding the physical characteristics of soil and rocks underlying a proposed site. The purpose is to design earthworks and foundations for structures and to execute earthwork repairs necessitated due to changes in the subsurface environment.

2.6.2 Construction Phase

Procurement and employment: The proposed Gihon Solar Energy Facility is likely to create approximately 500 employment opportunities (~7 jobs per MW), depending on the final design. Of this 60% of the opportunities (300 employees) will be available to low-skilled workers (construction labourers, security staff etc.), 10% (50 employees) to semi-skilled workers (drivers, equipment operators etc.), and 30% (150 employees) to skilled personnel (engineers, land surveyors, project managers etc.). The total wage bill for the construction for the project is estimated to be in the region of R13 million (2013 Rand values). The injection of income into the area in the form of wages will represent a significant opportunity for the local economy and businesses in the Bela-Bela area. The majority of the employment opportunities, specifically the low and semi-skilled opportunities, are likely to be available to residents of Bela-Bela and surrounding areas. The majority of the beneficiaries are likely to be historically disadvantaged (HD) members of the community, representing a significant positive social benefit in an area where unemployment is in the region of 23%.

The construction phase will entail a series of activities including:

Undertake Site Preparation: Site preparation involves construction of new access roads and improvement of existing on-site construction access roads with compacted native soil, installation of drainage crossings, setup of construction staging areas, stormwater management work, preparation of land areas for array installation, and other activities needed before installation of the solar arrays can begin. The work would involve trimming of vegetation, selected compacting and grading, and setup of modular offices and other construction facilities.

The PV arrays require a relatively level and stable surface for safe and effective installation. Topographic, geotechnical, and hydrologic studies will be used to determine the necessary grading and compaction.

Trenching would occur within each array to bury the electrical cables. The trenches would be up to ~ 1.8m in width and 2m deep, for a total combined length of approximately 10 km. Minimal ground disturbance may occur within the trenched corridors to restore them after soil has been replaced in the trenches, so that the corridor can conform to the existing surface contours.

Transport of Components and Construction Equipment to Site: The components for the proposed facility will be transported to site by road. For the proposed Gihon Solar Energy Facility, transport of components would occur via the N1 and/or R101 from the direction of suppliers/distributors in Gauteng. Some of the substation components may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)³ by virtue of the dimensional limitations (i.e. size and weight). The typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.), as well as the components required for the establishment of the substation and power line.

Establishment of Construction Equipment Camp: Once the required equipment has been transported to site, a construction equipment camp will need to be established for each phase. The purpose of this camp is to confine activities and storage of equipment to one designated area to limit the potential ecological impacts associated with each phase of the project. The laydown area(s) will be used for assembly purposes and the general placement/storage of construction equipment. The storage of fuel for the on-site construction vehicles and equipment will need to be secured in a temporary bunded facility at the construction camp, so as to prevent the possibility of leakages and soil contamination. It is anticipated that not more than 20 000 litres of fuel stored on site at one time for the refuelling of vehicles and machinery will be required. Fuel stored on site will be stored in a steel tank/s within a secured and bunded area.

Construction crew accommodation: The majority of construction workers are likely to be accommodated in Bela-Bela and surrounding areas. It is not currently anticipated that on-site accommodation is required due to the availability of accommodation in Bela-Bela. It is anticipated that construction crews will be transported to site at the start of each working day and from the site at the end of each working day.

Installation of the PV Power Plant: The construction phase involves installation of the solar PV panels and the entire necessary structural and electrical infrastructure to make the proposed Gihon Solar Energy Facility project operational. In addition, preparation of the soil and improvement of the access

³ A permit will be required for the transportation of these abnormal loads on public roads.

roads would continue throughout the majority of the construction process. For array installation, typically vertical support posts are driven into the ground. Depending on the results of the geotechnical report a different foundation method, such as screw pile, helical pile, micropile or drilled post/pile could be used. The posts will hold the support structures (tables) on which PV modules would be mounted. Brackets attach the PV modules to the tables. Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. While cables are being laid and combiner boxes are being installed, the PV tables are erected. Wire harnesses connect the PV modules to the electrical collection systems. Underground cables and overhead circuits connect the multiple inverters to the on-site substation.

Establishment of Ancillary Infrastructure: Ancillary infrastructure for the project will include a workshop, construction and operational laydown areas and an office. Temporary construction phase laydown areas are planned to be situated in areas of approximately 2ha-3ha on the periphery of the PV arrays and will include the construction camp. The establishment of these areas/facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to construction. The extent of the level to be occupied by the infrastructure is detailed in Table 2.1.

Construct on-site substation and undertake internal electrical reticulation: New internal electrical reticulation will be required in order to connect the proposed facility to the on-site substation. A substation is constructed in the following simplified sequence:

- » Step 1: Survey the area
- » Step 2: Final design of the substation and placement of the infrastructure
- » Step 3: Vegetation clearance and construction of access roads (where required)
- » Step 4: Construction of foundations
- » Step 5: Assembly and erection of infrastructure on site
- » Step 6: Connect conductors
- » Step 7: Rehabilitation of disturbed area and protection of erosion sensitive areas
- » Step 8: Continued maintenance

The expected lifespan of the proposed on-site substation associated with the facility is anticipated to be in line with the economic life of the PV project (in excess of 20 years with continued maintenance). During the life-span of the substation, on-going maintenance is performed and inspections are undertaken by Eskom.

Construct Access and Internal Roads: The site is traversed by the R101 and access to the site is directly from the R101. Several existing access points directly off of the R101 provide access to the eastern portion. Within the site itself, access will be required from the existing roads for construction purposes (and limited access for maintenance during operation). An access road which runs parallel to the existing SAR Pienaarsrivier–SAR Warmbad power line which traverses the site provides access to the eastern portion of the site.

Existing access roads from the R101, approximately 3m in width are required to be upgraded in order to provide access to the PV arrays east and west of the R101. Internal access roads adjacent to the on-site substation accessing the PV arrays will also be required.

Undertake Site Rehabilitation: As construction is completed in an area, and as all construction equipment is removed from the project site, the site must be rehabilitated where practical and reasonable.

2.6.3 Operational Phase

The Gihon Solar Energy Facility is expected to be operational for a minimum of 20 years, with an opportunity for a lifetime of 50 years or more with continuous equipment replacement and repowering. The project will operate continuously, 7 days a week, during daylight hours. While the project will be largely self-sufficient upon completion of construction, monitoring and periodic, as needed maintenance activities will be required. Key elements of the Operation and Maintenance plan include monitoring and reporting the performance of the project, conducting preventative and corrective maintenance, receiving visitors, and maintaining security of the project. The operational phase will create about 25 full-time employment positions. No large scale energy storage mechanisms for the facility which would allow for continued generation at night or on cloudy days are proposed.

2.6.4 Decommissioning Phase

Depending on the continued economic viability of the facility following the initial 20-year operational period, the project will either be decommissioned or the operational phase will be extended. If it is deemed financially viable to extend the operational phase, existing components would either continue to operate or be disassembled and replaced with new, more efficient technology/infrastructure available at that time. However, if the decision is made to decommission the facility, the activities explained below will form part of the project scope.

When the project is ultimately decommissioned, the equipment to be removed will depend on the proposed land use for the site at that time. For example,

depending on the power needs at the time of decommissioning, the on-site substation could remain for use by the utility or other industrial activity.

Below is a discussion of expected decommissioning activities.

Site Preparation: Site preparation activities will include confirming the integrity of the access to the site to accommodate the required decommissioning equipment.

Disassemble and Remove Existing Components: All above ground facilities that are not intended for future use at the site will be removed. Underground equipment (e.g. foundation, wiring) will either be removed, or cut off 1m below the ground surface, and the surface restored to the original contours. Much of the above ground wire, steel, and PV panels of which the system is comprised are recyclable materials and would be recycled to the extent feasible. The components of the plant would be deconstructed and recycled or disposed of in accordance with regulatory requirements. The site will be rehabilitated and can be returned to the agricultural or other beneficial land-use.

REGULATORY AND LEGAL CONTEXT

CHAPTER 3

3.1 National Policy and Planning Context

The need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the Department of Energy (DoE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as solar energy facilities is illustrated in **Figure 3.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed Gihon Solar Energy Facility.

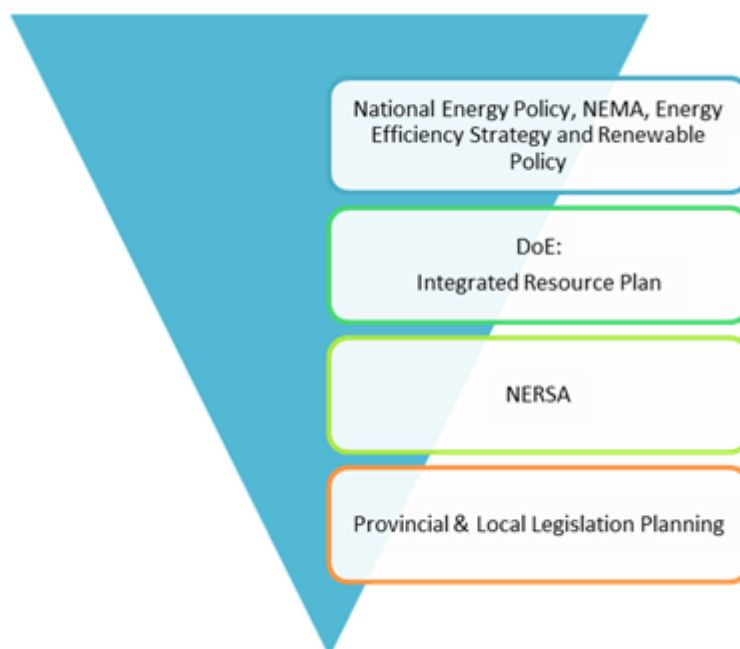


Figure 3.1: Hierarchy of electricity policy and planning documents

3.1.1 The National Energy Act (2008)

The National Energy Act was promulgated in 2008 (Act No 34 of 2008). One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar:

"To ensure that diverse energy resources are available, in sustainable quantities, and at affordable prices, to the South African economy, in support of economic growth and poverty alleviation, taking into account

environmental management requirements (...); to provide for (...) increased generation and consumption of renewable energies...(Preamble)."

The National Energy Act aims to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to renewable energy. The Act provides the legal framework which supports the development of renewable energy facilities for the greater environmental and social good.

3.1.2 White Paper on the Energy Policy of South Africa, 1998

Development within the South African energy sector is governed by the White Paper on a National Energy Policy (DME, 1998). The White Paper identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversity.

As such, investment in renewable energy initiatives is supported, based on an understanding that renewable energy sources have significant medium - long-term commercial potential and can increasingly contribute towards a long-term sustainable energy future.

3.1.3 White Paper on the Energy Policy of South Africa, 1998

Development within the South African energy sector is governed by the White Paper on a National Energy Policy (DME, 1998). The White Paper identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversity.

As such, investment in renewable energy initiatives is supported, based on an understanding that renewable energy sources have significant medium - long-term commercial potential and can increasingly contribute towards a long-term sustainable energy future.

3.1.4 White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)

The White paper on renewable energy supplements the Governments overarching policy on energy as set out in its White Paper on the Energy Policy of the republic of South Africa (DME, 1998). The White Paper on Renewable Energy Policy

recognizes the significance of the medium and long-term potential of renewable energy. The main aim of the policy is to create the conditions for the development and commercial implementation of renewable technologies. The White Paper on Energy Policy's position with respect to renewable energy is based on the integrated resource planning criterion of:

"Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options."

This White Paper on Renewable Energy (November, 2003) sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. South Africa relies heavily on coal to meet its energy needs because it is well-endowed with coal resources; in particular. However South Africa is endowed with renewable energy resources that can be sustainable alternatives to fossil fuels, so far these have remained largely untapped. The White Paper on Renewable Energy sets a target of generating 10 000GWh from renewable energy sources. Therefore the policy supports the investment in renewable energy facilities sources at ensuring energy security through the diversification of supply.

The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology) and more so when social and environmental costs are taken into account. In spite of this range of resources, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

Government policy on renewable energy is therefore concerned with meeting the following challenges:

- » Ensuring that economically feasible technologies and applications are implemented;
- » Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
- » Addressing constraints on the development of the renewable industry.

The White Paper on Renewable Energy states *"It is imperative for South Africa to supplement its existing energy supply with renewable energies to combat Global Climate Change which is having profound impacts on our planet."*

3.1.5 Final Integrated Resource Plan, 2010 - 2030

The Energy Act of 2008 obligates the Minister of Energy to develop and publish an integrated resource plan for energy. Therefore, the Department of Energy (DoE), together with the National Energy Regulator of South Africa (NERSA) has compiled the Integrated Resource Plan (IRP) for the period 2010 to 2030. The objective of the IRP is to develop a sustainable electricity investment strategy for generation capacity and transmission infrastructure for South Africa over the next twenty years. The IRP is intended to:

- » Improve the long term reliability of electricity supply through meeting adequacy criteria over and above keeping pace with economic growth and development;
- » Ascertain South Africa's capacity investment needs for the medium term business planning environment;
- » Consider environmental and other externality impacts and the effect of renewable energy technologies; and
- » Provide the framework for Ministerial determination of new generation capacity (inclusive of the required feasibility studies).

The objective of the IRP is to evaluate the security of supply, and determine the least-cost supply option by considering various demand side management and supply-side options. The IRP also aims to provide information on the opportunities for investment into new power generating projects.

The outcome of the process confirmed that coal-fired options are still required over the next 20 years and that additional base load plants will be required from 2010. The first and interim IRP was developed in 2009 by the Department of Energy. The initial four years of this plan was promulgated by the Minister of Energy on 31 December 2009, and updated on 29 January 2010. The Department of Energy released the Final IRP in March 2011, which was accepted by Parliament at the end of the same month. This Policy-Adjusted IRP is recommended for adoption by Cabinet and subsequent promulgation as the final IRP. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9.6 GW of nuclear; 6.3 GW of coal; 17.8 GW of renewables (including 8,4GW solar); and 8.9 GW of other generation sources.

3.1.6 Electricity Regulation Act, 2006

Under the National Energy Regulator Act, 2004 (Act No 40 of 2004), the Electricity Regulation Act, 2006 (Act No 4 of 2006) and all subsequent relevant Acts of Amendment, NERSA has the mandate to determine the prices at and conditions under which electricity may be supplied by licence to Independent Power Producers (IPPs). NERSA has recently awarded electricity generation

licences for new generation capacity projects under the IPP procurement programme.

3.2 Provincial Policy and Planning Context

3.2.1. Waterberg Spatial Development Framework (2011)

The overarching aim of the Waterberg District Spatial Development Framework (SDF) is to provide a spatial framework within which the sustainable development of the district and its specific resources can be carried out. The Framework is intended to be broad-scaled and centred on principles and issues significant to the district as a whole. The principle focus of the SDF is on spatial elements. The specific development objectives for the district are to:

- » Stimulate development and growth where there is proven demand.
- » Use future growth and development to consolidate and to improve municipal performance.
- » To ensure sustainable use of environmental resources, their enhancement and replenishment.
- » Capitalise on the valuable role of environmental resources.
- » Enhance the uniqueness, ecological sustainability, and liveability of the municipal area.
- » Meet community needs and promote community values and aspirations.
- » Ensure that the municipal structure has timeless qualities and that it does not short-sightedly respond to the mere current needs, circumstances, and fashion.
- » Create new social and economic opportunities and to improve access to the existing ones.
- » Promote the viability of public transport.
- » Promote all aspects of spatial integration.
- » Enrich people's lives, as well as to enhance uniqueness and identity of WDM, by means of a readable municipal form.
- » Enhance the functionality of all the elements constituting the municipal area.
- » Create healthy, comfortable and safe living and working environments for all.
- » Instil business confidence in the municipal area as a whole by providing an enabling spatial framework that supports development.

The SDF does not address the emerging industry of renewable energy. However the SDF documents key social and economic characteristics and aspirations for the Waterberg District Municipal area. Although not directly relevant to the proposed project it is however relevant in terms of contributing to economic development and growth opportunities in the Waterberg region.

3.2.2 The Waterberg District Environmental Management Framework (WDEMF) (2010- Draft)

The purpose of the EMF is to guide decision making in the Waterberg District Municipality area in order to facilitate appropriate and sustainable development. The EMF integrates policies and frameworks and aligns government mandates to streamline decision-making and to improve cooperative governance. The EMF has a number of specific objectives, which include identifying the status quo, development pressures and trends in the area and development of a decision support system for development in the area to ensure that environmental attributes, issues and priorities are taken into account.

Siting of new developments must be in line with the environmental management planning contained in the EMF. The proposed project is located in zone 10 in the Bela-Bela area which is an intensive agricultural priority area with commercial focus. One of the undesirable activities listed under zone 10 includes 'energy generation plants of any sort including wind turbines and solar panels and reflectors (excluding small systems that are used on farms).' However, for the farm Turfbult, no commercial agricultural activity takes place within the proposed project site. Therefore the proposed development will not obstruct any commercial agricultural activities and is not viewed to be in conflict with the EMF.

3.2.3 Bela-Bela Local Municipality Integrated Development Plan (2013/2014)

The main local planning document is the Bela-Bela Municipality Integrated Development Plan (IDP) (2013/2014). The Municipal vision and mission focusses on tourism characteristics of the area "Bela-Bela as a Tourism Getaway", Service Delivery Commitment for the community of Bela-Bela, Sustained Environmental friendliness and Economic Growth and Employment Creation. The Bela-Bela Municipality IDP is the fundamental strategic plan for the Municipality through which development planning is managed. The IDP takes into account the issues and problems unique to the area and proposes appropriate strategies and projects to address these in a manner which supports long term sustainable development. Tourism also plays a vital role in Bela-Bela. The proposed Solar Energy Facility will contribute to employment creation and economic growth which supports the Bela-Bela Local Municipality (IDP).

3.3.2 Legislation and Guidelines that have informed the preparation of this EIA Report

The following legislation and guidelines have informed the scope and content of this EIA Report:

- » National Environmental Management Act (Act No 107 of 1998).
- » EIA Regulations, published under Chapter 5 of the NEMA (GNR543, GNR544, GNR545, and GNR546 in Government Gazette 33306 of 18 June 2010).
- » Guidelines published in terms of the NEMA EIA Regulations, in particular:
 - * Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010).
 - * Public Participation in the EIA Process (DEA, 2010).
- » International guidelines – the Equator Principles

Several other acts, standards, or guidelines have also informed the project process and the scope of issues addressed and assessed in the EIA Report. A review of legislative requirements applicable to the proposed project is provided in the **Table 3.1**. **Table 3.2** provides the relevant South African environmental legislation applicable to the project in terms of environmental quality.

Table 3.1: Relevant legislative permitting requirements applicable to the proposed Gihon solar energy facility

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
National Environmental Management Act (Act No 107 of 1998)	<p>The EIA Regulations have been promulgated in terms of Chapter 5 of the Act. Listed activities which may not commence without an environmental authorisation are identified within these Regulations.</p> <p>In terms of S24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.</p> <p>In terms of GN R543, R544, R545 and R546 of 18 June 2010, a Scoping and EIA Process is required to be undertaken for the proposed project.</p>	<p>Department of Environmental Affairs – competent authority</p> <p>Limpopo Department of Economic Development, Environment and Tourism) - commenting authority</p>	<p>The listed activities triggered by the proposed solar energy facility have been identified and assessed in the EIA process being undertaken (i.e. Scoping and EIA).</p> <p>This EIA Report will be submitted to the competent and commenting authority in support of the application for authorisation.</p>
National Environmental Management Act (Act No 107 of 1998)	<p>In terms of the Duty of Care Provision in S28(1) the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised.</p> <p>In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.</p>	Department of Environmental Affairs	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section has found application during the EIA Phase through the consideration of potential impacts (cumulative, direct, and indirect). It will continue to apply throughout the life cycle of the project.
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)	Department of Environmental Affairs	Noise impacts are expected to be associated with the construction

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
		<p>Limpopo Department of Economic Development, Environment and Tourism -</p> <p>Local Authorities</p>	<p>phase of the project and are not likely to present a significant intrusion to the local community. Therefore is no requirement for a noise permit in terms of the legislation.</p> <p>On-site activities should be limited to 6:00am - 6:00pm, Monday – Saturday (excluding public holidays).</p> <p>Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from DEA and the Local Municipality.</p>
<p>National Water Act (Act No 36 of 1998)</p>	<p>Water uses under S21 of the Act must be licensed, unless such water use falls into one of the categories listed in S22 of the Act or falls under the general authorisation (and then registration of the water use is required).</p> <p>Consumptive water uses may include the taking of water from a water resource and storage - Sections 21a and b.</p> <p>Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and altering of bed, banks or characteristics of a</p>	<p>Department of Water Affairs</p> <p>Provincial Department of Water Affairs</p>	<p>A water use license (WUL) is required to be obtained if wetlands or drainage lines are impacted on, or if infrastructure lies within 500m of wetland features or the regulated area of a watercourse (being the riparian zone or the 1:100yr floodline whichever is greatest).</p> <p>Should water be extracted from</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	watercourse - Section 21i.		groundwater/ a borehole on site for use within the facility, a water use license will be required in terms of Section 21(a) and 21 (b) of the National Water Act.
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	<p>A mining permit or mining right may be required where a mineral in question is to be mined (e.g. materials from a borrow pit) in accordance with the provisions of the Act.</p> <p>Requirements for Environmental Management Programmes and Environmental Management Plans are set out in S39 of the Act.</p> <p>S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that might occur on site.</p>	Department of Mineral Resources	<p>As no borrow pits are expected to be required for the construction of the facility, no mining permit or right is required to be obtained.</p> <p>A Section 53 application will be submitted the Limpopo DMR office.</p>
National Environmental Management: Air Quality Act (Act No 39 of 2004)	<p>Measures in respect of dust control (S32) and National Dust Control Regulations of November 2013.</p> <p>Measures to control noise (S34) - no regulations promulgated yet.</p>	Department of Environmental Affairs	No permitting or licensing requirements arise from this legislation. However, National, provincial and local ambient air quality standards (S9 - 10 & S11) to be considered.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			<p>Measures in respect of dust control (S32) and the National Dust Control Regulations of November 2013.</p> <p>The Act provides that an air quality officer may require any person to submit an atmospheric impact report if there is reasonable suspicion that the person has failed to comply with the Act.</p>
National Heritage Resources Act (Act No 25 of 1999)	<ul style="list-style-type: none"> » Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35). » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38). » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological 	South African Heritage Resources Agency	An HIA and PIA has been undertaken as part of the EIA Process to identify heritage sites (refer to Appendix I). Should a heritage resource be impacted upon, a permit may be required from SAHRA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
<p>National Environmental Management: Biodiversity Act (Act No 10 of 2004)</p>	<p>sites as part of tourism attraction (S44).</p> <ul style="list-style-type: none"> » Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011). » This Act also regulates alien and invader species. 	<p>Department of Environmental Affairs</p>	<p>Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.</p> <p>An ecological study has been undertaken as part of the EIA Phase. As such the potential occurrence of critically endangered, endangered, vulnerable, and protected species and the potential for them to be affected has been considered. This report is contained in Appendix E.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Conservation of Agricultural Resources Act (Act No 43 of 1983)	<ul style="list-style-type: none"> » Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur. » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048). 	Department of Agriculture	<p>This Act will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented.</p> <p>The permission of agricultural authorities will be required if the Project requires the draining of vleis, marshes or water sponges on land outside urban areas. There are none for this project.</p>
National Forests Act (Act No. 84 of 1998)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.	National Department of Forestry	A licence is required for the removal of protected trees. No protected trees were identified for this project. Should any protected trees need to be removed, a permit will be required to be obtained from DAFF.
National Veld and Forest Fire Act (Act 101 of 1998)	In terms of S12 the applicant must ensure that the firebreak is wide and long enough to have a reasonable chance of preventing the fire from	Department of Agriculture, Forestry and Fisheries (DAFF)	While no permitting or licensing requirements arise from this legislation, this Act will find

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>spreading, not causing erosion, and is reasonably free of inflammable material.</p> <p>In terms of S17, the applicant must have such equipment, protective clothing, and trained personnel for extinguishing fires.</p>		<p>application during the construction and operational phase of the project.</p>
<p>Hazardous Substances Act (Act No 15 of 1973)</p>	<p>This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.</p> <p>Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance</p> <p>Group IV: any electronic product; and</p> <p>Group V: any radioactive material.</p> <p>The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.</p>	<p>Department of Health</p>	<p>It is necessary to identify and list all the Group I, II, III, and IV hazardous substances that may be on the site and in what operational context they are used, stored or handled. If applicable, a license is required to be obtained from the Department of Health.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Development Facilitation Act (Act No 67 of 1995)	<p>Provides for the overall framework and administrative structures for planning throughout the Republic.</p> <p>S(2-4) provide general principles for land development and conflict resolution.</p>	Local Municipality	The applicant must submit a land development application in the prescribed manner and form as provided for in the Act. A land development applicant who wishes to establish a land development area must comply with procedures set out in the Act.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	<p>The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment.</p> <p>The Minister may amend the list by –</p> <ul style="list-style-type: none"> » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. <p>In terms of the Regulations published in terms of this Act (GN 921), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed activities.</p> <p>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:</p> <ul style="list-style-type: none"> » The containers in which any waste is stored, are 	<p>National Department of Water and Environmental Affairs (hazardous waste)</p> <p>Limpopo Department of Economic Development, Environment and Tourism (general waste)</p>	<p>As no waste disposal site is to be associated with the proposed project, no permit is required in this regard.</p> <p>General waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of the Act, as detailed in the EMP (refer to Appendix K). The DWAF (1998) Waste Management Series. Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste will also need to be considered.</p> <p>The volumes of solid waste to be generated and stored on the site during construction and operation of the facility will not require a</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>intact and not corroded or in any other way rendered unfit for the safe storage of waste.</p> <ul style="list-style-type: none"> » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise; and » Pollution of the environment and harm to health are prevented. 		<p>waste license (provided these remain below the prescribed thresholds).</p> <p>The contractor's camp will result in sewage and grey water handling. Sewage is regarded as hazardous waste in terms of this Act.</p>
Subdivision of Agricultural Land Act (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the country	Department of Agriculture	Subdivision of land may be required in terms of S24 and S17 of the Act.
National Road Traffic Act (Act No 93 of 1996)	<ul style="list-style-type: none"> » The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. » Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. » The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating 	<ul style="list-style-type: none"> » South African National Roads Agency Limited (national roads) » Provincial Department of Transport 	An abnormal load/vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the power station components may not meet specified dimensional limitations (height and width).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.</p>		
Provincial Legislation			
<p>Limpopo Environmental Management Act / LIMA (Act 7 of 2003)</p>	<p>This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:</p> <ul style="list-style-type: none"> » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. » The Act provides lists of protected species for the Province. 	<p>Limpopo Department of Economic Development, Environment and Tourism</p>	<p>A collection/destruction permit must be obtained from LEDET for the removal of any protected plant species found on site. Additionally, a permit for the disturbance or destruction of indigenous species must be applied for.</p>

APPROACH TO UNDERTAKING THE EIA PHASE

CHAPTER 4

The EIA process for the proposed Gihon Solar Energy Facility facility is regulated by the EIA Regulations of June 2010 (as amended), which involves the identification of and assessment of direct, indirect, and cumulative environmental impacts (both positive and negative) associated with a proposed project. The EIA process forms part of the feasibility studies for a project, and comprises a Scoping Phase and EIA Phase which culminates in the submission of an EIA Report together with an Environmental Management Programme (EMPr) to the competent authority for decision-making.

The EIA process for the proposed Gihon Solar Energy Facility has been undertaken in accordance with the EIA Regulations in terms of Sections 24 and 24D of NEMA, as read with the EIA Regulations of GNR544; GNR545; and GNR546 of Section 24(5) of the National Environmental Management Act (NEMA Act No. 107 of 1998).

4.1. Scoping Phase

The scoping phase served to identify potential issues associated with the proposed project, and define the extent of studies required within the EIA Phase. This was achieved through an evaluation of the proposed project, involving the project proponent, specialist consultants, and a consultation process with key stakeholders that included both relevant government authorities and interested and affected parties (I&APs).

Scoping results influencing the project scope: The proposed Gihon Solar Energy Facility will make use of photovoltaic (PV) technology and will have a generating capacity of up to 75MW. The project was introduced in the Scoping phase as having a generating capacity up to 150MW and a study area of 392ha in extent. As indicated in Section 2.1.4, the total generating capacity of the project has been revised to 75MW only. In addition, an expanded section of the Farm Turfbult 494 KR (same portions of the farm included at Scoping) were provided for assessment in response to concerns raised by Forever Resorts Warmbaths, who operate a popular eco-tourism resort bordering the majority of the western portion of the proposed project site. These additional areas are not however to be considered as alternative areas for the siting of the facility, as they fall within the same portions of the Farm Turfbult 494KR originally included at Scoping. The extent of the farm portion assessed in this EIA report is 481ha.

In addition, the following results of the Scoping study were factored into the EIA phase and the development of the facility layout plan:

- » Grazing is practised across the majority of the site and the land has not been cultivated in the last 12 years (since 2002).
- » No surface water features were identified at Scoping, which meant that no areas of the site needed to be excluded at a conceptual level on this basis.
- » On the western periphery of the site, at the boundary shared with Forever Resorts, it was identified that intact sections of the Endangered Springbokvlakte Thornveld vegetation could be present.
- » Correspondence from Forever Resorts suggested that the proposed development was supported, but that consideration should be given to excluding the portion of the project site situated between the eastern boundary of Forever Resorts and the railway line which traverses the western section of the project site, on the basis of concerns relating to indirect ecological impacts as well as the anticipated visual impact of the facility.

No environmental fatal flaws were identified to be associated with the broader site through this process. The final Scoping Report was accepted by the DEA in December 2013.

4.2. Environmental Impact Assessment Phase

The EIA Phase for the proposed Gihon Solar Energy Facility aims to achieve the following:

- » Provide a comprehensive assessment of the social and biophysical environments affected by the proposed phases put forward as part of the project.
- » Assess potentially significant impacts (direct, indirect, and cumulative, where required) associated with the proposed facilities.
- » Comparatively assess any alternatives put forward as part of the projects.
- » Identify and recommend appropriate mitigation measures for potentially significant environmental impacts.
- » Undertake a fully inclusive public participation process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

The EIA Report addresses potential direct, indirect, and cumulative⁴ impacts (both positive and negative) associated with all phases of the project including design,

⁴ "Cumulative environmental change or cumulative effects may result from the additive effect of individual actions of the same nature or the interactive effect of multiple actions of a different nature" (Spaling and Smit, 1993).

construction, operation and decommissioning. In this regard the EIA Report aims to provide the relevant authorities with sufficient information to make an informed decision regarding the proposed project.

4.2.1. Tasks completed during the EIA Phase

The EIA Phase for the proposed Gihon Solar Energy Facility has been undertaken in accordance with the EIA Regulations published in GN 33306 of 18 June 2010, in terms of NEMA. Key tasks undertaken within the EIA phase included:

- » Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
- » Undertaking a public participation process throughout the EIA process in accordance with Regulation 54 of GN R543 of 2010 in order to identify any additional issues and concerns associated with the proposed project.
- » Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of GN R543 of 2010).
- » Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
- » Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.
- » Prepare a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process (in accordance with Regulation 57 of GN R543 of 2010).
- » Undertaking of independent specialist studies in accordance with Regulation 32 of GN R543 of 2010.
- » Preparation of a Draft EIA Report in accordance with the requirements of the Regulation 31 of GN R543 of 2010.

4.2.2 Authority Consultation

The National DEA is the competent authority for this application. A record of all authority consultation undertaken is included within this EIA report. Consultation with the regulating authorities (i.e. DEA and LEDET) has continued throughout the EIA process. Correspondence from authorities during the process included the following:

- » Comment from LEDET on the draft Scoping Report indicating that there is no objection to the proposed project and specifying measures for mitigation during construction of the facility.
- » Comment from the Department of Rural Development and Land Reform (Spatial Planning and Land Use Management) confirming that the land is not

subject to a land claim and that the proposed Gihon Solar Energy Facility project is supported.

- » Comment from the Department of Water Affairs concerning water entitlements and measures for stormwater and erosion control and control of pollution, waste and sewerage.
- » The Final Scoping Report for the Gihon Solar Energy Facility together with a Plan of Study for the EIA phase was accepted by DEA in December 2013.

The following will also be undertaken as part of this EIA process:

- » Submission of a final EIA Report to DEA following a public review period for the draft EIA.
- » If required, an opportunity for DEA and LEDET representatives to visit and inspect the proposed project site.
- » Notification and Consultation with Organs of State that may have jurisdiction over the project, including:
 - * Provincial and local government departments (including South African Heritage Resources Agency, Department of Water Affairs, South African National Roads Agency Limited, Department of Agriculture, etc.).
 - * Government Structures (refer to Table 4.1).

A record of the authority consultation in the EIA process is included within **Appendix B**.

4.2.3 Public Involvement and Consultation

The aim of the public participation process is primarily to ensure that:

- » Information containing all relevant facts in respect of the proposed project was made available to potential stakeholders and I&APs.
- » Participation by potential I&APs was facilitated in such a manner that all potential stakeholders and I&APs were provided with a reasonable opportunity to comment on the proposed project.
- » Comments received from stakeholders and I&APs were recorded and incorporated into the EIA process.

In order to accommodate the varying needs of stakeholders and I&APs within the study area, as well as capture their inputs regarding the project, various opportunities for stakeholders and I&APs to be involved in the EIA Phase of the process have been provided, as follows:

- » Focus group meetings and a public meeting (pre-arranged and stakeholders invited to attend - for example with directly affected and surrounding landowners).

- » Telephonic consultation sessions (consultation with various parties from the EIA project team, including the project participation consultant, lead EIA consultant as well as specialist consultants).
- » Written, faxed or e-mail correspondence.
- » The Draft EIA Report was released for a 30-day public review period from 28 February 2014 – 31 March 2014: The comments received from I&APs will be captured within a Comments and Response Report, which will be included within the Final EIA Report, for submission to the authorities for decision-making.

In terms of the requirement of Chapter 6 of the EIA Regulations of June 2010, the following public participation tasks are required to be undertaken:

- » Distribution of Letters of Notification to I&APs to inform them of commencement with the EIA phase.
- » Fixing a notice board at a place conspicuous to the public at the boundary or on the fence of—
 - (i) the site where the activity to which the application relates is or is to be undertaken; and
 - (ii) any alternative site mentioned in the application;
- » Giving written notice to:
 - (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
 - (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
 - (iii) Owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
 - (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
 - (v) the municipality which has jurisdiction in the area;
 - (vi) any organ of state having jurisdiction in respect of any aspect of the activity; and
 - (vii) any other party as required by the competent authority.
- » Placing an advertisement in:
 - (i) one local newspaper; and
 - (ii) in at least one provincial newspaper.
- » Open and maintain a register/ database of interested and affected parties and organs of state.
- » Release of a Draft EIA Report for Public Review for a 30-day period.
- » Hosting of a Public Meeting and Focus Group Meetings by the EAP to discuss and share information on the project.

- » Preparation of a Comments and Responses Report which document all the comments received and responses from the project team.
- » Apart from the 30 day commenting period on the Draft EIR, in order to give effect to Regulation 56(2), registered Interested and Affected parties will be given access to, and an opportunity to comment on the final report in writing before submitting the final environmental impact assessment report to the DEA.

Below is a summary of the key public participation activities conducted thus far.

- » **Placement of Site Notices**
Site notices have been placed on-site and at relevant public places and proof of this is included in Appendix D.
- » **Identification of I&APs and establishment of a database**
Identification of I&APs was undertaken by Savannah Environmental through existing contacts and databases, recording responses to site notices and the newspaper advertisement, as well as through the process of networking. The key stakeholder groups identified include authorities, local and district municipalities, public stakeholders, Parastatals and Non-Governmental Organisations (refer to Table 4.1 below).

Table 4.1: Key stakeholder groups identified during the EIA Process

Stakeholder Group	Department
National and Provincial Authorities	<ul style="list-style-type: none"> » Limpopo Province – Department of Economic Development, Environment and Tourism » Department of Transport and Public Works » Department of Water Affairs » South African Heritage Resources Agency » Department of Agriculture, Forestry and Fisheries » South African National Roads Agency » Department of Energy » Civil Aviation Authority » Square Kilometre Array (SKA) Project
Municipalities	<ul style="list-style-type: none"> » Bela-Bela Local Municipality » Waterberg District Municipality
Public stakeholders	<ul style="list-style-type: none"> » Landowners, surrounding landowners, occupiers of land, farmer’s unions.
Parastatals & service providers	<ul style="list-style-type: none"> » Eskom Transmission and Distribution » Limpopo Heritage Resources Agency (LIHRA)
NGOs/Business forums	<ul style="list-style-type: none"> » Wildlife Environment Society of South Africa » BirdLife South Africa

All relevant stakeholder and I&AP information has been recorded within a database of affected parties (refer to Appendix C). While I&APs were encouraged

to register their interest in the project from the onset of the process undertaken by Savannah Environmental, the identification and registration of I&APs has been on-going for the duration of the EIA phase of the process.

» **Newspaper Advertisements**

Newspaper advertisements were placed to inform the public of the availability of the draft EIA Report for comment in the following newspapers:

- * Limpopo Beat (English – 5 March 2014)
- * Die Pos (Afrikaans – 6 March 2014)

Refer to Appendix D for proof of advertisements which were placed.

» **Consultation**

In order to accommodate the varying needs of stakeholders and I&APs, the following opportunities have been provided for I&AP issues to be recorded and verified through the EIA phase, including:

- * Focus group meetings (stakeholders invited to attend)
- * Public meeting (advertised in the local press)
- * Written, faxed or e-mail correspondence

Meetings were held with the following stakeholders during the process:

- * Forever Resorts
 - * Bela-Bela Local Municipality (Social Services, Planning Department and Electrical Department)
 - * Other adjacent landowners including Mr Coetser, Mr Duvenage
- » In order to further facilitate comments on the Draft EIA report and to provide feedback on the findings of the specialist scoping studies, a public meeting will be arranged during the draft EIA comment period and advertised to I&APs and in the media.

Records of all consultation undertaken will be included within **Appendix D**.

4.2.4 Identification and Recording of Issues and Concerns

Issues and comments raised by I&APs over the duration of the EIA process will be synthesised into a Comments and Response Reports. The Comments and Response Report will include responses from members of the EIA project team and/or the project proponent. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view is provided.

4.2.5 Assessment of Issues Identified through the Scoping Process

Issues which require investigation within the EIA Phase, as well as the specialists involved in the assessment of these impacts are indicated in Table 4.2 below.

Table 4.2: Specialist studies undertaken within the EIA Phase

Specialist study	Specialist	Refer Appendix
Ecological Impact Assessment	Gerhard Botha (and reviewed by Marianne Strohbach of Savannah Environmental)	Appendix E
Soils and Agricultural Potential Assessment	Johann Lanz (Soil Scientist and Consultant)	Appendix F
Visual Impact Assessment	Lourens du Plessis of MetroGIS	Appendix G
Social Impact Assessment	Candice Hunter of Savannah Environmental and Neville Bews of Neville Bews and Associates	Appendix H
Heritage Impact Assessment	Jaco van der Walt (Archaeological Contracts and Heritage Consulting (HCAC))	Appendix I
Palaeontology specialist report	Dr John Almond of Natura Viva	Appendix J

Specialist studies considered direct, indirect, cumulative, and residual environmental impacts associated with the development of the proposed Gihon Solar Energy Facility. Issues were assessed in terms of the following criteria:

- » The **nature**, a description of what causes the effect, what will be affected, and how it will be affected
- » The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high)
- » The **duration**, wherein it is indicated whether:
 - * The lifetime of the impact will be of a very short duration (0-1 years) – assigned a score of 1
 - * The lifetime of the impact will be of a short duration (2-5 years) – assigned a score of 2
 - * Medium-term (5-15 years) – assigned a score of 3
 - * Long term (> 15 years) – assigned a score of 4
 - * Permanent – assigned a score of 5
- » The **magnitude**, quantified on a scale from 0-10, where a score is assigned:

- * 0 is small and will have no effect on the environment
- * 2 is minor and will not result in an impact on processes
- * 4 is low and will cause a slight impact on processes
- * 6 is moderate and will result in processes continuing but in a modified way
- * 8 is high (processes are altered to the extent that they temporarily cease)
- * 10 is very high and results in complete destruction of patterns and permanent cessation of processes
- » The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
 - * Assigned a score of 1–5, where 1 is very improbable (probably will not happen)
 - * Assigned a score of 2 is improbable (some possibility, but low likelihood)
 - * Assigned a score of 3 is probable (distinct possibility)
 - * Assigned a score of 4 is highly probable (most likely)
 - * Assigned a score of 5 is definite (impact will occur regardless of any prevention measures)
- » The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high
- » The **status**, which is described as either positive, negative or neutral
- » The degree to which the impact can be reversed
- » The degree to which the impact may cause irreplaceable loss of resources
- » The degree to which the impact can be mitigated

The **significance** is determined by combining the criteria in the following formula:

$S = (E+D+M) P$; where

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

- » **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
- » **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)

- » **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area)

As the developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. A draft EMPr is included as **Appendix K**.

4.2.6 Assumptions and Limitations

The following assumptions and limitations are applicable to the studies undertaken within this EIA Phase:

- » All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
- » It is assumed that the development site identified by the developer represents a technically suitable site for the establishment of the proposed Gihon Solar Energy Facility.
- » It is assumed correct that the proposed connection to the National Grid is correct in terms of viability and need.
- » Studies assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset.
- » This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices E – J** for specialist study specific limitations.

DESCRIPTION OF THE RECEIVING ENVIRONMENT

CHAPTER 5

This section of the EIA Report provides a description of the environment of the greater farm portion as well as the specific site within the greater farm portion that may be affected by the proposed Gihon Solar Energy Facility project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from both existing information available for the area as well as site investigations, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist reports contained within **Appendices E - J**.

5.1 Regional description

The identified site for the proposed Gihon PV Solar Energy Facility is situated approximately 4km south of Bela-Bela on Portions 1, 2, 5 and 7 of the farm Turfbult 494 KR. These farms are located in an area that has a distinct rural and agricultural character, with very little development in close proximity to the site. The average population density of the district municipality is estimated at approximately 13 people per km², primarily concentrated within the town of Bela-Bela. The topography of the area (Figure 5.1) is relatively flat and land use in the general area is characterised by agriculture, with limited crop and cattle farming.

The project site is accessible from the R101 arterial road by means of gravel roads that intersect with this regional route. The R101 is an alternative route between Bela-Bela and the Gauteng Province, frequented by residents and visitors to the region using an alternative route to the N1 toll road. This road is popular with day visitors to the Forever Resorts holiday resort located in Bela-Bela, which shares a farm boundary with the project site. It is also, together with the R516 from the N1, seen as the primary tourist access route to the southern Waterberg District and its numerous nature reserves, game farms and holiday resorts. In this respect the town of Bela-Bela acts as a gateway to the region and its multitude of tourist resorts and game lodges.

Land use activities to the north of Bela-Bela are predominantly and broadly described as game farming with limited cattle farming. The area south and east of this town (generally referred to as the Springbok Flats) is utilised primarily for maize farming, but may include sunflower cultivation, (limited) citrus plantations and cattle farming. Forever Resorts Warmbaths (previously known as the Hetbad Nature Reserve), is located immediately north and west of the western section of the proposed development site and is also the only protected area identified

within the study area. This reserve is bordered to the west by small holdings where a mix of commercial and subsistence agricultural activities is practised.

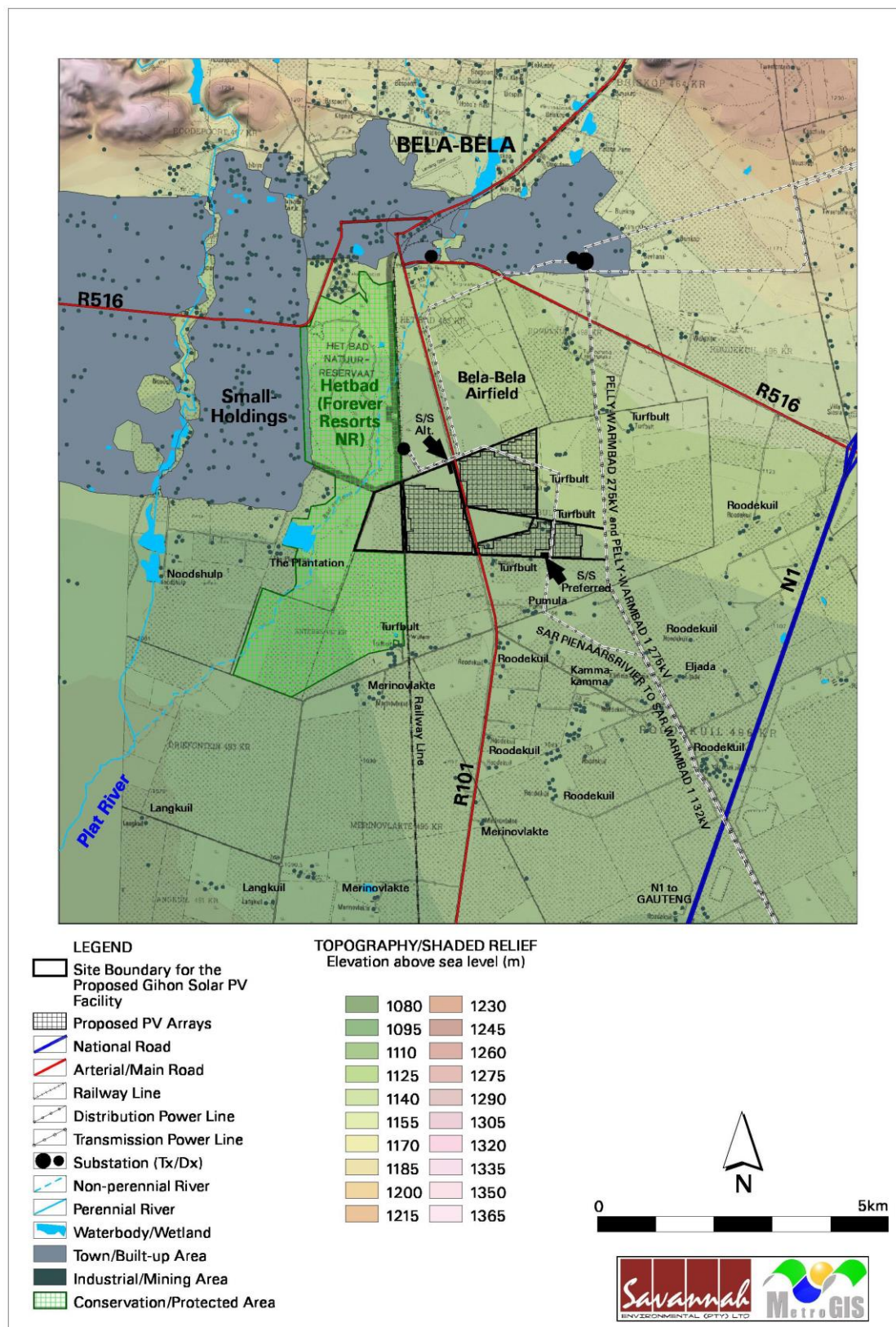


Figure 5.1: Topographic map showing the Gihon Solar Energy Facility site.

5.2 Geology and palaeontological potential

The study area lies on the north-western edge of the Springbok Flats Basin and is underlain by basaltic volcanics of the Lebombo Group (Karoo Igneous Province) of Early Jurassic age (Duncan & Marsh, 2009). These are mapped as belonging to the Letaba Formation (picritic lavas) overlying Triassic continental sediments of the Stormberg Group in the Springbok Flats Basin.

The Karoo volcanics are mantled by Cenozoic superficial deposits such as calcrete hardpans, downwasted gravels, alluvium and soils. Igneous rocks such as basaltic lavas are generally unfossiliferous and no fossils have been recorded from the Letaba Formation succession of the Lebombo Group in the Springbok Flats Basin. The fossiliferous Stormberg Group rocks which underlie the site will not be impacted by the proposed development. Fossils (e.g. plants, traces, vertebrate bones) might occur within thin sedimentary intervals between the successive lava flows but are likely to be very sparse. The overlying Cenozoic superficial sediments are likewise of low to very low palaeontological sensitivity.

5.3 Climate

Bela Bela generally experiences hot semi-arid climate, with average temperatures between 20° – 29°C. The highest temperatures are in summer days varying between 28° – 34°C in October and March. Similarly during summer, nights are hot to mild, with temperature ranging from 16° – 21°C. In winter, temperatures are mild during the day and may vary within a range of 19.6° – 25.1°C in April to September. Winter nights are cold with temperatures declining to 4.3° – 12.1°C.

The region receives an average of 500-650mm rainfall per annum and is representative of the climate associated with the Bushveld Basin.

5.4 Land-Use and Status

The proposed Gihon Solar Energy Facility project site falls within a grain producing agricultural region. Much of the land on the site was cleared of natural bushveld in the past for agricultural purposes, however the land has not been cultivated in the last twelve years, except for a 3ha section of irrigated lucerne in the east of the project site. There is also a very small lemon orchard occurring on the farm. The rest of the land is used only for grazing of cattle and game.

Other infrastructure located on the project site includes a railway line which traverses the section of the site to the west of the R101 in a north-south direction, as well as the SAR Warmbad-Warmbad 1 132kV power line which borders the northern boundary before traversing the site in the section east of the R101.

Surrounding land uses are for tourism and agricultural use, the former surrounding the land west of the R101, the latter dominating adjacent land use to the east. The Het-Bad Nature Reserve (Forever Resorts Nature Reserve) was proclaimed a nature reserve in 2003 and was extended in 2007 to include farm portions to the west and south west of the proposed Gihon Solar Energy Facility. Homesteads or farm residences are found throughout the area. Some of these are located in close proximity to the proposed development site. The Bela-Bela airfield (Falcons Flying Club) is situated to the north of the project area and east of the R101. Municipal land is situated to the east of the project site.

5.5 Regional floristic description

5.5.1 Broad scale vegetation patterns and conservation status

The project study area is situated in the Savanna biome, and is covered by the Springbokvlakte Thornveld a vegetation type that is currently listed as vulnerable. This vegetation type been described by Mucina and Rutherford (2006) as open to dense, low thorn savanna dominated by *Acacia* species or shrubby grassland.

The project site is not situated within a Critical Biodiversity Area (CBA) defined by the province, however, as indicated above the farm is located on the Springbokvlakte Thornveld, listed as Vulnerable. The extent of the Springbokvlakte Thornveld vegetation type is limited on the site, due to agricultural activities which occurred over the greater extent of the farm, particularly directly east and west of the R101. Representative areas of this vegetation type, where much of the vegetation remains intact are described in the section below.

5.5.2 Fine scale vegetation patterns

The following fine-scale vegetation units were determined to be present within the project site:

Unit 1 (*Brachiaria eruciformis* – *Acacia nilotica*) – less than 15% cover

This unit coincides with the typical description or natural state of the vegetation type described by Mucina and Rutherford (2006) which is Springbokvlakte Thornveld, characterized by an open to semi dense low thorn savanna with a well-developed tree, shrub and forb layer. This unit has a fractured distribution which combined constitutes less than 15% of the total project site. This unit is extremely high in species diversity when compared to the other units. To the far east of the farm, a small narrow fragment of this unit is located where it characterises the vegetation of a drainage line.

The following is applicable to this vegetation unit:

- » Disturbance - Low level of disturbance. Highly fragmented unit. Located along boarder fence with firebreak. Power line crosses a small section of the north western part of the unit. Low levels of weeds and alien species.
- » Species richness - 58 species recorded of 113 expected on study area
- » Conservation value - High; natural and relatively undisturbed representation of Springbokvlakte Thornveld.
- » Ecosystem function - High; provides a habitat and variety of niches for a wide variety of organisms (faunal and floral).
- » Sensitivity - High
- » Need for rehabilitation - None

Dominant species include:

Acacia nilotica, *A. tenuispina*, *Ziziphus mucronata*, *Searsia lancea*, *Diospyros lyciodes*, *Digitaria eriantha*, *Asparagus setaceus*, *Achyranthes aspera*, *Cyathula uncinulata*, *Crabbea angustifolia*, *Brachiaria eruciformis*, *Panicum coloratum*, *Panicum maximum*, *Sporobolus ioclados*, *Ischaemum afrum*, *Dinebra retroflexa*.

Rare and endangered species include:

- » *Aloe greatheadii* var. *davyana*



Figure 5.2: A view of vegetation unit 1 from the project site

Unit 2 (*Dichantium annulata* – *Aristida bipartita*) – 70% cover

This grassland unit covers the majority of the project site (approximately 70%) and is characterized as severely degraded and transformed, mainly due to anthropogenic influence (bush clearance). This unit is extremely species poor and a very sparse tall shrub/small tree layer is present.

The following is applicable to this vegetation unit:

- » Disturbance - Total transformation of area due to bush clearance for grazing purpose (pasture).
- » Species richness - 12 species recorded of 113 expected in study area
- » Conservation value – Low
- » Ecosystem function – Immediate Ecosystem: Low. Larger Ecosystem: West of the railway line this unit may fulfil a more important function regarding the broader ecosystem.
- » Sensitivity - Low
- » Need for rehabilitation – This area has been transformed past the point of rehabilitation.

Dominant species include:

Aristida bipartita, *Ischaemum afrum*, *Ischaemum spp.*, *Setaria sphacelata* var. *sphacelata*, *Bothriochloa insculpta*, *Sesbania bispinosa*, *Osteospermum muricatum*, *Senecio spp.*, *Acacia karroo*, *A. tortilis*

Rare and endangered species include:

- » *None*



Figure 5.3: A view of vegetation Unit 2

Unit 3 (*Tephrosia capensis*– *Hyparrhenia filipendula*)

This species poor grass dominated unit is located on a reddish soil with a lower clay content. The most important ecological disturbance is that of bush clearance.

The following is applicable to this vegetation unit:

- » Disturbance - Total transformation of area due to bush clearance.
- » Species richness - 9 species recorded of 113 expected on study area
- » Conservation value – Low
- » Ecosystem function – Ecological function largely altered. Removal of vegetation might expose soil to erosion.
- » Need for rehabilitation – This area has been transformed past the point of rehabilitation.
- » Sensitivity - Low

Dominant species include:

Hyparrhenia filipendula, *Heteropogon contortis*, *Cymbopogon pospischilii*, *Melinis repens*, *Trichoneura grandiglumis*, *Pogonarthria squarrosa*, *Tephrosia capensis*.

Rare and endangered species include:

- » *None*



Figure 5.4: A view of vegetation Unit 3 characterised by an almost monotonous species composition dominated by *Hyparrhenia filipendula*.

Unit 4 (*Hyparrhenia filipendula* – *Heteropogon contortis*)

This grassy unit is located on a similar type of soil. The distinguishing factor between the two units is the type of disturbance. Whilst Unit 3 has been cleared almost completely from trees and shrubs, Unit 4 has only been partially cleared with overgrazing the main driving force of this unit. This unit is characterized by a medium to sparse grass covering, a few exotic weeds and a sparse shrubby tree layer.

The following is applicable to this vegetation unit:

- » Disturbance - the main disturbance driving the floral structure and composition is overgrazing with bush clearance to a lesser extent
- » Species richness - 23 species recorded of 113 expected on study area
- » Conservation value – Low
- » Ecosystem function – Almost insignificant. Provides low grazing. Bare patches prone to the potential of erosion and invasion of weeds and alien species.
- » Need for rehabilitation – Area is prone to weed and alien species invasion. Clearing and monitoring of these weeds and alien species will be necessary.
- » Sensitivity – Low

Dominant species include: *Hyparrhenia filipendula*, *Heteropogon contortis*, *Cymbopogon pospischilii*, *Melinis repens*, *Acacia karroo*, *A. tortilis*, *Chamaecrista mimosoides*, *Cucumis myriocarpus*, *Tagetes minuta*, *Zinnea peruviana*, *Aristida congesta*, *Tephrosia capensis*.

Rare and endangered species include:

- » *Aloe greatheadii* var. *davyana*



Figure 5.5: A view of vegetation Unit 4

Unit 5 (*Eragrostis superba* – *Acacia tortilis*)

This vegetation unit is an open low thorn savannah with a well-developed tree, shrub and forb layer located on a reddish type of soil with much lower levels of clay (than that of Unit 1 and 2) and subsequently creating a different species composition than those units located on vertic soils. Moderate to low levels of overgrazing is evident in this unit causing low levels of encroachment in parts by unpalatable pioneer species such as *Heteropogon contortus*, *Cymbopogon pospischilii* etc.

The following is applicable to this vegetation unit:

- » Disturbance - Relatively low. Area in reasonable to good condition. Moderate to low levels of grazing.
- » Species richness - 31 species recorded of 113 expected on study area
- » Conservation value – Medium-low
- » Ecosystem function – Due to relatively natural state the ecological function of this unit is regarded as important. This unit contributes to the diversity of the study area. The dense grass cover of moderate to high palatability provides reasonable grazing and stability to the soil and also increases infiltration while inhibiting surface flow after rainfall events.
- » Need for rehabilitation – A few weeds and invasive aliens have been noted and will have to be managed and monitored.
- » Sensitivity – Medium to low

Dominant species include: *Themeda triandra*, *Eragrostis superba*, *Heteropogon contortus*, *Eragrostis chloromelas*, *Brachiaria serrata*, *Cymbopogon pospischilii*, *Melinis repens*, *Acacia tortilis*, *A. caffra*, *Searsia leptodictya*, *Grewia flava*, *Zinnea peruviata*, *Lantana rugosa*.

Rare and endangered species include:

- » *Aloe greatheadii* var. *davyana*



Figure 5.6: A view of vegetation Unit 5 with taller trees and palatable grasses

5.5.3 Adjacent sensitive areas

The Hetbad Nature Reserve (Forever Resorts Nature Reserve) which borders the project site to the west is home to a number of protected small mammals whose movements are near impossible to confine within fenced areas. These species include honey badger (*Mellivora capensis*), serval (*Laptialurus serval*), and hedgehog (*Alterlerix frontalis*). A breeding pair of African fish-eagle (*Haliaeetus vocifer*) is resident in the Eucalyptus trees located in close proximity to the western boundary of the project site. The presence of the relatively dense vegetation cover present on the project site (refer to Unit 1 above) is currently considered by Forever Resorts to provide an ecological and visual buffer between the Reserve and the proposed project site.

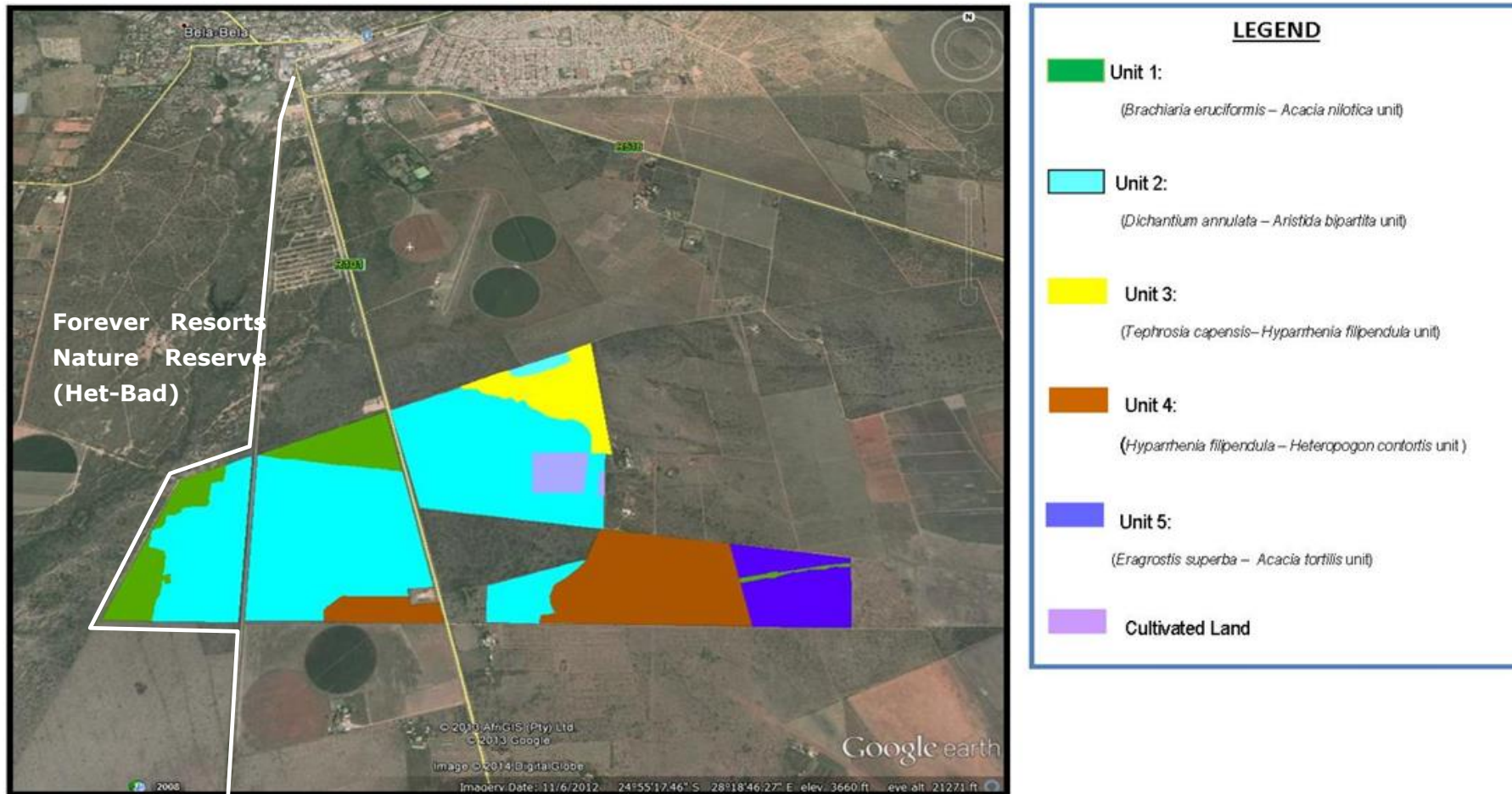


Figure 5.7: Fine-scale vegetation types identified on the Gihon Solar Energy Facility project site indicating the boundary of the Forever Resorts Nature Reserve west of the railway line

5.5.4 Plant species of conservation concern

During the survey a total of 113 different indigenous species were noted. No rare, endangered or endemic species were found to occur, apart from *Aloe greatheadii* var. *davyana*, listed under the Limpopo Environmental Management Act / LIMA (Act 7 of 2003) as a Protected Plant (Schedule 12).

5.6 Faunal communities

No protected or endangered faunal species were noted within the project site. No mammals were observed and the avifaunal species observed were mostly highly mobile foraging species which are unlikely to be negatively affected by the proposed project.

5.6.1 Mammals

According to the Animal Demography Unit (ADU) database approximately 25 mammal species could potentially occur within the greater project area. Of these, 4 are of conservation concern, including one species classified as *Endangered*, the Tsessebe, one species classified as *Vulnerable*, the Roan Antelope, and two species classified as *Near Threatened*, the Honey Badger and the Brown Hyena. Only the Honey Badger and Brown Hyena are expected to be visitors to, or residents of the larger area.

Possible animals that might move into the project site from the direction of the Het-Bad Nature Reserve include:

- » Hedgehog (*Altelerix frontalis*)
- » Honey badger (*Mellivora capensis*)
- » Serval (*Laptailurus serval*)
- » Aardvark (*Orycteropus afer*)

5.6.2 Reptiles

Currently, 96 reptile species are known to occur within the greater project area. Of these, 12 are endemic species and 3 are Provincially protected under Schedule 3 of LIMA. Most species have, however, not had their population status evaluated at this stage, and as such, none have been listed as red data species.

LIMA schedule 3 species recorded for the project area include:

- » Southern African Python (*Python natalensis*)
- » Common File Snake (*Gonionotophis capensis*)
- » Black File Snake (*Gonionotophis nyassae*).

Possible animals that might move into the project site from the direction of the Het-Bad Nature Reserve include:

- » Any tortoise or snake species found on the reserve.

5.6.3 Amphibians

According to the ADU database, up to 25 amphibian species are known to occur within the greater project area. Of the 25 species, none are endemic or of particular conservation concern, with all listed as *Least Concern* in South Africa. Most amphibians occur in or near wetland habitats or wetter areas and therefore would only occur on the proposed project area during periods of higher rainfall or if water pooled on site.

5.6.4 Avifauna

126 bird species have been recorded within the pentad (2455_2815) overlapping the greater project area according to the South African Bird Atlas Project 2 (SABAP 2) database. Of these, none are endemic or of particular conservation concern, however, certain species are Provincially protected under Schedule 4 of LIMA. It should however be noted that the adjacent pentad (2450_2815) which includes the Hetbad Nature Reserve bordering on the western section of the proposed project area, lists 239 bird species.

LIMA Schedule 4 species recorded for the site and the nearby Hetbad Nature Reserve and that may frequent the site include:

- » Crested Francolin (*Dendroperdix sephaena*)
- » Natal Spurfowl (*Pternistis natalensis*)
- » Swainson's Spurfowl (*Pternistis swainsonii*)
- » Egyptian Goose (*Alopochen aegyptiacus*)
- » Spur-winged Goose (*Plectropterus gambensis*)
- » Helmeted Guineafowl (*Numida meleagris*)
- » Speckled Pigeon (*Columba guinea*)

5.7 Soils and land status

The project site has a very gentle slope (<1%) and a westerly aspect towards the west. There are two land types across the project site (refer to Figure 5.8). Ea146 occupies the majority of the site, with Ae18 occurring on the parts of the project site that extend eastwards. All soils are high clay content soils. Ea146 is dominated by vertic clays, which have high swelling and shrinking properties (so called cracking clays), while Ae18 is dominated by deep, well drained red soils with only a small proportion of vertic soils.

Much of the project site was cleared of bushveld in the past, but has not been cultivated in the last twelve years, except for a 3ha section in the east which is also irrigated and used as winter feed for the cattle. There is also a very small lemon orchard on the farm. The rest of the land is used only for grazing of cattle and game. Despite the clearance of bushveld over the majority of the project site, there is no evidence of erosion or other land degradation on the site.

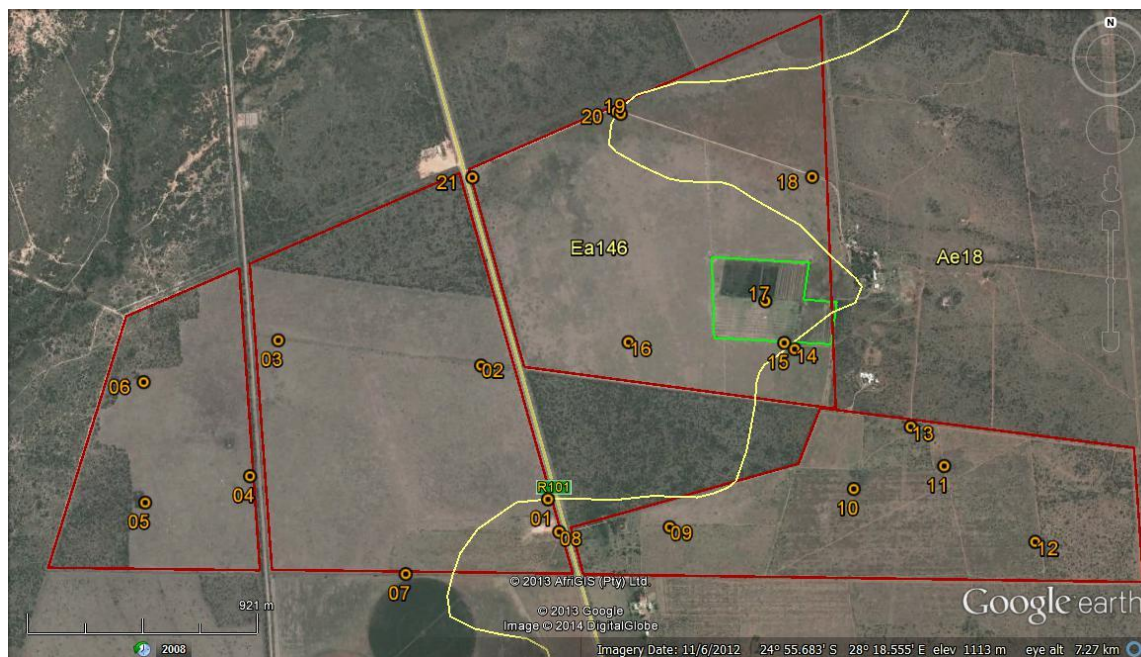


Figure 5.8: Land types (yellow labels) and soil sample positions (orange markers) over the project site.

5.8 Agricultural capability

Land capability is the combination of soil suitability and climate factors. The entire project site is defined as moderate potential arable land. The land has a low erosion hazard (class 1). The potential maize yield is given on the Agricultural Geo-referenced Information System (AGIS) as between 0.6 and 2.4 tons per hectare. The natural grazing capacity of the farm is between 10 and 20 hectares per large stock unit.

Limitations to agriculture are the high clay content of the soils and the swelling and shrinking characteristics of the vertic soils that complicate cultivation and irrigation management. There are moderate soil depth limitations in certain sections of the farm. Agricultural potential is largely uniform across the entire project site. However land type Ae18 in the east (red soils), are more versatile and more suited to large-scale irrigation development such as centre pivots. All the neighbouring centre pivot developments are located on these soil types rather than the vertic soils. Therefore the parts of the site that fall on land type Ae18 have a slightly higher agricultural sensitivity.

5.9 Surface Water Resources

A tributary to the Plat River (most likely non-perennial) runs approximately 200m west and north-west of the western boundary of the project site within the Forever Resort Nature Reserve. No obvious surface water features other than a small drainage line and fringing vegetation in the east of the project site were identified. There are no wetlands identified on the project site.

5.10 Groundwater

The proposed Gihon Solar Energy Facility is situated in the drainage region A of the quaternary sub-catchment A23G. According to information provided by the landowner, twenty-one boreholes are situated over the farm, five of which occur west of the railway line, seven of which occur between the R101 and the railway line and nine of which are situated east of the R101. All boreholes are situated in close proximity to the proposed PV array. Three of the boreholes on the farm are used for stock watering purposes and to irrigate a 3ha section of lucerne that produces winter feed for the cattle. The quality of groundwater is anticipated to be good due to the generally undeveloped nature of the area.

5.11 Heritage Resources

Most of the site was extensively ploughed in the past and would have destroyed any surface indications of in-situ cultural material. Highly weathered undecorated ceramics (Figure 5.9) indicative of Iron Age people using the landscape surrounding the area around the Bad Se Loop River (possibly for agricultural reasons) was recorded in the area of the railway line but do not constitute a heritage site. This area is also characterised by turf and is not suitable for permanent villages. This turf area also has isolated scattered Middle Stone Age (MSA) artefacts (Figure 5.9) that show a high degree of weathering possibly from being washed from their original location. Artefacts are characterised by triangular flakes (some with retouch) with faceted butts mostly on fined grained quartzite. As these tools are out of context and do not constitute a habitation site, knapping site, or even a concentration of tools, these individual finds were not point plotted.



Figure 5.9: Undated ceramics and MSA artefacts recorded on site

One site consisting of a farm house and associated outbuildings that might be older than 60 years was identified during the survey located in the southern section of the project site, east of the R101 (Figure 5.10).



Figure 5.10: Dwelling and outbuilding on site possibly older than 60 years

5.12 Palaeontological potential

The study area lies on the north-western edge of the Springbok Flats Basin and is underlain by basaltic volcanics of the Lebombo Group (Karoo Igneous Province) of Early Jurassic age. These are mapped as belonging to the Letaba Formation (picritic lavas) overlying Triassic continental sediments of the Stormberg Group in the Springbok Flats Basin.

The fossiliferous Stormberg Group rocks which underlie the site will not be impacted by the proposed development. The Karoo volcanics are mantled by Cenozoic superficial deposits such as calcrete hardpans, downwasted gravels, alluvium and soils. Igneous rocks such as basaltic lavas are generally unfossiliferous and no fossils have been recorded from the Letaba Formation succession of the Lebombo Group in the Springbok Flats Basin. Fossils (e.g. plants,

traces, vertebrate bones) might occur within thin sedimentary intervals between the successive lava flows but are likely to be very sparse. The overlying Cenozoic superficial sediments are likewise of low to very low palaeontological sensitivity.

5.13 Noise Receptors in the Study Area

The undeveloped surroundings of the proposed development site mean that the background noise levels are very low 30 – 35 decibels (dBA). Noise sources in the immediate vicinity of the development site are restricted to traffic on the R101. Traffic volumes are moderate-low (excluding Fridays and Sundays), and therefore noise emanating from the road is relatively insignificant.

5.14 Visual Quality of the Study Area

The study area is located in an area that has a distinct rural and agricultural character, with very little development in close proximity to the site. Exceptions occur where the SAR Pienaarsrivier - SAR Warmbad 1 132kV and Pelly -Warmbad 275kV power lines traverse over or near the site. The town of Bela-Bela is situated within 4km from the site and therefore no urban features characterise the visual landscape.

5.15 Socio-Economic Environment

The Waterberg District is predominantly rural and the key pillars for development within this district are mainly centred on three economic sectors; agriculture, mining and tourism. There are key areas of concern and weakness within the Waterberg District, namely the high clusters of poverty which indicate a 'mismatch' between where people are located and where economic activities are taking place. This was also exacerbated by the demand of specialised skills in key sectors of the economy since the skills base is relatively low amongst the poorer communities. Another key area of concern in the Waterberg District is the provision of sufficient water supply to cater for future economic growth and development.

The Bela-Bela Local Municipality is one of six constituent Municipalities that make up the Waterberg District Municipality. The Waterberg District Municipality is comprised of these six local municipalities namely; Bela-Bela, Lephalale, Modimolle, Mogalakwena, Mookgophong and Thabazimbi.

The Bela-Bela Local Municipality shares the boundaries with Modimolle Municipality to the north, Thabazimbi Municipality to the west and Mookgopong Municipality to the east. The Bela-Bela Municipality also shares the boundaries with Mpumalanga Province to the south east, Gauteng to the south and North-West Province to the south west. The total area of Bela-Bela Local Municipality (both urban and rural) is approximately 3406.20km² in extent (Census 2011).

The Bela-Bela Municipality is divided into 9 wards. The study area is located within ward 4 and ward 9. The Bela-Bela Local Municipal Area includes two formal towns, namely Bela-Bela town and Pienaarsrivier as well as other smaller settlements such as Settlers, Radium/Masakhane, Rapotokwane, Vingerkraal and Tsakane. Bela-Bela is situated on the N1, main highway from Gauteng to the Limpopo Province and Zimbabwe. Bela-Bela Central Business District (CBD) is directly and strategically linked with the major cities of Gauteng through the National (N1) Route which connects the area with Pretoria and Johannesburg while Polokwane is approximately 200 km to the north. Tourism and agriculture are the main contributing industries to the economy of Bela-Bela.

Economy

Bela-Bela is the strongest agricultural area in the Waterberg but it also shows comparative advantages as a strong service sector in both the national and provincial economies, although community and social services is not a basic activity. Agricultural production includes fruit, vegetables, cattle, grains and game. There are significant tourism attractions that span across the Bela-Bela, Modimole, Mogalakwenta and Lephalale areas and these include Makapans Valley, World Heritage Sites, Nature Reserves, hot springs, fauna and flora.

Bela-Bela has an extensive and well-known tourism network with key attractions and facilities as well as its competitive edge through its proximity to Gauteng. It is the focus of large scale tourism activities and forms the hub of tourism outside the proclaimed nature reserves and Waterberg Biosphere (Waterberg SDF 2009). Bela-Bela has two major holiday resorts (Bela-Bela Forever Resorts and ATKV Kleinkariba), a large number of large game farms (Zebula, Mabula, Mabalingwe, etc.), the Elements Golf Estate as well as some smaller game farms and estates. The contribution of the mining sector towards local economic development in Bela-Bela is insignificant.

Mining is the predominant activity in Thabazimbi while Bela-Bela, Modimolle and Mookgopong have very few activities associated with mining.

Social aspects

Population: The total size of Bela-Bela's population is currently estimated at 66 500 individuals, approximately 19.52 per km² (Census 2011), an increase of 27.6% compared to Census 2001. It is also estimated that there are approximately 18 068 households within Bela-Bela (5.30 per km²). The population growth rate for Bela-Bela was approximately 2.4% from 2001 to 2011 (Census 2011).

Age composition and gender differentiation: The age composition or structure determines the kind of economic activities within the area. According to the Census 2007, Bela-Bela has a large youthful population between the age group of 0-14 constituting 28.1% of the entire population. The working age between 15-64 age groups constitutes 66% of the total population and the elderly (over 65) accounts for 5.9% of the population. However the dependency ratio of those typically not in the labour force account for 51.6%.

Education levels: Education plays a pivotal role in community development. It provides a set of basic skills for development, creativity and innovative abilities. The South African Constitution stipulates that everyone has a right to education and this includes Adult Basic Education. The education profile in Bela-Bela is another area of concern in that approximately 16% of the adult population (18 – 85+) can be considered as illiterate since they did not attend any school. Of the population aged 20 years and older, 9.7% have no schooling, 26.2% of the population aged 20 years and older have matriculated and 9.5% of the population aged 20 years and older have higher education (refer table 3). There are various factors that may have contributed to the poor education profile such as people having insufficient funds. This is also exacerbated by the fact there are limited tertiary institutions within the area. At the present moment there is only one (1) private educational institution that offers tertiary training within Bela-Bela (i.e. Sondela Academy). This tertiary institution currently provides training in Tourism (Guiding and Hospitality), Nature Conservation and Technical Courses.

Annual household income levels: This area has an unemployment rate of 23% with 5 779 households earning less than R1 000 per month (poverty line) and 815 households without an income.

Health: HIV/AIDS continues to have an impact on population growth and the DBSA database estimated approximately 14 932 individuals were infected in Bela-Bela by 2006. The high growth ratio (2.4% growth from 2011 to 2011) takes into account other factors such as in-migration of people from other provinces (such as Gauteng).

Crime: Bela-Bela is currently serviced by three police stations to cater for public safety. These facilities are located within three different areas (i.e. Bela-Bela Town, Piernaarsriver and Rus de Winter) within the municipality. The areas that do not currently have Police Stations are Bela-Bela Township and Rapotokwane Village. According to the Bela-Bela IDP 2013/2014 crime statistics in Bela-Bela are comparatively low to the rest of the country.

Infrastructure and services

Water: Of the 18 068 households in the municipality, 41.9% have access to piped water in their dwelling or in the yard, 3.2% of households have no access to piped water (Census 2011)..

Energy: The distributions of Bela-Bela households using electricity for lighting, heating and cooking are approximately 11898 (66%) of households(Census 2011). It was stated in the Bela-Bela IDP 2013/2014 that it is important for the municipality to develop its Energy/Electricity Plan that considers renewable and non-renewable energy sources being very critical.

Sanitation: The backlog as estimated by the municipality is approximately 615 households which do not have access to the sanitation facilities at the appropriate standard (Census 2011).

Waste removal: Approximately 65% of Bela-Bela households refuse removal is removed by local authority / private company. 26.2% of households use a communal refuse dump and 6.1% of the households have no rubbish disposal (Census 2011).

Communities located on the project site

Portions 1, 2, 5 and 7 of the Farm Turfbult 494 KR are all owned by a sole landowner who took ownership approximately 10 years ago, before the cessation of agricultural activities 12 years ago. The owner is not resident on the farm but currently rents out four of the houses located on the farm to contacts workers. A fifth rental home is currently under construction. These rented houses are located in close proximity to each other near the centre of Portion 1of the farm Turfbult 494 (on the eastern outskirts of the project site boundary). Some of the renters make use of the farm for grazing of livestock.

ASSESSMENT OF POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED FACILITY

CHAPTER 6

This chapter serves to assess the significance of the positive and negative direct and indirect environmental impacts (cumulative considered in Chapter 7) expected to be associated with the development of the proposed Gihon Solar Energy Facility. This assessment is done for all of the facility's components which will comprise:

- » Arrays of PV panels and respective inverter stations;
- » Appropriate mounting structures for panels;
- » Cabling between the projects components, to be laid underground where practical;
- » On-site transformers to step up the power and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- » An overhead power line to loop-in and loop out of the existing Pelly-Warmbad 132kV power line located at the northern boundary of the site (the combined line consisting of sections SAR Warmbad – Warmbad, SAR Pienaarsrivier - SAR Warmbad and Pelly-SAR Pienaarsrivier);
- » Building for maintenance, control and storage;
- » Internal access roads; and
- » Fencing.

The development of the proposed Gihon Solar Energy Facility will comprise of the following phases:

- » *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of the access road, electricity generation infrastructure, construction camp, temporary and permanent laydown areas, transportation of components/construction equipment to site; and undertaking site rehabilitation and establishment and implementation of a stormwater management plan. This will occur over a period of 18-24 months.
- » *Operation* – will include operation of the facility and the generation of electricity. The operational phase is expected to extend in excess of 20 years.
- » *Decommissioning* – depending on the economic viability of the plant, the length of the operational phase may be extended. Alternatively decommissioning will include site preparation; disassembling of the components of the facility; clearance of the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to construction. Therefore, these impacts are not considered separately within this chapter.

6.1. Methodology for the Assessment of Impacts

A broader site of 481 hectares was identified by the project developer for the purpose of establishing the proposed Gihon Solar Energy Facility. However, the developmental footprint for the 75MW project will cover an extent of approximately 220 hectares. A preliminary facility layout was developed by taking cognisance of the environmental sensitivities and technical preferences identified during the scoping phase and refined based on surveys conducted during the EIA phase. This 220 hectares is likely to suffer disturbance, particularly during the construction phase, as the establishment and operation of a PV plant may result in whole-scale disturbance to significant portions of the affected site where infrastructure is located.

The assessment of potential issues has involved key input from specialist consultants, the project developer, key stakeholders, and interested and affected parties (I&APs). The Comments and Response Report included within Appendix E lists these issues and the responses given by the EAP during the Scoping Phase. Meetings with adjacent landowners and the municipality were also held during the EIA Phase. Some of the comments from I&APs, notably Forever Resorts have had a direct influence over the design and extent of the project.

In order to assess the potential impacts associated with the proposed facility, it was necessary to quantify the extent of the permanently and temporarily affected areas. This includes the area required for the photovoltaic panels and associated infrastructure and substation, and equates to ~45.7% of the entire farm portion (i.e. $(220\text{ha}/481\text{ha})\times 100$).

6.2. Assessment of the Potential Impacts associated with the Construction and Operation Phases

The sections which follow provide a summary of the findings of the assessment undertaken for potential impacts associated with the construction and operation of the proposed solar energy facility on the identified site. Issues were assessed in terms of the criteria detailed in Chapter 4 (Section 4.2.5). The nature of the potential impact is discussed; and the significance is calculated with and without the implementation of mitigation measures. Recommendations are made regarding mitigation/enhancement and management measures for potentially significant impacts and the possibility of residual and cumulative impacts are noted.

6.2.1 Potential Impacts on Ecology

Solar energy facilities require relatively large areas of land for placement of infrastructure; this 75MW PV facility requires 220 hectares. The expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual species. Potential impacts and the relative significance of the impacts are summarised below (refer to Appendix E - Ecology Report for more details).

Vegetation: Five vegetation units were identified to occur on the project site, namely:

- » Unit 1: *Brachiaria eruciformis* – *Acacia nilotica* unit
- » Unit 2: *Dichanthium annulatum* – *Aristida bipartita* unit
- » Unit 3: *Tephrosia capensis*– *Hyparrhenia filipendula* unit
- » Unit 4: *Hyparrhenia filipendula* – *Heteropogon contortis* unit
- » Unit 5: *Eragrostis superba* – *Acacia tortilis* unit

Of these five units only Unit 1 and Unit 5 (constituting approximately 20 – 25% of the project site) are regarded as being in a natural condition. These areas are extremely rich in species when compared to the rest of the units and especially Unit 1 fulfils an important role in the functionality of the larger ecosystem.

Unit 2, Unit 3 and Unit 4 are species poor areas characterised by past and present disturbances. These disturbances include bush clearing and overgrazing and has transformed and degraded these areas to a point where little or none of the original Springbokvlakte Thornveld vegetation remain. This transformation has made these areas susceptible to the invasion of weeds and alien species. The proposed development within these three units will have the least impact on the functionality of the larger ecosystem, with the exception of a small section of Unit 2 located to the west of the railway line.

Sensitive fauna and avifauna: No protected or endangered faunal species were identified as using or being resident on the site.

However, the western boundary (west of the railway line) is encircled by the Hetbad Nature Reserve under the ownership of Forever Resorts. Within the nature reserve and in close proximity to the boundary of the project site, concerns regarding the impact of the proposed facility on sensitive faunal species occurring in these areas were raised. These species include honey badger (*Mellivora capensis*), serval (*Laptialurus serval*), and hedgehog (*Alterlerix frontalis*) and several avifaunal species. These concerns were subsequently investigated by the ecologist to determine their validity, where it was determined that without careful planning, sufficient management and mitigation measures as well as the negligence to implement these measures, the concerns raised by Forever Resorts would have validity.

The potential for these species to move between the nature reserve and surrounding farms is high and these species could potentially be at risk during the construction phase. The potential impact of the proposed PV facility could therefore manifest in off-site impacts on fauna and avifauna resident to the Forever Resorts Nature Reserve.

Edge effects: entails the reduction of core areas of ecosystems with an increase in edge habitats, which are prone to the influence of altered microclimates, biodiversity distributions and thus also prone to the influences of accelerated erosion and alien invasion (Perlman and Milder 2005).

The presence of this relatively dense vegetation cover creates an important buffer for the nature reserve bordering the project site. The removal of vegetation and the development of infrastructure within Unit 1 will lead to the loss of a representative section of the Springbokvlakte Thornveld (Vulnerable), moreover an increased risk of the occurrence of edge effects, potentially manifesting as the flow of contaminated surface water and impact on sensitive flora and fauna occurring within the Forever Resorts Reserve and migrating into the project site.

Sensitivity mapping: The vegetation units identified to occur on the project site and the associated ecological sensitivity of each are as follows (refer to Figure 6.1):

- » Unit 1 (*Brachiaria eruciformis* – *Acacia nilotica*)
 - Sensitivity - High
- » Unit 2 (*Dichanthium annulata* – *Aristida bipartita*)
 - Sensitivity - Low
- » Unit 3 (*Tephrosia capensis*– *Hyparrhenia filipendula*)
 - Sensitivity - Low
- » Unit 4 (*Hyparrhenia filipendula* – *Heteropogon contortis*)
 - Sensitivity – Low
- » Unit 5 (*Eragrostis superba* – *Acacia tortilis*)
 - Sensitivity – Medium to low

Due to the natural state of Vegetation Unit 1 the high species diversity and the important ecological function provided along the western boundary of the property, Unit 1 is regarded to be a highly sensitive area. The drainage line and fringing vegetation in the east of the site is also ascribed to be of high sensitivity. The section of the site located to the west of the railway line, is deemed to be of Medium-High sensitivity. Units 2, 3 and 4 of low sensitivity make up majority of the site.

The ecological sensitivity map (Figure 6.1) forms the basis of the layout plan prepared for the proposed Gihon Solar Energy Facility with respect to avoidance of areas of high and medium to high ecological sensitivity.

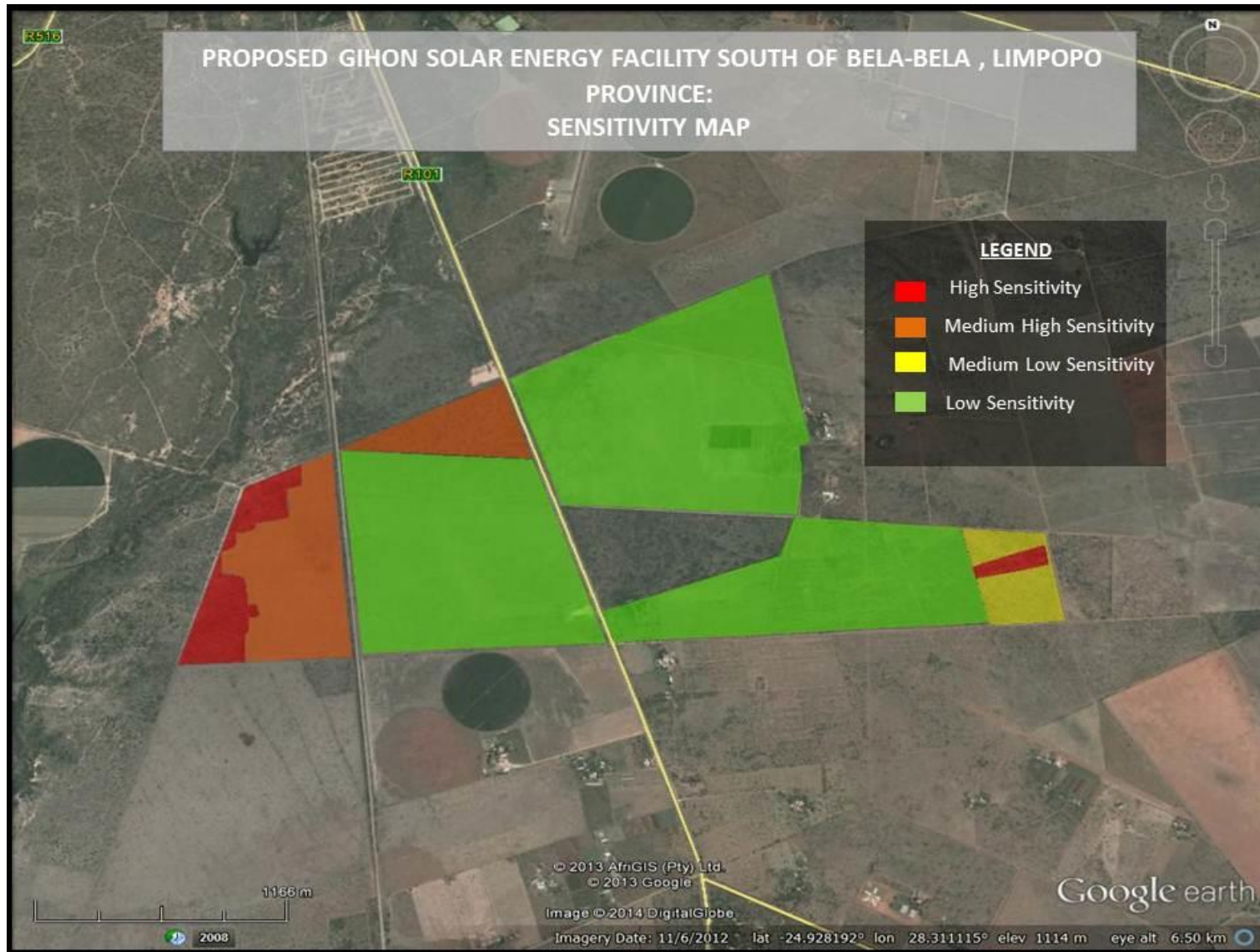


Figure 6.1: Ecology sensitivity map for the Gihon Solar Energy Facility project site

a) Impacts on vegetation and associated habitats

Construction and operational phase:

The tables to follow apply to all activities associated with the construction and operational phase of the proposed project, describing the nature of the impact within the specific vegetation Units, including:

Construction

- » Removal of vegetation,
- » Loss of microhabitats within and outside of the project site,
- » Loss of species of concern,
- » Compaction and disturbance of soils,
- » Reduced buffering capacities of the landscapes during extreme weather events alteration of soil surface properties,
- » Concentration of surface water flows leading to erosion,
- » Possible crossing of drainage areas,
- » Impacts on protected species,
- » Displacement of terrestrial vertebrates,
- » Disturbance of avifauna,
- » Impact on protected areas (disturbance of sensitive faunal species and contamination of water resources).

Operation

- » Possible contamination of topsoil and surface water by chemicals or hydrocarbons,
- » Redistribution and concentration of runoff from panel surfaces,
- » Artificial shading of vegetation.

The table to follow is a consolidation of the impacts tables included in the Ecological Impact Assessment (Appendix E) for the construction and operational phases. Potential ecological impacts have been identified to vary widely between the vegetation units identified on the project site and therefore the impact assessment is relative to each of these vegetation units.

Unit	Unit 1				Unit 2				Unit 3		Unit 4		Unit 5	
Sub-unit	Unit 1a		Unit 1b		Unit 2a		Unit 2b		Unit 3		Unit 4		Unit 5	
Mitigation	None	With	None	With	None	With	None	With	None	With	None	With	None	With
Extent (E)	Local (5)	Local (3)	Local (4)	Local (2)	Local (4)	Local (4)	Local (2)	Local (1)	Local (2)	Local (1)	Local (2)	Local (1)	Local (4)	Local (2)
Duration (D)	Permanent (5)	Long-term (4)	Long-term (4)	Long-term (4)	Permanent (4)	Long-term (4)	Permanent (4)	Long-term (4)	Permanent (4)	Long-term (4)	Permanent (4)	Long-term (4)	Permanent (5)	Long-term (4)
Magnitude (M)	High (8)	Moderate (6)	High (6)	Moderate (6)	Moderate (6)	Moderate (4)	Minor (2)	Minor (2)	Minor (2)	Minor (2)	Minor (2)	Minor (2)	Minor (8)	Minor (6)
Probability (P)	Definite (5)	Definite (5)	Definite (5)	Definite (4)	Definite (5)	Definite (4)	Definite (5)	Definite (4)	Definite (5)	Definite (4)	Definite (5)	Definite (4)	Definite (5)	Definite (4)
Significance (E+D+M)*P	High (90)	High (65)	High (70)	Medium (48)	High (70)	Medium (48)	Medium (40)	Low (28)	Medium (40)	Low (28)	Medium (40)	Low (28)	High (85)	Medium (48)
Status	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reversibility	Not reversible	Not reversible	Not reversible	Not reversible	Partially reversible	Partially reversible	Reversible	Reversible	Reversible	Reversible	Reversible	Reversible	Unlikely	Reversible

Unit	Unit 1				Unit 2				Unit 3		Unit 4		Unit 5	
Irreplaceable loss of resources?	Definite	Most likely	Definite	Not likely	Definite	Likely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Definite	Slightly
Can impacts be mitigated?	Unlikely	-	Reasonably well	-	Reasonable	-	Highly likely	-	Highly likely	-	Highly likely	-	Highly likely	-
Unit specific mitigation measures:	Vegetation unit 1 A & B should be excluded during the site layout planning and marked as no-go areas.				The area west of the railway line including vegetation unit 2 A (west of railway line) must be avoided during the site layout planning.				Best practices should be implemented according to the Environmental Management Plan.		Best practices should be implemented according to the Environmental Management Plan		Due to relatively natural state of unit 5 as well as its contribution to the total floral diversity of the farm it is recommended that this section be avoided.	
General mitigation measures applicable to all vegetation units:	<ul style="list-style-type: none"> » <i>Aloe greatheadii</i> var <i>davyana</i> has been found within several vegetation units. This is a protected species and all affected species should be translocated to an area not affected by the development and which is similar to that from which these species have been removed. » It is the contractors responsibility to be, at all times, aware of any possible movement of animals from the Nature Reserve into the farm. These animals should not be harmed and the manager of the nature reserve should be contacted to relocate these species to the nature reserve. Possible animals that might move into the farm from the nature reserve include: <ul style="list-style-type: none"> ○ Hedgehog (<i>Altelrix frontalis</i>) ○ Honey badger (<i>Mellivora capensis</i>) 													

Unit	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	<ul style="list-style-type: none"> ○ Serval (<i>Laptailurus serval</i>) ○ Aardvark (<i>Orycteropus afer</i>) ○ Any tortoise or snake species found on the reserve. » After the final layout has been approved, conduct a thorough footprint investigation to detect and map (by GPS) any protected plant species and active animal burrows » Protected plant species: must be relocated » Animal burrows: must be monitored by ECO prior to construction for activity/presence of animal species. If detected, such animals must be removed and relocated by a qualified professional/contractor » Keep areas affected to a minimum, strictly prohibit any disturbance outside the demarcated footprint area » Clear as little vegetation as possible, aim to maintain vegetation where it will not interfere with the construction or operation of the development, rehabilitate an acceptable vegetation layer » use only species that were part of the original indigenous species composition as listed in the specialist report » The higher level of shading anticipated from fixed panels may prevent or slow the re-establishment of desirable grass species, thus re-establishment must be monitored and species composition adapted if the above species fail to establish sufficiently. » A strong herb layer will also suppress the re-emergence of weed species from existing seed banks » Aim to maintain a buffer zone, as mentioned above, around the drainage line in the eastern section of the site » Remove all alien invasive vegetation » Continuously monitor the establishment of new invasive species and remove as soon as detected, whenever possible before regenerative material can be formed, up to decommissioning » If filling material is to be used, this should be sourced from areas free of invasive species » Topsoil (the upper 25 cm of soil) is an important natural resource; where it must be stripped, never mix it with subsoil or any other material, store and protect it separately until it can be re-applied, minimise handling of topsoil » Temporarily stored topsoil must be re-applied within 6 months, topsoils stored for longer need to be managed according to a detailed topsoil management plan » Monitor the area below the PV panels regularly after larger rainfall events to determine where erosion may be initiated and then mitigate by modifying the soil micro topography and revegetation efforts accordingly 				

Unit	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
	<ul style="list-style-type: none"> » The rehabilitation plan for all temporarily affected areas and for the development area after decommissioning must aim to re-introduce all non-weed indigenous species listed in the specialist report as a minimum, taking the observed original cover percentages as a guideline of acceptable vegetation cover » Prevent leakage of oil or other chemicals, strictly prohibit littering of any kind » Monitor the establishment of (alien) invasive species and remove as soon as detected, whenever possible before regenerative material can be formed » After decommissioning, if access road or portion thereof will not be of further use to the landowner, remove all foreign material and rip area to facilitate the establishment of vegetation, followed by a suitable re-vegetation program. 				
Cumulative impacts:	<p>If mitigation measures are not strictly followed the following could occur:</p> <ul style="list-style-type: none"> » spread and establishment of invasive species » occurrence and spread of erosion » contamination of runoff with hazardous substances » destruction and removal of natural vegetation forming part of an Endangered Vegetation Type. 				
Residual impacts:	<ul style="list-style-type: none"> » Altered topsoil characteristics » Altered vegetation composition » Spread of erosion » Weed and alien vegetation invasion » Destruction and removal of natural vegetation forming part of an Endangered Vegetation Type. 				

Comparative Assessment of Alternatives

Comparative Assessment of PV Panel technology (Fixed vs Tracking):

Tracking PV technology is ecologically a preferred technology alternative due to the shading effect and potential loss of vegetation below the panels. This could become especially pronounced after decommissioning, when it is expected that seedbanks under a fixed panel system will have vanished and topsoil quality will have deteriorated to such an extent due to absence of vegetation that re-establishment of vegetation will be very difficult. The difference in the potential impacts on ecology associated with the two technology alternatives. Therefore, tracking PV technology is nominated as the preferred alternative.

Comparative Assessment of Substation positions: The location of Substation Alternative 1 in the areas of low ecological sensitivity is preferred from an ecological perspective. Substation Alternative 2 is situated in an area of medium to high ecological sensitivity. Both substation positions are feasible from a technical perspective. The selection of Substation Alternative 1 is thus the overall preferred alternative.

Implications for Project Implementation

- » From an ecological perspective it is recommended that the PV facility footprint and associated infrastructure be constrained to areas outside of vegetation units of high and medium to high ecological sensitivity (i.e. should be restricted to Units 2, 3 and 4).
- » By implication, no activities west of the railway line within the project site and adjacent to the Forever Resorts Nature Reserve are recommended. This section of the project site will serve as an ecological buffer between the PV facility and the Nature Reserve.
- » The protected plant species, *Aloe greatheadii* var *davyana* has been found within several vegetation units. This is a protected species and all affected species should be translocated (on receipt of the necessary permits) to an area not affected by the development and which is similar to that from which these species have been removed.
- » Measures for the relocation of sensitive faunal species which may migrate onto the project site must be implemented during construction.

6.2.2 Potential Impacts on Soils and Agricultural Potential

Three potential negative impacts of the development on agricultural resources and productivity were identified as:

- » Loss of agricultural land use caused by direct occupation of land by the energy facility footprint (medium significance with and without mitigation).

- » Soil erosion caused by alteration of the surface run-off characteristics (low significance with and without mitigation).
- » Loss of topsoil in disturbed areas, causing a decline in soil fertility (low significance with and without mitigation).

a) Loss of agricultural land use

Limitations to agriculture are the high clay content of the soils and the swelling and shrinking characteristics of the vertic soils that complicate cultivation and irrigation management. There are moderate soil depth limitations in certain sections of the farm. Agricultural potential is largely uniform across the entire project site. However land type Ae18 in the east (red soils), are more versatile and more suited to large scale irrigation development such as centre pivots. All the neighbouring centre pivot developments are located on these soil types rather than the vertic soils. Therefore the parts of the site that fall on land type Ae18 have a slightly higher agricultural sensitivity.

Construction, operation and decommissioning: This impact is caused by direct occupation of land by footprint of energy facility infrastructure and having the effect of taking affected portions of land out of agricultural production.

	Without mitigation	With mitigation
Extent	Low (1) – Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Slight (4)	Slight (4)
Probability	Definite (5)	Definite (5)
Significance	(Medium) 45	(Medium) 45
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Cumulative impacts: The overall loss of agricultural land in the region due to other developments – medium significance.		
Residual impacts: No mitigation possible so same as impacts without mitigation		

b) Generation of alternative land use income

Construction, operation and decommissioning: This impact is caused by the alternative land use of energy facility rental on low productivity agricultural land in combination with continued farming on the rest of the farm and having the

effect of providing landowners with increased cash flow and improved rural livelihood.

	Without mitigation	With mitigation
Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Highly probable (4)	Highly probable (4)
Significance	(Low) 28	(Low) 28
Status	Positive	Positive
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Cumulative impacts: None		
Residual impacts: None		

c) Soil erosion

Construction, operation and decommissioning:

This impact is caused by the alteration of run-off characteristics due to hard surfaces and access roads and having the effect of loss and deterioration of soil resources. There is however a low risk of erosion due to the flat topography of the site as well as the dominant clay soil forms on the project site.

	Without mitigation	With mitigation
Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Minor (3)	Small (1)
Probability	Improbable (2)	Very improbable (1)
Significance	(Low) 16	(Low) 6
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		

Implement an effective system of run-off control, where it is required, that collects and disseminates run-off water from hardened surfaces and prevents potential down slope erosion. This should be in place and maintained during all phases of the development.

Cumulative impacts: None

Residual impacts: Low

d) Loss of topsoil

Construction phase: This impact is caused by poor topsoil management (burial, erosion, etc) during construction related soil profile disturbance (levelling, excavations, disposal of spoils from excavations etc.) and having the effect of loss of soil fertility on disturbed areas after rehabilitation.

	Without mitigation	With mitigation
Extent	Low (1) - Site	Low (1) - Site
Duration	Long term (4)	Long term (4)
Magnitude	Minor (3)	Minor (2)
Probability	Probable (3)	Very improbable (1)
Significance	24 (Low)	7 (Low)
Status	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
1. Strip and stockpile topsoil from all areas where soil will be disturbed. 2. After cessation of disturbance, re-spread topsoil over the surface. 3. Dispose of any sub-surface spoils from excavations where they will not impact on agricultural land, or where they can be effectively covered with topsoil.		
Cumulative impacts: None		
Residual impacts: None		

Comparative Assessment of Alternatives

Comparative Assessment of PV Panel technology (Fixed vs Tracking):

In terms of impact arising from soils and agricultural potential, there is no significant difference in the potential impacts associated with the two technology alternatives tracking panels can occupy more land than fixed panel technology regardless of the type of technology used. The agricultural potential for this site

is moderate, in terms of impact arising from soils and agricultural potential, there is no significance difference in the potential impacts associated with the two technology alternatives. Therefore, there is **no preference** between the alternative technologies.

Comparative Assessment of Substation positions: There is no preference for the siting of the on-site Substation from an agricultural perspective.

Implications for Project Implementation

No intensive agricultural practices are undertaken on the farm (for last 12 years) and land use is almost entirely grazing of cattle and game. Agricultural capability is of moderate potential under irrigation however this may be limited by the soil type.

6.2.3 Assessment of Potential Heritage and Palaeontological Impacts

Heritage: Potential impacts on heritage sites relate to the direct loss of heritage features or sites during construction. One potential heritage site was identified on the project site namely an old farm house and associated outbuildings that might be older than 60 years. The site is considered to be of low – medium heritage significance. The few artefacts identified on the project site are not considered to be of consequence as they are considered to be out of context and do not fulfil the criteria of a heritage site.

Palaeontology: The overlying Caenozoic superficial sediments are considered to be of low to very low palaeontological sensitivity and therefore no assessment of the potential palaeontological impact has been undertaken.

a) Loss of heritage resources

Construction: During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects which have been identified. The following table applies to the old abandoned farmhouse located on the site which may be older than 60 years.

	Without mitigation	With mitigation
Extent	Local (2)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (3)
Probability	Probable (4)	Probable (3)
Significance	Medium (40)	(Low) 27
Status (positive or	Negative	Negative

negative)		
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation: The abandoned farmhouse site must be avoided and if required to be demolished must be assessed by a conservation architect whereby a destruction permit for demolition may be required.		
Cumulative impacts: Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive.		
Residual Impacts: N/A		

Comparative Assessment of Alternatives

Comparative Assessment of PV Panel technology (Fixed vs Tracking)

In terms of impacts arising from Heritage and Palaeontology, there is no significance difference in the potential impacts associated with the two technology alternatives. Therefore, there is no preference between the alternative technologies.

Comparative Assessment of Substation positions: There is no preference for the siting of the on-site Substation from a heritage perspective.

Implications for Project Implementation

The abandoned farmhouse structure should be avoided by the proposed facility footprint.

6.2.4 Assessment of Potential Visual Impacts

The study area for the visual assessment encompasses a geographical area of 204km² and includes a minimum 8km buffer zone from the proposed development area. It includes the town of Bela-Bela, a section of the N1 national road and the R101 arterial (regional) road.

The viewshed analyses were undertaken from a number of vantage points within the proposed development area at an offset of 10m above ground level (tracking technology alternative) and 4m above ground level for the static PV technology alternative. This was done in order to determine the general visual exposure

(visibility) of the area under investigation, simulating the maximum height of the proposed structures (PV panels) associated with the facility.

It must be noted that the effect of vegetation cover on the visual exposure of the proposed facility, is simulated by adding the natural thicket and bushland to the digital terrain model. These natural vegetation types (where intact) are expected to reduce the visual exposure of the facility to a large extent.

No dedicated viewshed analyses were undertaken for the other ancillary infrastructure (i.e. the on-site substation (both alternatives), overhead power line connection, administrative building, internal access roads and workshop). These structures are located within the proposed development site and are not expected to be highly visible amongst the PV panel infrastructure (i.e. the area of potential visual exposure will fall entirely within the viewshed catchment of the PV panels).

Between 0km - 2km

Theoretical visibility within a 2km radius of the proposed facility includes mainly vacant agricultural land, a section of the R101 arterial road traversing the site and a number of homesteads/residences located west, south and east of the site. These include *Pumula*, *Roodekuil* (2) and *Turfbult* (3) – refer to Figure 6.3 and 6.4. Theoretical visibility within this zone further includes the southern section of the Hetbad Nature Reserve. The lower-lying central sections of the reserve may be exposed to the taller (10m high PV structures) but is not expected to be exposed for the 4m high option (refer to Figure 6.3 and 6.4).

Between 2km – 4km

Visibility between the 2 - 4km radii includes sections of the R101 and R516 arterial roads, residences situated within the small holdings, the northern and southern sections of the Hetbad Nature Reserve and a number of homesteads (*Noodshulp*, *Merinovlakte* and *Roodekuil* (2)). The larger part of the town of Bela-Bela and a section of the N1 national road also fall within this zone. Although the facility may theoretically be visible from Bela-Bela, the built-up nature of this town and the presence of urban visual clutter are expected to nullify the potential visual exposure (refer to Figure 6.3 and 6.4).

Between 4km – 8km

The intensity of visual exposure is expected to subside beyond a 4km radius. This zone contains large tracts of agricultural land, sections of the R101 and R516 arterial roads, a section of the N1 national road, the town of Bela-Bela and outlying small holdings, and a number of farm residences. These include: *Merinovlakte* (2) to the south of the facility that is mainly expected to be exposed to the taller (10m) PV structures (refer to Figure 6.3 and 6.4).

Greater than 8km

Visibility beyond 8km from the proposed development is expected to be negligible and highly unlikely due to the distance between the object (development) and the observer for either panel height (refer to Figure 6.3 and 6.4).

It is envisaged that the structures (where visible from shorter distances) may constitute a high visual prominence, potentially resulting in a high visual impact.

Visual Impact Index

The visual impact index indicates a core zone of moderate visual impact within a 2km radius from the facility (both 4m and 10m alternatives), where the facility may be visible from land generally devoid of sensitive visual receptors (i.e. vacant natural land or agricultural fields).

Where sensitive visual receptors occur within the 2km radius from the facility and exposure is likely, the visual impact is anticipated to be high due to the relative close proximity of the observer to the facility.

Homesteads and residences located within this zone include the residences Turfbult east (located on the farm earmarked for the development), Turfbult (Kalson Ranch) immediately south of the proposed site, Pumula (further south) and Swallows Rest to the south-west. It is likely that Kalson Ranch and possibly Swallows Rest may experience the highest visual impact due to their close proximity to the proposed Solar Energy Facility. It is assumed that the residents of Turfbult east are supportive of the proposed PV development and is not expected to be negatively influenced thereby. No comments to the contrary were received during the public participation process conducted.

Another area of potentially high visual impact is the R101 arterial road (2), traversing the proposed development site. Observers travelling along this may be negatively impacted on by the sight of the PV infrastructure.

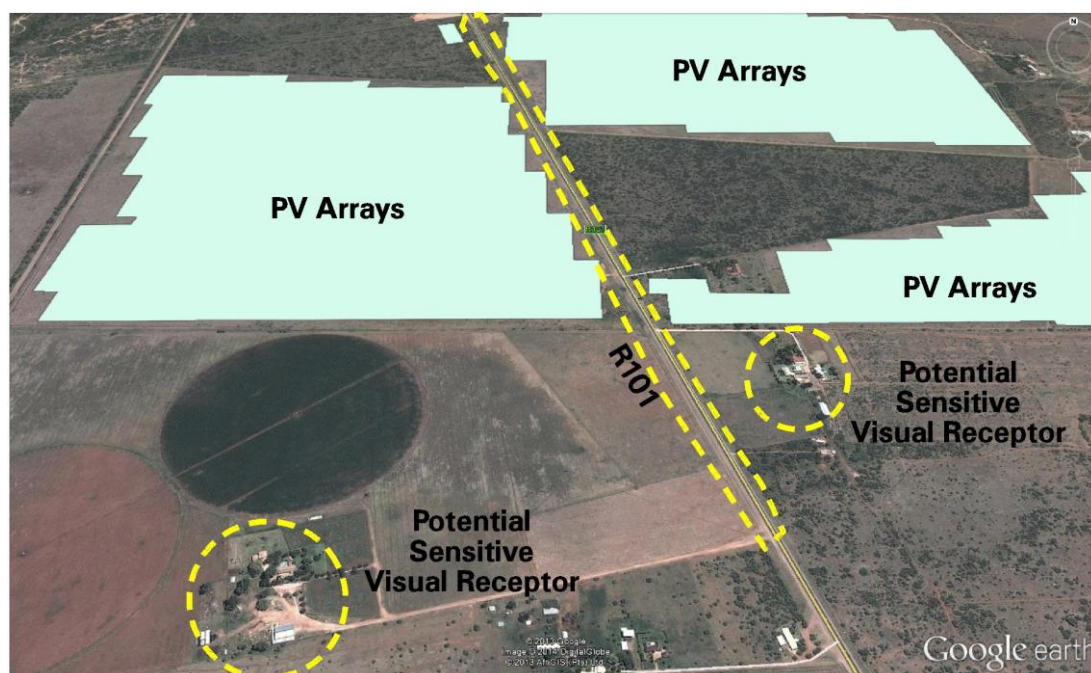


Figure 6.2: Potential sensitive visual receptors south of the proposed facility (also including a section of the R101 arterial road).

The southern section of the Forever Resorts Nature Reserve (for the 4m high structures) and an additional central section (for the 10m high structures) also falls within a 2km radius of the proposed PV development. Although the number of observers may be lower than the previously mentioned sensitive visual receptors, the impact may still be high, especially the central section that affords access to the southern part of the reserve.

The potential visual exposure within the 2km to 4km zone from the facility is expected to have a low visual impact, where sensitive visual receptors are generally absent, but may be moderate where observers are present. Homesteads and residences located within this zone mainly include Merinovlakte (to the south-west). It is expected though, that the vegetation cover and relative distance may negate the visual impact to a large degree.

The visual impact beyond 4km and up to 8km from the facility, is expected to be very low, but may potentially be low where observers are present. Visibility beyond 8km from the proposed development is expected to have a negligible visual impact.

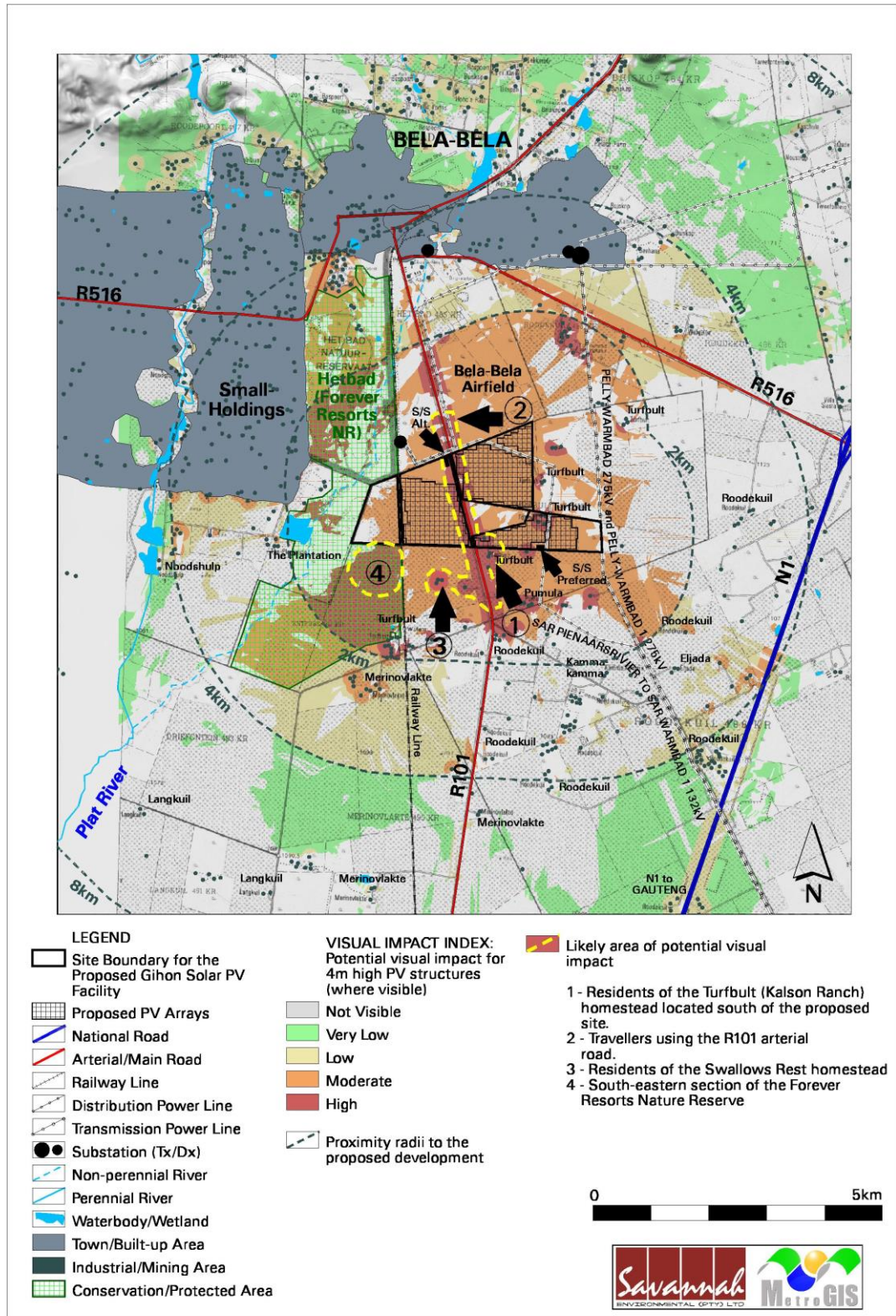


Figure 6.3: Visual impact index of the proposed Gihon Solar Energy Facility (4m PV structure alternative).

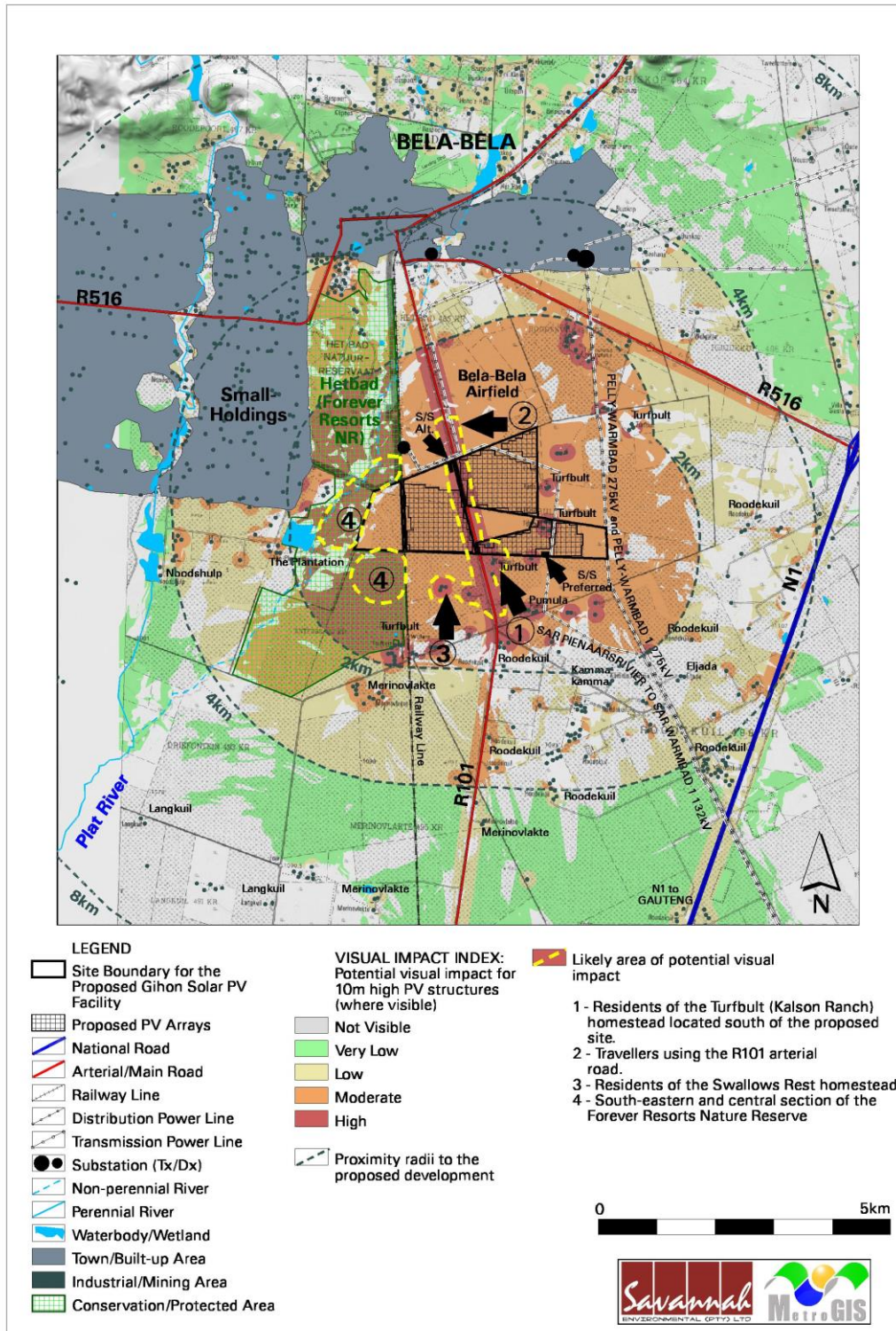


Figure 6.4: Visual impact index of the proposed Gihon Solar Energy Facility (10m PV structure alternative).

Operational phase

a) Potential visual impact on users of arterial roads in close proximity to the proposed Gihon Solar Energy Facility.

The facility could potentially have a high visual impact on road users travelling along the R101 arterial road (both alternatives).

Mitigation of this impact is possible, but is expected to be more effective when implemented for the 4m high PV panels, than for the 10m high alternative structures.

Both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact to low (4m alternative) and moderate (10m alternative). The table below illustrates this impact assessment.

	4m high PV panels		10m high PV panels	
	No mitigation	Mitigation considered	No mitigation	Mitigation considered
Extent	Local (4)	Local (4)	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)	High (8)	Moderate (6)
Probability	Highly Probable (4)	Improbable (2)	Definite (5)	Probable (3)
Significance	High (64)	Low (28)	High (80)	Moderate (42)
Status (positive, neutral or negative)	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes		Yes	

General mitigation/management:

Planning:

- » Retain and maintain natural vegetation in all areas outside of the development footprint.

Operations:

- » Maintain the general appearance of the facility as a whole.

Decommissioning:

- » Remove infrastructure not required for the post-decommissioning use of the facility.
- » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
- » Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Site specific mitigation measures:

Plant vegetation barriers along the R101 arterial road (both east and west) in order to shield the structures from observers travelling along these roads.

Cumulative impacts:

The construction of the Solar Energy Facility is expected to increase the cumulative visual impact within the region, considering the visual exposure of the power line infrastructure already present at this locality. Alternatively, the close proximity of the proposed facility to the existing visual disturbances (power lines) allows for the effective connection with the power grid without incurring any additional expanded visual impacts (i.e. lengthy overhead power lines).

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility infrastructure is removed and the site is rehabilitated to its original (current) status. Failing this, the visual impact will remain.

b) Potential visual impact on residents of homesteads in close proximity to the proposed Gihon Solar Energy Facility.

The potential visual impact on residents of homesteads in close proximity to the facility is expected to be of **high** significance. The residences in question are *Kalson Ranch* (112m south of the eastern PV arrays) and *Swallows Rest* (570m south of the western PV arrays).

The above residences (especially *Kalson Ranch*) located immediately adjacent (bordering) the proposed development, are expected to experience high visual impacts. Visual impacts at these two locations need to be discussed with the affected landowners and potential site-specific mitigation measures (or compensation) must be negotiated. Failing this, the visual impact will remain high and not moderate (for the 4m alternative) as reflected in the table below. Mitigation measures for the 10m high PV arrays are not expected to be as effective as for the 4m high alternative. This is due to the relatively tall structures (10m) and the short viewing distance.

Residences (renters) located on the project site earmarked for the development are not included in this assessment.

Mitigation of this impact is possible and both specific measures as well as general “best practice” measures are recommended in order to reduce/mitigate the potential visual impact. The table below illustrates this impact assessment of the two receptors located immediately adjacent to the proposed facility.

	4m high PV panels		10m high PV panels	
	No mitigation	Mitigation considered	No mitigation	Mitigation considered
Extent	Local (4)	Local (4)	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)	Very high (10)	High (8)
Probability	Definite (5)	Highly probable (4)	Definite (5)	Highly probable (4)
Significance	High (80)	Moderate (56)	High (90)	High (64)
Status (positive, neutral or negative)	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes		Yes	

General mitigation/management:

Planning:

- » Retain and maintain natural vegetation in all areas outside of the development footprint.

Operations:

- » Maintain the general appearance of the facility as a whole.

Decommissioning:

- » Remove infrastructure not required for the post-decommissioning use of the facility.
- » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.
- » Monitor rehabilitated areas post-decommissioning and implement remedial actions.

Site specific mitigation measures:

- » Plant vegetation barriers along the southern borders of the PV plant in order to shield the structures from observers residing at the abovementioned homesteads. Engage with land owners in order to inform, plan and execute mitigation measures.

Cumulative impacts:

The construction of the facility is expected to increase the cumulative visual impact within the region, considering the visual exposure of the power line infrastructure already present at this locality. Alternatively, the close proximity of the proposed facility to the existing visual disturbances (power lines) allows for the effective connection with the power grid without incurring any additional expanded visual impacts (i.e. lengthy overhead power lines).

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility infrastructure is removed and the site is rehabilitated to its original (current) status. Failing this, the visual impact will remain.

c) Potential visual impact on sensitive visual receptors within the region.

The visual impact on the users of roads and the residents of towns (Bela-Bela), settlements and homesteads within the region (i.e. beyond a 2km radius) is expected to be **low** for the proposed facility, both before and after the implementation of mitigation measures.

	4m high PV panels		10m high PV panels	
	No mitigation	Mitigation considered	No mitigation	Mitigation considered
Extent	Regional (3)	Regional (3)	Local (4)	Regional (3)
Duration	Long term (4)	Long term (4)	Long term (4)	Long term (4)

Magnitude	Low (4)	Low (4)	Moderate(6)	Low (4)
Probability	Improbable (2)	Very Improbable (1)	Improbable (2)	Improbable (2)
Significance	Low (22)	Low (11)	Low (28)	Low (22)
Status (positive, neutral or negative)	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes		Yes	
<p>General mitigation/management:</p> <p><u>Planning:</u></p> <ul style="list-style-type: none"> » Retain and maintain natural vegetation in all areas outside of the development footprint. <p><u>Operations:</u></p> <ul style="list-style-type: none"> » Maintain the general appearance of the facility as a whole. <p><u>Decommissioning:</u></p> <ul style="list-style-type: none"> » Remove infrastructure not required for the post-decommissioning use of the facility. » Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. » Monitor rehabilitated areas post-decommissioning and implement remedial actions. <p>Site specific mitigation measures:</p> <ul style="list-style-type: none"> » Plant vegetation barriers (where required) along the borders of the facility in order to shield the structures from observers residing at the abovementioned homesteads. 				
<p>Cumulative impacts:</p> <p>The construction of the facility is expected to increase the cumulative visual impact within the region, considering the visual exposure of the power line infrastructure already present at this locality. Alternatively, the close proximity of the proposed facility to the existing visual disturbances (power lines) allows for the effective connection with the power grid without incurring any additional expanded visual impacts (i.e. lengthy overhead power lines). There are no other facilities situated within the visual impact zone of the facility.</p>				
<p>Residual impacts:</p> <p>The visual impact will be removed after decommissioning, provided the facility infrastructure is removed and the site is rehabilitated to its original (current) status. Failing this, the visual impact will remain.</p>				

d) Potential visual impact on observers visiting the Forever Resorts Nature Reserve.

The proposed Gihon Solar Energy Facility may have a **high** visual impact on visitors to the Nature Reserve (10m high PV panel alternative), especially within

the central section of the reserve. Vehicular access to the southern part of the reserve traverses along the eastern boundary of the reserve, in relative close proximity to the proposed PV structures. This impact may be mitigated to **moderate** with the implementation of site specific mitigation measures. The 4m high PV panel alternative is expected to have a **low** visual impact on this reserve, due to constrained dimensions of this alternative.

	4m high PV panels		10m high PV panels	
	No mitigation	Mitigation considered	No mitigation	Mitigation considered
Extent	Local (4)	Local (4)	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)	High (8)	Moderate (6)
Probability	Improbable (2)	Improbable (2)	Highly probable (4)	Probable (3)
Significance	Low (28)	Low (24)	High (64)	Moderate (42)
Status (positive, neutral or negative)	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes		Yes	
General mitigation/management:				
<u>Planning:</u>				
» Retain and maintain natural vegetation in all areas outside of the development footprint.				
<u>Operations:</u>				
» Maintain the general appearance of the facility as a whole.				
<u>Decommissioning:</u>				
» Remove infrastructure not required for the post-decommissioning use of the facility.				
» Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications.				
» Monitor rehabilitated areas post-decommissioning and implement remedial actions.				
Site specific mitigation measures:				
» Plant vegetation barriers or vegetated berms along the western boundary (alongside the railway line) in order to shield the structures from observers visiting the nature reserve. Engage the reserve manager in the planning, placement and implementation of the mitigation measures.				

Cumulative impacts:

The construction of the Solar Energy Facility is expected to increase the cumulative visual impact within the region, considering the visual exposure of the power line infrastructure already present at this locality. Alternatively, the close proximity of the proposed facility to the existing visual disturbances (power lines) allows for the effective connection with the power grid without incurring any additional expanded visual impacts (i.e. lengthy overhead power lines).

Residual impacts:

The visual impact will be removed after decommissioning, provided the facility infrastructure is removed and the site is rehabilitated to its original (current) status. Failing this, the visual impact will remain.

e) Lighting Impacts

Lighting impacts relate to the effects of glare and sky glow. The source of glare light is unshielded luminaries which emit light in all directions and which are visible over long distances.

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. It is possible that the PV plant may contribute to the effect of sky glow within the environment which is currently undeveloped.

Mitigation of direct lighting impacts and sky glow entails the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the facility and the ancillary infrastructure (e.g. workshop, storage facilities and substation) will go far to contain rather than spread the light. The project proponent has indicated that the light sources for the Gihon Solar Energy Facility would be limited to:

- » Downward lights at the substation building wall: 6x50W high pressure sodium-vapour lamps (around the building at 2,75m above ground level to lit external facade and entrance door)
- » 6x250W high pressure sodium vapour downward bulbs at 5m above ground level located adjacent to the building (at the on-site substation).

The table overleaf summarizes the assessment of this anticipated impact, which is likely to be of **moderate** significance, and may be mitigated to **low**. The visual impact assessment is summarised in the table below. This assessment is specifically relevant to residents residing at homesteads within a 2km radius of the proposed facility.

	4m high PV panels		10m high PV panels	
	No	Mitigation	No	Mitigation

	<i>mitigation</i>	<i>considered</i>	<i>mitigation</i>	<i>considered</i>
Extent	Local (4)	Local (4)	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)	Low (4)	Low (4)
Probability	Probable (3)	Improbable (2)	Probable (3)	Improbable (2)
Significance	Moderate (36)	Low (24)	Moderate (36)	Low (24)
Status (positive, neutral or negative)	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes		Yes	
Mitigation:				
<u>Planning:</u>				
<ul style="list-style-type: none"> » Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself); » Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights; » Making use of minimum lumen or wattage in fixtures; » Making use of down-lighters, or shielded fixtures; » Making use of Low Pressure Sodium lighting or other types of low impact lighting. » Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes 				
Cumulative impacts:				
The development of the facility will contribute to an increase in light sources within the region, and as a result an increase in lighting impact at night.				
Residual impacts:				
The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.				

Construction phase

f) Potential visual impact of construction on sensitive visual receptors in close proximity to the proposed Gihon Solar Energy Facility

During construction, there will be a noticeable increase in heavy vehicles utilising the road to the development site. This increase in traffic and the construction activities on the site is expected to have a **high** visual impact on observers residing along this road, and for residents located immediately adjacent to the development site.

Special programmes need to be followed to rehabilitate disturbed land after construction. It is therefore imperative that the unnecessary removal of vegetation during construction must be avoided at all cost. Appropriate measures to rehabilitate cleared areas after construction, must be carried out.

The table below illustrates the assessment of this anticipated impact, indicating that this potential (short term) visual impact may be mitigated to **moderate**. Once again it is imperative for the project proponents to engage with land owners in order to inform, plan and execute mitigation measures.

	4m high PV panels		10m high PV panels	
	No mitigation	Mitigation considered	No mitigation	Mitigation considered
Extent	Local (4)	Local (4)	Local (4)	Local (4)
Duration	Short Term (2)	Short Term (2)	Short Term (2)	Short Term (2)
Magnitude	Very high (10)	High(8)	Very high (10)	High(8)
Probability	Highly probable (4)	Probable (3)	Highly probable (4)	Probable (3)
Significance	High (64)	Moderate (42)	High (64)	Moderate (42)
Status (positive, neutral or negative)	Negative	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)	Recoverable (3)
Irreplaceable loss of resources?	No	No	No	No
Can impacts be mitigated?	Yes		Yes	

Mitigation:

- » Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
- » Reduce the construction period through careful logistical planning and productive implementation of resources.
- » Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
- » Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
- » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
- » Reduce and control construction dust through the use of approved dust suppression techniques as and when required, especially on the dirt road giving access to the site (i.e. whenever dust becomes apparent).
- » Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
- » Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works.

Cumulative impacts:

None

Residual impacts:

None

Comparative Assessment of Alternatives:

Tracking technology: The primary visual impact, namely the appearance of the Solar Energy Facility is not possible to mitigate. The functional design of the PV panels cannot be changed in order to reduce visual impacts. The two design alternatives (i.e. 4m high PV panels or 10m high panels) do however offer the potential to largely increase the effectiveness of the mitigation measures (e.g. the shielding of the 4m panels is expected to be more effective than the much taller 10m panels).

Sensitive receptors on the roads or in nearby homesteads will be able to see either fixed or tracking panels on the project site due to the flat topography of the project site. Tracking panels can result in a higher visual intrusion than fixed panels due to the more mechanically complex structure. However, for this particular site there is a distinct difference in the potential impacts associated with the two technology alternatives, as summarised in the table below. From a visual perspective, the 4m PV technology is preferred.

Visual Impact	Significance			
	4m high PV panels	10m high PV panels	4m high PV panels	10m high PV panels
	No mitigation	Mitigation considered	No mitigation	Mitigation considered
Visual impact on residents of homesteads and settlements in close proximity to the proposed SEF.	High (80)	Moderate (56)	High (90)	High (64)
Visual impact on sensitive visual receptors within the region.	Low (22)	Low (11)	Low (28)	Low (22)
Visual impact of construction on sensitive visual receptors.	High (64)	Moderate (42)	High (64)	Moderate (42)
Visual impact on visitors to the Forever Resorts Nature Reserve located in close proximity to the proposed SEF	Low (28)	Low (24)	High (64)	Moderate (42)
Visual impact of lighting on sensitive visual receptors.	Moderate(36)	Low (24)	Moderate(36)	Low (24)

Comparative Assessment of Substation positions:

Regarding the substation alternatives; the preferred alternative generally consolidates the substation infrastructure within the development footprint of the PV arrays. The alternative substation position, located west of the R101 arterial road, spreads the substation infrastructure over a larger area and would generally be more exposed next to this road. To this end, the *preferred* substation position (Alternative 1) is deemed to be more suitable from a visual impact point of view.

Implications for Project Implementation

- » Visual impacts are difficult to mitigate, however, possible mitigation measures are recommended in Section 6.8 of the visual report.
- » Ultimately the use of static PV panels at a height of up to 4m will be desirable from a visual perspective due to the significance in the difference of impacts between the two technologies.

6.2.5 Assessment of Potential Social Impacts

a. Direct employment and skills development – construction phase

The construction of the proposed project will require a workforce and therefore direct employment will be generated. This is therefore a positive social impact. Although the exact number of employment opportunities has not been determined at this stage, it is estimated that during the construction phase ~7 jobs per MW installed will be generated which equates to approximately 500 jobs for the 75MW Solar Energy Facility. However this number is likely to vary based on final designs and size of the proposed project. In terms of skills requirements, it is common that highly skilled or skilled labour such as engineers, technical staff and project managers will constitute about 30% of the work force; semi-skilled staff would typically be required to operate machinery and this will constitute about 10% of employees; while low skilled construction and security staff will constitute about 60% of the work force. It is likely that an EPC contractor will be appointed by the developer who will hire the necessary subcontractors with expertise in civil work, electrical work and mechanical assembly.

The level of education in the Bela-Bela Local Municipality is poor which is linked to limited skills base. This is combined with a high level of unemployment. Although the more specialised tasks are likely to require skills from outside the Bela-Bela Local Municipal area, there are potential opportunities for low skilled (construction and security workers) staff which would require associated training.

Nature: The creation of employment opportunities and skills development opportunities during the construction phase for the country and local economy		
	Without enhancement	With enhancement
Extent	Local- Regional (3)	Local- Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (4)	Moderate (4)
Probability	Probable (3)	Highly probable (4)
Significance	Low (27)	Medium (36)
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	
Enhancement measures:		
In order to enhance the local employment and business opportunities associated with the construction phase the following measures should be implemented:		
» It is recommended that local employment policy is adopted to maximise the opportunities made available to the local labour force. Networx should make it a requirement for contractors to implement a 'locals first' policy, especially for semi and low skilled job categories		

<ul style="list-style-type: none"> » It is recommended to set realistic local recruitment targets for the construction phase » Training and skills development programmes should be initiated prior to the commencement of the construction phase
<p>Cumulative impacts Opportunity to upgrade and improve skills levels in the area</p>
<p>Residual impacts Improved pool of skills and experience in the local area</p>

The impact is therefore assessed to be positive; local, district and provincial in extent; temporary in duration; moderate-high in intensity and highly probable. The impact is assessed to be of medium significance to the decision making process.

b. Economic multiplier effects – construction phase

There are likely to be economic multiplier effects from the use of local goods and services which includes, but is not limited to, construction materials and equipment and workforce essentials such as food, clothing, safety equipment, and other goods. Off-site accommodation would also be required for those construction staff not located in the area, and there is a large amount of accommodation available in Bela-Bela. Transport services to the site from town would also be required as there is limited public transport in the area. This additional spend would provide an indirect boost to the local economy.

The total wage bill for the construction for the 75 MW phase is estimated to be in the region of R13 million (2013 rand values). The injection of income into the area in the form of wages will represent a significant opportunity for the local economy and businesses in the Bela-Bela area.

Direct impacts would include the creation of new jobs for construction workers and the associated income generated by the solar project. Indirect impacts would occur as a result of the new economic development, and would include new jobs at businesses that support the expanded workforce or provide project materials, and associated income.

Nature: Significance of the impact on economic multiplier effects from the use of local goods and services		
	Without enhancement	With enhancement
Extent	Local- regional (3)	Local- Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Highly probable (4)
Significance	Low (27)	Medium (36)

Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources	N/A	
Can impacts be enhanced	Yes	
Enhancement		
<ul style="list-style-type: none"> » It is recommended that a local procurement policy is adopted by the developer to maximise the benefit to the local economy » Networkx should develop a database of local companies, specifically Historically Disadvantaged (HD) which qualify as potential service providers (e.g construction companies, catering companies, waste collection companies, security companies etc.) prior to the commencement of the tender process for construction contractors; these companies should be notified of the tender process and invited to bid for project-related work where applicable » It is a requirement to source as much good and services as possible from the local area; engage with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible 		
Cumulative impacts		
Opportunity for local capital expenditure, potential for the local service sector		
Residual impacts		
Improved local service sector, growth in local business		

The impact is therefore assessed to be positive; local, district and provincial in extent; temporary in duration; low intensity; and highly probable. The impact is assessed to be of low significance to the decision-making process.

c. Safety and security impacts

The influx of people into the area especially job seekers and a non-local workforce could lead to a temporary increase in the level of crime. Relations to the perceived loss of security during the construction phase of the proposed project due to the influx of workers or outsiders to the area (as influxes of newcomers or jobseekers are usually associated with an increase in crime), may have indirect effects, such as increased safety and security issues for neighbouring farms and damage to property, such as the risk of veld fire, stock theft, crime and so forth. The perception exists that construction related activities (influx of jobseekers, and construction workers and so forth) is a contributor to increased criminal activities in an area. Safety and security impacts are a reality which needs to be addressed through appropriate mitigation measures. Even though crime levels in Bela-Bela are considered to be low (according to crime statistics from 2008 adopted from Bela-Bela IDP 2013/2014), locals suffer from theft and poaching of livestock and game. Property owners are thus concerned that this type of criminal activity would increase during the construction phase, uncontrolled veld fires are also a concern in Bela-Bela, especially in the dry winter season, which poses a potential risk to surrounding areas. An increase of traffic from the rise in construction

vehicles is a safety concern for other road users and local communities in the area. The proposed site is traversed by the R101 which links Pretoria to the Bela-Bela (alternative route to the N1 to avoid tolls) and therefore the movement of construction related activities along the R101 does have the potential to impact other road users.

Nature: Temporary increase in safety and security concerns associated with the influx of people during the construction phase		
	Without mitigation	With mitigation
Extent	Local- regional (2)	Local- Regional (2)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	Low (24)	Low (16)
Status (positive or negative)	Negative	Negative
Reversibility	Yes, compensation paid for stock losses attributable to construction workers	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Mitigation		
<ul style="list-style-type: none"> » Safety at and around the construction site should be ensured by limiting any fire risks, fencing off the construction area to avoid unauthorised access and employing security personnel » Employing local community members could minimise the potential for criminal activity or perceived perception of an increase in criminal activity due to the presence of an outside workforce and influx of people » Working hours should be kept between 6am and 6pm as per the ECA during the construction phase, agreed with surrounding landowners and occupiers » The perimeter of the construction site should be appropriately secured to prevent any unauthorised access to the site; the fencing of the site should be maintained throughout the construction period » Security personnel should be on site on a permanent basis » No unauthorised entry to the site is to be allowed; access control and a method of identification of site personnel are required at all times » Local community organisations and policing forums / neighbourhood watches must be informed of construction times and the duration of the construction phase » Security lighting should be implemented » The contractor must ensure that open fires on the site for heating, smoking or cooking are not allowed except in designated areas » Contractor must provide adequate firefighting equipment on site and provide firefighting training to selected construction staff. » A comprehensive employee induction programme would cover land access protocols, fire management and road safety. This must be addressed in the construction EMP as the best practice. » All vehicles must be road worthy and drivers must be qualified and made aware of the potential road safety issues and follow the speed limits. » Provide adequate signage along the R101 to warn motorists of the construction 		

activities taking place
Cumulative impacts Possible increase in crime levels with subsequent possible economic losses and increased traffic on the R101
Residual impacts None anticipated

The impact is assessed to be negative; local in extent; temporary in duration; low intensity with mitigation and probable. The impact is assessed to be of low significance with mitigation to the decision making process.

d. Pressure on economic and social infrastructure impacts from an in migration of people

The in migration of people to the area as either non-local workforce of construction workers and/or jobseekers could result in pressure on economic and social infrastructure due to in migration of construction workers and jobseekers and pressure on local population (rise in social conflicts). Influx of people into the area, especially by job seekers, could further lead to a temporary increase in the level of crime, to the deterioration of health and put pressure on basic services. The introduction of a non-local workforce has the potential to result in social disruption, both physical and emotional, during construction. Such disruption could result in an increased demand on social infrastructure such as accommodation, health facilities, transport facilities and so forth. Social ills including the spread of diseases (such as HIV/AIDS), crime and social conflict are currently a problem within the Bela-Bela area and with an influx of non-local workers to the area this could heighten the problem. Adverse impacts could occur if a large in-migrant workforce, culturally different from the local indigenous group, is brought in during construction. This influx of migrant workers could also strain the existing community infrastructure and social services. However, the degree to which society is disrupted largely depends on the level of local employment achievable and in the case of this Project a portion of the workforce is expected to be sourced locally and the overall number of outsiders would not be significant.

Nature: Added pressure on economic and social infrastructure during construction as a result of in migration of people		
	Without mitigation	With mitigation
Extent	Local-regional (2)	Local- regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	Low (30)	Low (16)
Status (positive or negative)	Negative	Negative
Reversibility	No	

Irreplaceable loss of resources	No
Can impacts be mitigated	Yes, to some degree. However the risk cannot be eliminated
Mitigation	
<ul style="list-style-type: none"> » Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories. » A comprehensive employee induction programme should address issues such as HIV/AIDS and TB as well as alcohol and substance abuse. The induction should also address a code of conduct for employees that would align with community values. 	
Cumulative impacts	
<p>Additional pressure on infrastructure due to additional people in the area</p> <ul style="list-style-type: none"> » Possible increase in the spread of diseases » Possible increase in criminal activities in area » Possible increase in poaching and stock theft with subsequent economic losses for property owners 	
Residual impacts	
<p>Possibility of outside workers remaining in the area after construction is completed and subsequent pressures on local infrastructure</p>	

The impact is assessed to be negative; local in extent; temporary in duration; low intensity; and improbable with mitigation measures. The impact is assessed to be of low significance to the decision-making process.

e. Nuisance Impacts

Impacts associated with construction related activities include noise, dust and disruption or damage to adjacent properties (including access arrangements) is a potential issue. Experience from other Solar Energy Facilities projects indicate that site clearing does increase the risk of dust being generated, which can in turn impact on adjacent properties. The potential impacts can be addressed by implementing effective mitigation measures. The movement of heavy construction vehicles during construction phase also had the potential to create noise, damage to roads and dust. The primary sources of noise during construction would be from the construction equipment and other sources of noise include vehicular traffic. Generation of dust would come from construction activities. Short-term increases in the use of local roads would occur during the construction period. Heavy equipment would most likely remain at the site for the construction period. Shipments of materials are unlikely to affect primary or secondary road networks through an increase in wear and tear on the access roads.

The noise, dust and increased use of the local roads are expected to be negative but short term. Impacts from these nuisances could impact project workers and the surrounding farms.

Nature: Nuisance impacts in terms of temporary increase in noise and dust, or the wear and tear on private farm roads for access to the site		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	improbable (2)
Significance	Low (15)	Low (10)
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources	No	
Can impacts be mitigated	Yes	
Mitigation		
The potential impacts associated with construction and heavy vehicles can be effectively mitigated. The mitigation measures include:		
<ul style="list-style-type: none"> » The movement of heavy vehicles associated with the construction phase should be timed to avoid weekends and holiday periods where feasible » The contractor must ensure that damage caused by construction related traffic to the internal access roads is repaired before the completion of the construction phase. The costs associated with the repair must be borne by the contractor » Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers » All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits 		
Cumulative impacts		
If damage to roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users		
Residual impacts		
Only damage to roads that are not fixed could affect local farmers and other road users		

The impact is assessed to be negative; local in extent; temporary in duration; low intensity; and probable. The impact is assessed to be of low significance to the decision-making process.

Comparative Assessment of PV Panel technology (Fixed vs Tracking):

There is no preference for the siting of the on-site Substation from a social perspective.

Implications for project implementation

- » Mitigation of construction phase impacts on renters residing on the project site and adjacent landowners is required.

- » The findings of the SIA undertaken for the proposed Gihon Solar Energy Facility indicate that the development will create employment and business opportunities for locals during both the construction and operational phase of the project.
- » The establishment of a Community Trust will also create an opportunity to support local economic development in the area.

6.3 Decommissioning Phase

Typically, the major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of the proposed facility the decommissioning phase is likely to involve the disassembly and replacement of the existing components with more modern technology. This is likely to take place in the 20 - 25 years post commissioning. The decommissioning phase is therefore likely to create additional, construction type jobs, as opposed to the jobs losses typically associated with decommissioning however for a limited period of time.

Given the relatively small number of people employed during the operation phase (~ 15), the social impacts at a community level associated with decommissioning are likely to be limited. In addition, potential impacts associated with the decommissioning phase can be effectively managed with the implementation of a retrenchment and downscaling programme. With mitigation, the impacts are assessed to be Low (negative).

Nature: Social impacts associated with retrenchment including loss of jobs, and source of income		
	Without Mitigation	With Mitigation
Extent	Local- regional (3)	Local- regional (2)
Duration	Medium Term (2)	Very Short Term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (44)	Low (16)
Status	Negative	Negative
Reversibility	Yes, assumes retrenchment packages are paid to all affected employees	
Irreplaceable loss of resources?	No	

Can impact be mitigated?	Yes
Mitigation	
<ul style="list-style-type: none"> » The proponent should ensure that retrenchment packages are provided for all staff retrenched when the plant is decommissioned. » All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning; » There should be a decommissioning/ rehabilitation fund established as part of the environmental management programme, allocated to rehabilitate disturbed areas. 	
Cumulative impacts	
Loss of jobs and associated loss of income etc. can impact on the local economy and other businesses. However, decommissioning can also create short term, temporary employment opportunities associated with dismantling etc.	
Residual impacts	
Loss of jobs and associated loss of income, can impact on local economy and other businesses.	

6.4 Assessment of the Do Nothing Alternative

The impacts of pursuing the No-go Option are both positive and negative as follows:

- » The benefits would be that there is no change in status quo in terms of the negative impacts described above during all project phases which would be experienced by neighbours, society and the landscape – namely through disruption, noise, visual, road safety, and tourism impacts. The impact is therefore neutral.
- » There would be an opportunity loss in terms of contributing to the renewable energy targets nationally. The impact is therefore negative.
- » There would also be an opportunity loss in terms of job creation, skills development and associated economic multipliers for the local economy.

The No-Development option would represent a lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy. Given South Africa's position as one of the highest per capita producer of carbon emissions in the world, this would represent a High negative social cost. Foregoing the proposed Gihon Solar Energy Facility would not necessarily compromise the development of renewable energy facilities in South Africa. However, the socio-economic benefits for local communities in the Bela-Bela Municipality would be forfeited.

6.5 Summary of impacts

After the application of mitigation measures there are no negative impacts of high significance expected to be associated with the proposed Gihon Solar Energy

facility provided that the recommended mitigation measures are implemented. The following is of relevance:

- » Areas of high and medium to high ecological sensitivity will be avoided by the facility and associated infrastructure.
- » The project will occupy agricultural land which has not been used for crop farming and where grazing is not practised intensively.
- » The single heritage site identified will be avoided by the facility and the impact on heritage will be low.
- » The impact on palaeontological resources is anticipated to be very low
- » The potential impact on the visual environment could be significant for both PV alternatives (4m and 10m) however the impact can be mitigated through the preferred use of the 4m PV alternative.
- » The overall social impact will be positive.

ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

CHAPTER 7

Cumulative impacts in relation to an activity are defined in the Environmental Impact Assessment Regulations (Government Notice R543) as meaning “the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area”.

There has been a substantial increase in renewable energy developments recently in South Africa as legislation is evolving to facilitate the introduction of Independent Power Producers (IPPs) and renewable energy into the electricity generation mix. Due to the recent substantial increase in interest in renewable energy developments in South Africa, it is important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts are considered and avoided where possible.

The Department of Energy has, under the REIPPP Programme released requests for proposals to contribute towards Government’s renewable energy target of 3725 MW (1450 MW of which has been allocated to solar PV energy) and to stimulate the industry in South Africa. The bid selection process will consider the suggested tariff as well as socio-economic development opportunities provided by the project and the bidder.

There is a legislated requirement to assess cumulative impacts associated with a proposed development. This chapter looks at whether the proposed project’s potential impacts become more significant when considered in combination with the other known or proposed solar farm projects within the area.

7.1 Assessment of Potential Cumulative Impacts

A cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant, but may become significant when added to the existing and potential impacts eventuating from similar or diverse undertaking in the area⁵.

Significant cumulative impacts that could occur due to the development of other solar energy facilities and associated infrastructure in proximity to each other may include impacts such as:

- » Loss of vegetation and impacts on ecology

⁵ Definition as provided by DEA in the EIA Regulations.

- » Soil and agricultural potential impacts
- » Heritage impacts
- » Visual impacts
- » Social impacts

7.2 Cumulative impacts of multiple phases

As the proposed development will no longer be constructed in 2 phases as would be required for a 150MW facility, the potential cumulative impacts associated with the scale of the project over two phases would not be registered and therefore does not require consideration.

7.2 Cumulative impacts of renewable energy facilities in the region

According to the baseline data mapped for the Strategic Environmental Assessment for the rollout of wind and solar PV energy in South Africa (DEA and CSIR, 2013), there is one other approved PV facility (Bela-Bela Solar Park - 30 MW) located within 10 km from Bela-Bela and within 7 km from the proposed Gihon PV facility.

7.2.1 Ecological Processes

Cumulative negative impacts on ecology relate to disturbance and habitat loss which may occur during construction. The significance of this impact is expected to be of a low significance, based on the low sensitivity of the areas considered for the siting of the facility as well as through sound environmental management during construction and operation. Cumulative impacts on ecology will be of low significance, due to the low number (2) of existing projects contemplated within the area, and their distance from each other. The impact of additional PV facilities in the immediate vicinity of the Gihon Solar Energy Facility could begin to impact on ecological processes within nearby protected areas without proper mitigation.

7.2.2 Cumulative soil and agricultural impacts

The impact of the proposed project on soil and loss of agricultural land is limited by the high clay content of the soils and the swelling and shrinking characteristics of the vertic soils, that complicate cultivation and irrigation management. The overall loss of agricultural land in the region due to the value of agricultural land in this region and other similar developments which may be contemplated is considered to be of moderate significance.

7.2.3 Cumulative Heritage Impacts

Archaeological sites are non-renewable and impact on any archaeological context or material will be permanent and destructive. No cumulative heritage impacts are anticipated due to the broad-scale disturbance of land in this region through agricultural practices.

7.2.4 Visual impacts

The cumulative impacts associated with solar energy facilities are largely linked to the visual impact on the areas sense of place and landscape character.

The construction of the PV panels together with the associated infrastructure will increase the cumulative visual impact of industrial type infrastructure within the region. This is especially relevant in light of the other alternative energy facilities proposed to be constructed in the region, however such sites should be located within similar viewsheds in order for there to be a cumulative visual impact. This is not the case for the Gihon project.

The construction of the proposed PV facility is expected to increase the cumulative visual impact within the region, considering the visual exposure of the power line infrastructure already present at this locality. Alternatively, the close proximity of the proposed PV project to the existing visual disturbances (power lines) allows for the effective connection with the power grid without incurring any additional expanded visual impacts (i.e. lengthy overhead power lines).

7.2.5 Socio-economic impacts

Cumulative impacts have been considered as part of this social impact assessment and identified where relevant. The potential impact of the proposed Gihon Solar Energy Facility on the areas sense of place is likely to be low to medium. The potential impact of solar facilities on the landscape is an issue that does needs to be considered, specifically given South African's strong attachment to the land and the growing number of solar plant applications. With regard to the area, a number of Solar Energy Facilities have been proposed in the Limpopo Province, but with only 2 known (including Gihon) in the vicinity of Bela-Bela.

The proposed Gihon Solar Energy Facility has the potential to result in significant positive cumulative impacts; specifically the establishment of a number of Solar Energy Facilities in the vicinity of Limpopo will create a number of socio-economic opportunities for the Province, which, in turn, will result in a positive social benefit. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream business opportunities. Benefits to the local, regional and national economy through employment and procurement of services could be substantial should many of the renewable energy facilities

proceed. This benefit will increase significantly should critical mass be reached that allows local companies to develop the necessary skills to support construction and maintenance activities and that allows for components of the renewable energy facilities to be manufactured in South Africa. Furthermore at municipal level, the cumulative impact could be positive and could incentivise operation and maintenance companies to centralise and expand their activities towards education and training and more closely to the projects.

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 8

This chapter concludes the EIA Report by providing a summary of the conclusions of the assessment of the proposed site for the development of the proposed Gihon Solar Energy Facility. In so doing, it draws on the information gathered as part of the EIA process and the knowledge gained by the environmental specialist consultants and presents an informed opinion of the environmental impacts associated with the proposed project.

Networx Renewables (Pty) Ltd an Independent Power Producer (IPP), is proposing the construction of a commercial solar electricity generating and associated infrastructure on Portions 1, 2, 5 and 7 of the farm Turfbult 494 KR, located approximately 4 km south of Bela-Bela in the Limpopo Province. The proposed facility will have a generating capacity of up to 75MW and will comprise of the following infrastructure:

- » Arrays of PV panels and respective inverter stations;
- » Appropriate mounting structures for panels;
- » Cabling between the projects components, to be laid underground where practical;
- » On-site transformers to step up the power and a substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- » An overhead power line to loop-in and loop out of the existing Pelly-Warmbad 132kV power line located at the northern boundary of the site (the combined line consisting of sections SAR Warmbad – Warmbad, SAR Pienaarsrivier - SAR Warmbad and Pelly-SAR Pienaarsrivier);
- » Building for maintenance, control and storage;
- » Internal access roads; and
- » Fencing.

During the public participation process conducted for the Scoping study, the proposed project was generally well received from the recipient community, interested and affected parties as well as stakeholders. In response to concerns from the neighbouring Forever Resorts Nature Reserve, additional land was identified on the same farm for assessment with the aim of mitigating the potential impact on the Reserve, as well as to mitigate ecological and visual impacts anticipated to be associated with the proposed PV facility. The entire extent of 481 ha has been assessed for suitability for the proposed development.

8.1. Evaluation of the Solar Energy Facility and Associated Infrastructure

The preceding chapters of this report together with the specialist studies contained within Appendices E - J provide a detailed assessment of the potential impacts that may result from the proposed project.

From the assessment of potential impacts undertaken within this EIA, it is concluded that there are no environmental fatal flaws associated with the proposed site identified for the development of the Gihon Solar Energy Facility. Potential environmental impacts and some areas of high sensitivity were, however, identified. In summary, the most significant environmental impacts associated with the project, as identified through the EIA, include:

- » Potential impacts on flora and fauna
- » Potential impact on listed floral species
- » Potential impacts on migrating small animals from the Forever Resorts Nature Reserve and avifauna nesting within the reserve
- » Potential impacts on the local soils, land capability and agricultural potential of the site
- » Potential visual impacts mainly due to the different heights between the PV technologies
- » Potential heritage impacts
- » Potential social and economic impacts
- » Potential cumulative impacts

8.1.1. Impacts on Ecology

Areas of ecological sensitivity within the proposed development site were identified through the EIA process. Overgrazing and bush clearing has significantly altered the ecological status over the majority of the site. The vegetation units identified to occur on the project site and the associated ecological sensitivity of each unit are as follows:

- » Unit 1 (*Brachiaria eruciformis* – *Acacia nilotica*)
 - Sensitivity - High
- » Unit 2 (*Dichanthium annulata* – *Aristida bipartita*)
 - Sensitivity - Low
- » Unit 3 (*Tephrosia capensis*– *Hyparrhenia filipendula*)
 - Sensitivity - Low
- » Unit 4 (*Hyparrhenia filipendula* – *Heteropogon contortis*)
 - Sensitivity – Low
- » Unit 5 (*Eragrostis superba* – *Acacia tortilis*)
 - Sensitivity – Medium to low

Units 1 and 5 will be avoided by the proposed activities on account of their ecological value and sensitivity and the entire facility will be situated on areas determined to be of low ecological sensitivity. The exclusion of Unit 1 and a section of Unit 2 to the west of the railway line will serve to buffer the potential ecological impacts on the Forever Resorts Nature Reserve. This represents an area of 71ha. Additional mitigation is required to ensure that the impact on the protected plant *Aloe greatheadii* var. *davyana* located throughout the project site is mitigated. Furthermore the potential migration of sensitive small animals onto the project site from the nature reserve during construction should not be overlooked.

The impacts on ecology as a result of the construction of the proposed Gihon Solar Energy Facility and associated infrastructure have been rated as being of low significance with the implementation of appropriate mitigation measures.

8.1.2. Impact on Soils, Land Capability and Agricultural Potential

No intensive agricultural practices are undertaken on the farm (for last 12 years) and land use is almost entirely grazing of cattle and game with small areas of cultivation and orchards. Agricultural capability is of moderate potential under irrigation however this has been determined to be of limited viability because of soil conditions and type.

Three potential negative impacts of the development on agricultural resources and productivity were identified as:

- » Loss of agricultural land use caused by direct occupation of land by the energy facility footprint (medium significance with and without mitigation).
- » Soil Erosion caused by alteration of the surface run-off characteristics (low significance with and without mitigation).
- » Loss of topsoil in disturbed areas, causing a decline in soil fertility (low significance with and without mitigation).

One potential positive impact of the development on agricultural resources and productivity was identified as:

- » Generation of alternative land use income through rental for energy facility on low productivity agricultural land. This will provide land owners with increased cash flow and rural livelihood (low significance with and without mitigation).

The loss of agricultural land has been rated as being of medium significance, due only to the occupation of agricultural land by the PV facility, however all other soil impacts have been rated as low with and without the implementation of mitigation measures.

8.1.3. Visual Impacts

From a visual perspective it was concluded that the position of the associated infrastructure (including on-site substation) would have no impact on the visual impact of the proposed facility. It was concluded that the proposed use of tracking technology (10m alternative) would potentially result in a high visual impact, but this could be mitigated to moderate significance through the use of 4m high static technology (4m alternative). Similarly the impact on the Forever Resorts Nature Reserve and users of the R101 would high (10m alternative) and moderate (4m alternative). The visual impact of the facility on the town of Bela-Bela (both 4m and 10m alternatives) was determined to be of low significance (for all receptors beyond a 2km radius from the facility).

The anticipated visual impacts (post mitigation measures) are on average expected to be of moderate significance. The proposed facility is not considered to be fatally flawed from a visual perspective, provided that land owners adjacent to the facility are consulted and reasonably accommodated.

8.1.4. Impacts on Heritage Resources

One site of possible heritage significance was identified during the survey consisting of an old farm house and outbuildings. Should the building be impacted by the project, it is recommended that a conservation architect assess the site prior to its alteration, use or destruction. If the site is older than 60 years a demolition permit will be required before construction starts. Other artefacts identified on the project site are not considered to be of consequence as they are out of context.

Based on the facility layout plan provided by the developer, the old farm house will not be included in the development area and this site has been avoided. The overall impact of the project on heritage resource is rated as low significance.

8.1.5. Social and Economic Impacts

The proposed Gihon Solar Energy Facility is unlikely to result in permanent damaging social impacts. In terms of potential social impacts arising from the project, the SIA has found that there is no obvious reason for the competent authority to reject the application on social grounds. From a social perspective it is concluded that the project could be developed subject to the implementation of the recommended mitigation measures and management actions contained in the report. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the challenges created by climate change, represents a positive social benefit for society as a whole.

8.2 Comparison of Alternatives

Layout alternatives: No feasible layout alternatives within the broader project site were identified as the Gihon PV facility layout/footprint was optimized in response to the results of the land capability assessment undertaken during the Scoping phase, comments from I&APs as well as the recommendations of the EIA specialist studies. Whole sections of the project site were excluded for the siting of the facility on the basis of ecological sensitivity and the potential for the occurrence of direct and indirect impacts on adjacent areas (most notably the Forever Resorts Nature Reserve).

A technically preferred location for the on-site substation was considered at Scoping. Subsequently, an alternative, environmentally preferred site for the siting of the on-site substation was identified by the developer based on the findings of the ecological study and in order to avoid direct ecological impacts from occurring. From an ecological perspective it was concluded that the alternative siting of the on-site substation was in an area of low ecological sensitivity, but having the benefit of also being technically viable due to its location relative to the overhead power line facilitating a loop in – loop out connection to the grid, thereby avoiding the need for a long power line.

Technology alternatives: Two solar energy technology alternatives were considered for the proposed project, and included:

- » Preferred technology: Fixed Mounted PV systems (static/fixed-tilt panels) having a height of approximately 4m.
- » Alternative technology: Tracking PV systems (with solar panels that rotate around a defined axis to follow the sun’s movement) having a height of up to 4m (for 1-axis tracking) or 10m (for 2-axis tracking).

For the majority of impacts, those alternative PV technologies do not differ in any significant way. Therefore, there is no significant difference in the potential impacts associated with the alternatives. In terms of the specialist studies undertaken, the following conclusions were made regarding the preferred PV technology alternative:

	Fixed	Tracking
Ecology	Less preferred	Preferred
Soils and agricultural potential	No preference	No preference
Visual	Preferred	Less preferred
Heritage & palaeontology	No preference	No preference
Social	No preference	No preference

- » **Ecology** – Tracking PV technology is ecologically a preferred technology alternative, due to the shading effect and potential loss of groundcover during

operation as a result, the impact of tracking systems would seem less than that of a fixed panel array, even if the latter may occupy less space.

- » **Soils and agricultural potential** - The agricultural potential for this site is low, in terms of impact arising from soils and agricultural potential, there is no significance difference in the potential impacts associated with the two technology alternatives.
- » **Visual** - Fixed or 1-axis tracking technologies (4m option) are preferred being that they are less intrusive to sensitive visual receptors. 2-axis tracking technology could result in the height of the panels being up to 10m, thereby extending the visual intrusion of the facility.
- » **Heritage and palaeontology** - There is no significance difference in the potential impacts associated with the technology alternatives as the footprint remains nearly unchanged.
- » **Social** - There is no difference in social / economic impacts from either technology alternatives.

There are no impacts of unacceptably high significance associated with either technology alternative assessed for the proposed Gihon Solar Energy Facility, however a stronger preference for the use of lower height technologies in order to mitigate the potential visual impacts has emerged.

On-site Substation: the position of Substation Alternative 1 has emerged as the preferred alternative based on its location on areas of low ecological sensitivity, whereas the position of Substation Alternative 2 within areas mapped as medium – high ecological sensitivity is not recommended. No preference for the siting of the substation from a visual, agricultural, and heritage perspective exists.

8.3 Environmental Costs of the Project versus Benefits of the Project

Environmental (natural environment, economic and social) costs can be expected to arise from the project proceeding. This could include:

- » Loss of biodiversity, flora, fauna and soils due to the clearing of land for the construction and utilisation of land for the PV project (which is limited to the development footprint of 220 hectares). The loss of biodiversity has been minimised by the careful location of the development to avoid key areas supporting biodiversity including high and medium sensitive areas.
- » Visual impacts associated with the PV panels
- » Change in land-use and loss of agricultural land on the development footprint.

These costs are expected to occur at a local level.

Benefits of the project include the following:

- » The project is poised to bring about important economic benefit at the local and regional scale through job creation, procurement of materials and provision of services and other associated downstream economic development. These will transpire during the preconstruction/ construction and operational phases.
- » The project serves to diversify the economy and electricity generation mix of South Africa by addition of solar energy to the mix.
- » South Africa's per capita greenhouse gas emissions being amongst the highest in the world due to reliance on fossil fuels, the proposed project will contribute to South Africa achieving goals for implementation of non-renewable energy and 'green' energy. Greenhouse gas emission load is estimated to reduce by 0.86% for a 500MW coal-fired power station compared to a similar MW PV project, on a like for like basis.

The benefits of the project are expected to occur at a national, regional and local level. These benefits partially offset the localised environmental costs of the project.

8.4. Overall Conclusion (Impact Statement)

The technical viability of establishing the Gihon Solar Energy Facility with a generating capacity of up to 75MW on portions of the Farm Turfbult has been established by Networx. The positive implications of establishing the PV facility include the following:

- » One of the first commercial renewable energy facilities in the region aiding in bolstering energy security in the region.
- » The potential to harness and utilise solar energy resources within the Limpopo Province.
- » The project would assist the South African government in reaching their set targets for renewable energy.
- » The project would assist the South African government in the implementation of its green growth strategy and job creation targets.
- » The National electricity grid in the Limpopo Province would benefit from the additional generated power.
- » Promotion of clean, renewable energy in South Africa
- » Creation of local employment, business opportunities and skills development for the area.

The findings of the specialist studies undertaken within this EIA to assess both the benefits and potential negative impacts anticipated as a result of the proposed project conclude that there are **no environmental fatal flaws** that should prevent the proposed project from proceeding, provided that the recommended mitigation

and management measures are implemented. The significance levels of the majority of identified negative impacts have been reduced by implementing the mitigation measures recommended by the specialist team during the EIA process, and this specifically included the consideration of the facility layout in relation to sensitivities identified. The avoidance of areas of sensitivity is illustrated by the facility layout drawing included as Figure 8.1. The significance levels of the majority of identified negative impacts can be reduced by implementing the recommended mitigation measures. The project is therefore considered to meet the requirements of sustainable development. Environmental specifications for the management of potential impacts are detailed within the draft Environmental Management Programme (EMPr) which is included within Appendix K.

With reference to the information available at this planning approval stage in the project cycle, the **confidence** in the environmental assessment undertaken is regarded as **acceptable**.

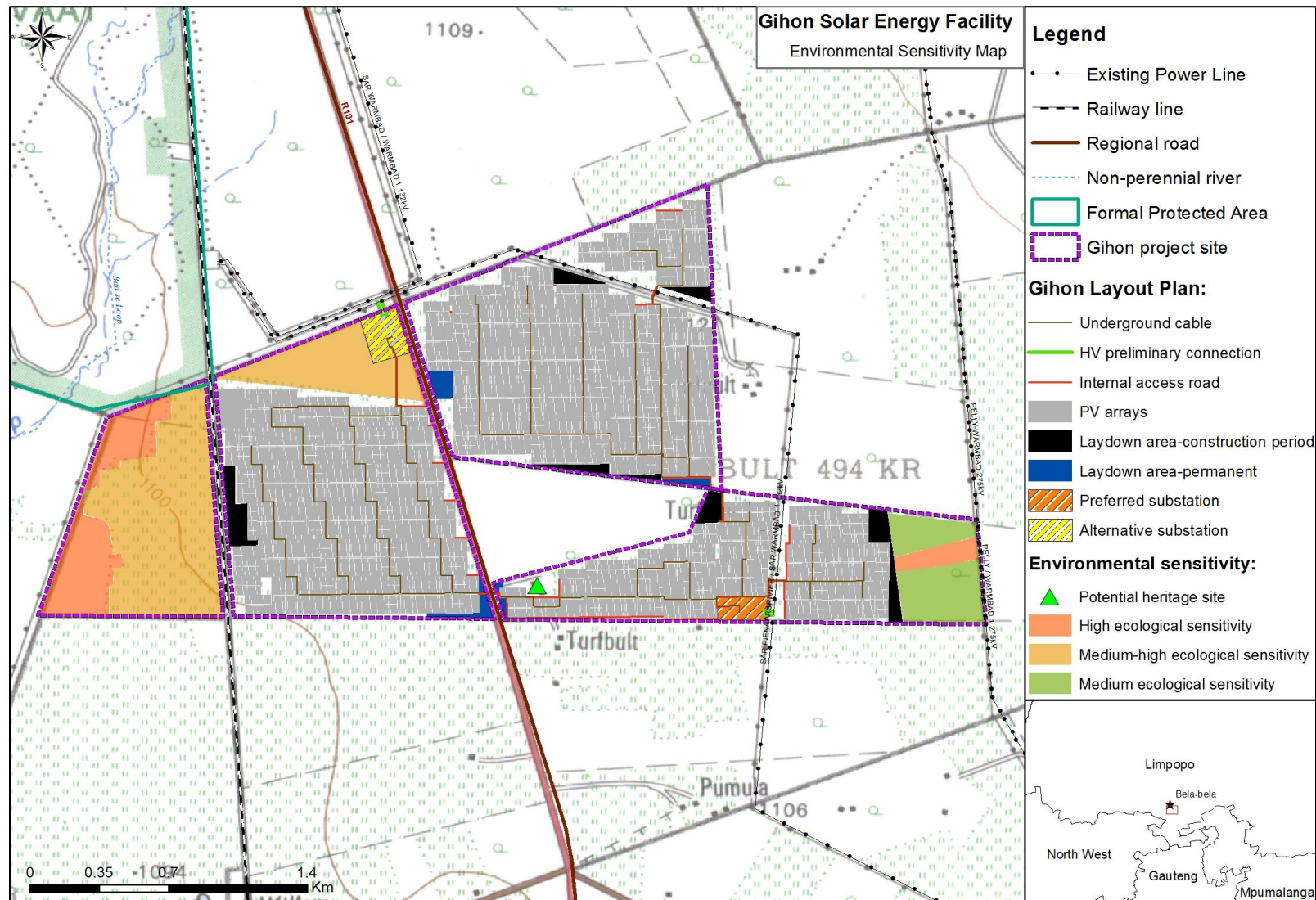


Figure 8.1: Composite sensitivity map and layout plan for the proposed Gihon Solar Energy Facility

8.5. Overall Recommendation

Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the Gihon Solar Energy Facility and associated infrastructure, the findings of the EIA, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the identified impacts can be mitigated to an acceptable level. In terms of this conclusion, the EIA project team support the decision for environmental authorisation.

The following conditions would be required to be included within an authorisation issued for the project:

- » Areas of high and medium to high ecological sensitivity determined through the EIA must be avoided.
- » No development activities may occur to the west of the railway line or between the Forever Resorts Nature Reserve and the railway line. This area and the area to the east of the project site must be excluded from the development footprint.
- » The use of PV technology consistent with a lower visual profile is recommended in order to mitigate the potential visual impacts on the neighbouring visual receptors identified.
- » Substation Alternative 1 must be developed as the preferred alternative.
- » The draft Environmental Management Programme (EMPr) as contained within Appendix K of this report should form part of the contract with the Contractors appointed to construct and maintain the proposed facility, and will be used to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project. This EMPr should be viewed as a dynamic document that should be updated throughout the life cycle of the facility, as appropriate.
- » All relevant practical and reasonable mitigation measures detailed within this report and the specialist reports contained within Appendices E to J must be implemented.
- » An independent Environmental Control Officer (ECO) should be appointed to monitor compliance with the specifications of the EMPr for the duration of the construction period.
- » A detailed stormwater management plan must be developed and implemented for the facility following final design.
- » Should the abandoned farmhouse structure be impacted by the project, it is recommended that a conservation architect assess the site prior to its alteration, use or destruction. If the site is older than 60 years a demolition permit will be required before commencement of alteration or demolition.

- » Should substantial archaeological or paleontological (fossils) remains be exposed during construction, the ECO should safeguard these, preferably in situ, and alert SAHRA as soon as possible so that appropriate action (e.g. recording, sampling or collection) can be taken by a professional palaeontologist.
- » Site rehabilitation of temporary laydown and construction areas to be undertaken immediately after construction.
- » Should the facility be decommissioned, the development footprint must be rehabilitated.
- » Alien invasive vegetation is to be managed or removed (as required) during construction, operations, decommissioning and post-closure of the facility.
- » Following the final design of the facility, a final layout must be submitted to DEA for review and approval prior to commencing with construction.
- » Applications for all other relevant and required permits required to be obtained by the developer and must be submitted to the relevant regulating authorities.

8.6. Listed activities to be authorised

As indicated in Chapter 1, below follows a concluding statement for each of the listed activities applied for and concludes whether the listed activity should be authorized or not, based on the outcome of the evaluation, impact assessment and relationship of the project footprint and associated infrastructure requirements to the receiving environment.

GNR. 544, Activity 10 (i): The construction of facilities or infrastructure for the transmission and distribution of electricity (i) Outside urban areas or industrial complexes with a capacity of more than 33kV but less than 275kV.

The project will require the construction of a new overhead power line (outside an urban area) in order to loop in and out of the existing Pelly-Warmbad 132kV power line traversing the project site. This activity requires authorisation.

GNR 544, Activity 11: (xi) The construction of (xi) infrastructure or structures covering 50 square metres or more, where such construction occurs within a watercourse or within 32 metres of a watercourse, measures from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

The proposed Gihon Solar Energy facility is located within 32m from a watercourse delineated on the eastern margin of project site. An area within 32m from a watercourse will be utilised for the PV panels or for temporary laydown of materials. This activity requires authorisation.

GNR. 544 Activity 13: The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.

Infrastructure (storage tanks) for the cumulative storage of hazardous substances (diesel and lubricants) on the project site, for the refuelling and maintenance of vehicles and machinery will be in the region of 20m³ – 30m³ and will not exceed 80m³ at any time. This activity **does not** require authorisation.

GNR. 544, Activity 18(i): The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from a watercourse

The positioning of the PV array and placement of the power line towers and roads associated with the project may intercept with watercourses or drainage lines whereby the dredging, excavation, removal or moving of soil, sand, pebbles or rock from the watercourse may occur. This activity requires authorisation.

GNR. 544, Activity 22 (ii): The construction of a road, outside urban areas, (ii) where no road reserve exists where the road is wider than 8 metres.

The proposed development would involve construction of an access road and internal roads approximately 3.5m in width. This activity **does not** require authorisation.

GNR. 544 Activity 26: Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).

This activity does not apply to the proposed development as there is no activity/process defined in terms of the Gazette, section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). This activity **does not** require authorisation.

GNR. 544 Activity, 47 (ii): The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre – (ii) where no reserve exists, where the existing road is wider than 8 metres – excluding widening or lengthening occurring inside urban areas.

The proposed development would involve widening of existing internal access roads to a standard width of 3.5m to ensure the ease of construction and maintenance of the solar facility. This activity **does not** require authorisation.

GNR. 545, Activity 1: The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more.

The solar energy facility will have a generating capacity of up to 75MW. Power lines and a substation are required as ancillary/support infrastructure. This activity requires authorisation.

GNR. 545 Activity 15: Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more.

The development footprint for the proposed solar energy facility will cover an area greater than 20 hectares, as approximately 220 hectares is required in order to realise the full proposed 75MW generation capacity. Agricultural land will be transformed to an industrial land use. This activity requires authorisation.

GNR. 546, Activity 4 (a)(ii)(gg): The construction of a road wider than 4 metres with a reserve less than 13,5 metres (ii) outside urban areas, in: (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve.

The proposed development would involve the construction of internal roads of between 3.5m to 4m wide (less than 4m wide) but within 5 kilometres of and adjacent privately owner nature reserve (Forever Resorts). This activity **does not** require authorisation

GNR. 546, Activity 10 (a)(ii)(gg): The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres (ii) outside urban areas, in (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve.

Infrastructure (storage tanks) for the cumulative storage of hazardous substances (diesel and lubricants) on the project site, for the refuelling and maintenance of vehicles and machinery will be in the region of 20m³ – 25m³ and will not be equal to or exceed 30m³ at any time, but will occur within 5 kilometres of and adjacent privately owner nature reserve (Forever Resorts). This activity **does not** require authorisation.

R. 546, Activity 12 (b) The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation (b) Within critical biodiversity areas identified in bioregional plans

The proposed development does not fall within a Critical Biodiversity Area identified in the Limpopo Province. This activity **does not** require authorisation.

R. 546, Activity 13 (2)(c)(ii)(ff) The clearance of vegetation of an area of 1 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for (2) (the undertaking of a linear activity falling below the thresholds in Notice R544 of 2010 (c) In Limpopo,(ii) Outside urban areas, the following (ff) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA, or core area of biosphere reserve

The development may result in the clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation within 5km from a protected area. The site shares a border with the Forever Resort private nature reserve. This activity requires authorisation.

R. 546, Activity 14: The clearance of vegetation of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: 1) purposes of agriculture or afforestation inside areas identified in spatial instruments adopted by the competent authority for agriculture or afforestation purposes. 2) The undertaking of a process or activity included in the list of waste management activities published in terms of the Waste Act or the undertaking of a linear activity falling below the thresholds in Notice 544 of 2010

The development may result in the clearance of more than 5 hectares of indigenous vegetation, whereby 75% or more of the vegetative cover may constitute indigenous vegetation outside urban areas in Limpopo. This activity requires authorisation.

